



# Teaching and Learning Aesthetics of Interaction

Sus Lundgren

Chalmers University of Technology

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Thesis for the degree of Doctor of Philosophy

# Teaching and Learning Aesthetics of Interaction

Sus Lundgren

Interaction Design

Department of Computer Science and Engineering

Chalmers University of Technology

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## **Teaching and Learning Aesthetics of Interaction**

Sus Lundgren

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Department of Computer Science and Engineering

Interaction Design

412 96 Gothenburg

SWEDEN

(+46) 31 772 10 00

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*This work is dedicated to...*

*... all the students I ever had; thanks for letting me learn from you!*

*...all the teachers I've ever had, for showing me what to do... and what not.*



*...the unknown person who saved my life back in 2004, and keeps saving my life everyday. Everything good I ever do is for you as well.*

*...my Dad, who did not live to see this. We miss you.*

*The burden on design instructors is much greater than most of us give credit for. Think about the goal of an instructor in any creative industry. They have to not only be proficient and educated in the execution of the medium, they also have to be able to express relevant opinions, provide options without leading students down predefined paths, and give appropriate feedback to a group of people as diverse as they come. In addition they have the added pressure of possibly being the only connection the student has to the medium, or the subject of the class. The instructor has to communicate the value of the medium in their own life, be caring, have a natural desire to teach and above all they have to be passionate. **That's a lot to lay on one person.***

*–Stefan Mumaw and Wendy Lee Oldfield in  
“Caffeine for the Creative Mind” (p. 87)*

# ABSTRACT

This dissertation is framed as an action research project, aiming to explore different means of teaching aesthetics of interaction. As such, it consists of a case study describing the work with a course in interaction design entitled “Aesthetics of Interaction”. Different views on aesthetics of interaction are discussed, as well as seeing interaction and temporality as design materials. These are then applied or utilized in design exercises as well as in other aspects of teaching.

The result is threefold:

- Firstly, the approach to teach, learn and discuss aesthetics of interaction in terms of aesthetic ideals. These are seen as aims of design, and do also illustrate that there is more than one possible, and valid, view on aesthetics of interaction. Six ideals are described; *Coherency, Efficiency, Criticism, Sensing, Emotion and Playfulness*.
- Secondly, a series of design exercises in the form of stand-alone learning objects. They are highlighting various aspects of aesthetics of interaction such as interaction per se, temporality, and of course the different aesthetic ideals. The exercises are thoroughly described with observations on what can be considered hard, examples of outcomes and suggestions on how to skew exercises towards a slightly different aim.
- Thirdly, one possible syllabus for teaching aesthetics of interaction.

To some extent the case description in itself can be valuable as well since it touches upon many common issues in design teaching.

**Keywords:** *aesthetics of interaction, aesthetic ideals, design exercises, action research, constructive alignment, learning objects, interaction design*

# REFERAT

Denna avhandling beskriver ett aktionsforskningsprojekt som syftar till att utforska hur man kan undervisa i interaktionsestetik. Den består av en fallstudie som beskriver arbetet med interaktionsdesignkursen "Aesthetics of Interaction". Olika uppfattningar om interaktionsestetik diskuteras, liksom synen på interaktion och temporalitet (förändringar över tid) som designmaterial i sig. Detta har sedan legat till grund för kursen, samt en uppsättning relaterade designövningar.

Resultaten är som följer:

- Idén att lära ut, lära sig och diskutera interaktionsestetik i form av olika estetiska ideal. Dessa kan ses som mål för design, och illustrerar dessutom att det finns mer än en möjlig, och valid, syn på interaktionsestetik. Sex ideal beskrivs; *Coherency* (konsekvent design), *Efficiency* (effektivitet), *Criticism* (design som kritik), *Sensing* (design med fokus på kroppliga och själliga upplevelser), *Emotion* (känslor) och *Playfulness* (lekfullhet).
- En uppsättning fristående designövningar som belyser olika aspekter av interaktionsestetik, t.ex. interaktionen som sådan, temporalitet och de olika estetiska idealen. Övningarna är utförligt beskrivna med avseende på vad som kan vara svårt, vilken sorts utfall man kan vänta sig och förslag på hur övningen kan anpassas till en annan kontext.
- Ett förslag på hur en kursplan för en kurs i interaktionsestetik skulle kunna se ut.

I någon mån är också själva fallstudien ett bidrag, eftersom den beskriver många vanliga dilemman och frågeställningar inom designundervisning.

**Nyckelord:** *interaktionsestetik, estetiska ideal, design övningar, aktionsforskning, constructive alignment, learning objects, interaktionsdesign*

# PUBLICATIONS

This dissertation partly builds on the following publications:

Lundgren, S. (2006) ***Facets of Fun: On the Design of Computer Augmented Entertainment Objects***. Licentiate thesis, Chalmers University of Technology, Gothenburg, Sweden. *On designing for emotion and playfulness.*

Lundgren, S., Eriksson, E., Hallnäs, L., Ljungstrand, P., Torgersson, O. (2006) ***Teaching Interaction Design: Matters, Materials and Means*** In: Proceedings of WonderGround - 2006 Design Research Society International Conference in Lisbon, 1-4 November 2006. *On teaching interaction design in general. On groups and group work.*

Lundgren, S. (2008) ***Treating and Teaching Aesthetics as Personality*** In: Proceedings of NordiCHI 2008: Using Bridges, 18-22 October, Lund, Sweden. *On character as a means for coherency.*

Lundgren, S., Bergström K., and Björk, S. (2009) ***Exploring Aesthetic Ideals of Gameplay*** In: Proceedings of DiGRA 2009 (Digital Games Research Association Conference 2009 Breaking New Ground: Innovation in Games, Play, Practice and Theory), Brunel University, West London, United Kingdom, 1st - 4th of September 2009. *On designing for playfulness and on aesthetic ideals in gameplay design.*

Lundgren, S. and Hultberg, T. (2009) ***Time, Temporality and Interaction***. In: interactions, Volume 16, Issue 4 (July+August 2009), Pages 34-37. ACM Press. *On designing temporal aspects.*

Lundgren, S. (2009) ***Case Study. Teaching Design in Large Heterogeneous Classes***. In: Interfaces No. 79, Summer 2009, pp. 12-15, Available from: Interfaces Archive. *On teaching design in large classes.*

Lundgren, S. (2009) ***Exploring the Interplay between Emotions and Interaction*** In: Proceedings of the third Nordic Design Research Conference, NORDES'09: Engaging Artefacts, Oslo, Norway, 30th of August to 1st of September 2009. *On the two design exercises "Designing Emotions" and "Expressions of Interaction".*

Lundgren, S. (2009) ***Teaching Aesthetics in Interaction Design: Attempt One***. In: Proceedings of the International Conference of Human Computer Interaction Educators 2009 (HCIEd 2009) in Dundee, 22-24 April 2009. *On the first version of the course "Aesthetics of Interaction"*

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Na

INTERACT  
LEAD TO  
ENJOYMENT

Life:  
"Confusion and clutter  
are failures & design's  
not a failure"

REFLECTION TOO,  
CAN BE AN  
AESTHETIC

Gesamtkunstwerk

Gaver:  
Ambiguous  
life-like richness,  
layers, mystery/intrigue/  
play

Disjuncting  
Aesthetics  
Usability  
follow

Disjuncting  
Aesthetics follow Usability  
Usability still the first  
place in Aesthetics?

Aesthetic =  
AN EXPERIENCE  
SIGNIFIED BY  
EMOTIONS

EXPLORATIVE  
DESIGN THROUGH  
AESTHETIC NARRATIVES  
AND PROVOKING

Zip:  
What is aesthetic

Zip:  
What is aesthetic  
Zip: What is aesthetic  
depends on what one  
chooses to give one's aesthetic  
attention.

Aesthetics is a  
matter of  
expression logic

ACTION  
(WS)

AESTHETIC FACTORS  
ARE: INTERACTION  
PATTERNS (TIMING, RHYTHM,  
FLOW); RICHNESS OF  
MOTOR ACTIONS; FREEDOM  
OF INTERACTION

*Design learning is in itself a design process. It should be a creative and self-creating process where future designers are given the opportunity to develop their own ideas of what reason, aesthetics and ethics they want to be 'guided' by in their design work.*

*– Erik Stolterman in "Guidelines or aesthetics: design learning strategies" (1994, p.458)*

In this dissertation I am “designing learning”, taking on the intersection of aesthetics, interaction design and practical teaching. Set in the context of action research it is an exploration into a new territory; teaching and learning aesthetics of interaction.

Interaction design is a new discipline, proposed in the late 1980ies by Moggridge (2007, pp 9-14), meaning that it is even newer than its close relative Human Computer Interaction. Being the art of inventing, and designing the interaction of and with interactive artifacts (such as computers, cellphones, interactive toys, computer games etc) its focus lies upon design, design processes and rationales for design, however utilizing methods for observation and analysis, as well as design guidelines firstly developed and used by the Human Computer Interaction-community. As such, it is an interdisciplinary subject, drawing from computer science, information technology, electronics, informatics, cognitive science, psychology, graphic design, industrial design and a handful other subjects. This, that the discipline is new, and to a greater extent that it is interdisciplinary – bringing sometimes contradictory influences from all the involved disciplines – means that there is not yet any official accreditation program for it (Thomassen and Ozcan 2010). Additionally, it has resulted in a rather diverse approach when it comes to teaching it, with the result that some interaction designers see themselves as engineers (e.g. usability engineers), others as creative artist-designers.

As early as in 1994, Stolterman observed this dichotomy in design teaching, one that seems to still be present in interaction design. He calls the two approaches the *guideline approach* and the *aesthetics approach*. The guideline approach is about teaching students a rational design process, this rationality being expressed as guidelines and standards. If the design process can be controlled in this way, so can the result, meaning that the designer is someone who can apply the process. On the contrary, the aesthetics approach does not acknowledge generic processes; instead each design situation requires individual attention from the designer, who is very skilled in recognizing and designing for quality, aiming for a good product, rather than process. According to Stolterman, the

choice of either tradition is based on teaching traditions, connection to practice and/or (perhaps most importantly?) the preconceptions of what a designer in a certain area (an artist, an architect, an information systems specialist) should be like. Stolterman's conclusion is that both approaches can (should?) be successfully combined, but that the important part is to open up the design students' eyes to the nature of design work as well as looking through the preconceptions surrounding it.

In interaction design, the tendency towards one of the approaches probably partly depends on which department or institution that runs the education; is it computer science, psychology or art? Or something else? The traditions and preconceptions from that department will most likely steer its interaction design education, especially since it also affects its teachers' interests and skill areas. Or, as put by Thomassen and Ozcan (2010) investigating world wide interaction design educations:

*"Despite their similar education philosophies, all universities have their own policies as a result of national requirements set by the institutions, the industry and national (and local) governments. And consequently formed their curricula based on artistic, engineering, design and media philosophies."*

*– Aukje Thomassen and Oguzhan Ozcan in "Standardizing interaction design education" (2010, p. 849)*

As a consequence, the notion of aesthetics and aesthetics of interaction is not easily seen as a natural part of an interaction design education at some institutions; the teachers do not feel competent enough to run a course on the subject, and it's not part of the local preconception of what the interaction designer knows and does anyway. This does of course not mean that aesthetic aspects are not taught in some way anyway, if nothing else by just inculcating into students what is being considered "good" design at that very education or institution.

One might wonder what is currently going on, when it comes to teaching aesthetics of interaction. Unfortunately, not much. The ACM<sup>1</sup> (Association for Computing Machinery), one of the key resources for anyone doing research in the computing science realm, providing a *"Full text collection of every article published by ACM, including over 50 years of archives."* yields 588 hits on "Interaction design" aesthetics, 523 hits on Interaction design teaching and only 10 hits on teaching "aesthetics of interaction". The total number of items in the library that day was 248,317<sup>2</sup>. Looking at



ACM's suggested curricula, there is none for interaction design, but one for Human Computer Interaction (Hewett et al 1992, 1996), but this is almost 20 years old and by ACM itself considered *"significantly out-of-date"*<sup>3</sup>. Aesthetics is not mentioned anywhere in it. Meanwhile, IxDA (Interaction Design Association)<sup>4</sup> lists Education and Mentorship as one of their activities, aiming to *"create a useful repository of curricula structure, lecture content, reading material, and other artifacts that, collectively, illustrate best practices for higher education of Interaction Designers and encourage the development of new interaction design programs."*<sup>5</sup> – but none could be found on their site in March 2010. Neither do the educational databases ERIC (Education Resources Information Center)<sup>6</sup>, Ariadne<sup>7</sup>, MERLOT<sup>8</sup>, Connexions<sup>9</sup> or Edna<sup>9</sup>, contain much material on interaction design – a few hits at best, of which none was related to aesthetics. Skimming through the first Google hits of online curricula of the interaction design programmes at: Carnegie-Mellon University<sup>10</sup>; Copenhagen Institute of Interaction Design /The Danish Design School<sup>11</sup>; Delft University of Technology<sup>12</sup>; Malmö University<sup>13</sup>; Royal College of Arts<sup>14</sup>; and Umeå Institute of design<sup>15</sup> results in no explicit courses on aesthetics, and the term only being mentioned twice – at TU Delft students will *"pursue a multi-disciplinary course of study covering topics which include ergonomics, aesthetics, interaction design, psychology and sociology"*<sup>16</sup> and at the RCA one of the main three areas is *"Technology as medium: exploring the aesthetic and functional potential of new technology by experimenting with the material, and simply by playing with it."*

Widening the search area towards the design-realm did not help very much; the databases of the four design-related magazines Design Issues, Leonardo, Design Studies and International Journal of Design yield only a handful of articles as a result, most of which will be quoted somewhere in this dissertation. Additionally the publications of ELIA (European League of Institutes of the Arts) are very interesting from a design-teaching point of view, but not once on some 1000 pages is the term "interaction design" mentioned (Miles 2004, ELIA 2008).

Arguably there is one conference on teaching interaction design and HCI, called HCI Educators (HCIEd). The conference started in 2006 and has run every year since (i.e. four times at present), publishing some 20 papers each time (not part of the ACM count above). The scope of it is very wide, ranging from teaching any aspect of interaction design or human computer interaction in any sub-topic, on any faculty, but also covering more over-arching topics like HCI-curricula. These are wide areas to cover and naturally the ca 80 papers published at HCIEd so far have only made a few raids into this vast terrain; apart from my own publications there,

none deal with aesthetics. And – depressingly enough, HCIEd 2010 was cancelled due to too few submissions.

I am however not stating that aesthetics are *not* taught in interaction design; e.g. my own interaction design education was full of discussion aesthetic issues, since they dwell in many aspects of the subject. As a consequence, aesthetics can be – and probably are – a part of almost any course in design. However, it does not seem as if aesthetics of interaction has yet gained the status of being a course or subject on its own, and as a consequence of this, no one shares their insights in how to teach it.

One can of course question whether aesthetics of interaction is important enough to become its own subject? Here, the growing interest in aesthetics of interaction suggests something else (see the “Related Work-section, or Udsen and Jørgensen (2005) for a quick overview), as does the public’s growing awareness of the “importance of design” which encompasses not only usability but also aesthetics. Even Business Week dedicates one of its sections to innovation and design<sup>47</sup>! E.g. Tractinsky, Katz and Ikar (2000) studied the connection between usability, aesthetics and user’s appreciation of an ATM with the conclusion that users’ perceptions of interface aesthetics is tightly coupled to how they perceive its usability. “However, most surprising is the fact that post-experimental perceptions of system usability were affected by the interface’s aesthetics and not by the actual usability of the system.” (p 8). Commenting on Tractinsky et al, Norman (2004) states that “*attractive things work better*” (pp. 17-33).

Somewhat along the same lines, Löwgren (2008) writes that “We need holistic, interpretative approaches to dealing with aesthetics in interaction design.” (p. 8). Currently there is not one such approach, but several different and to some extent non-holistic ideas on aesthetics of interaction, since they focus on different aspects or ideas (e.g. pragmatism, usability, critical design or whatever). The subject aesthetics of interaction is by far explored, expressed and analyzed fully. E.g. Fällman (2008), writes about three areas of interaction design research; design practice, design studies and design exploration. Placing the study of aesthetics of interaction in the latter, he writes:



*"While suppressed by functionalism for decades, we believe aesthetics to be a central concern for interaction design research. Understanding the role of aesthetics means being able to deal with issues of what is beautiful, harmonic, and fitting in the digital world..."*

– Daniel Fällman in *"The Interaction Design Research Triangle of Design Practice, Design Studies and Design Exploration"* (p. 8, 2008)

And, most interesting of all, is Löwgren's comment in Fishwick, Diehl, Prophet and Löwgren (2005), where the authors give an introduction to four aspects of what they call aesthetic computing:

*It may seem odd, and in fact it is odd, to talk about aesthetic computing as if it were something new and hitherto unexplored. All computing is aesthetic in the sense that all use of digital artefacts entails aesthetic reactions. To be sure, many contemporary digital artefacts tend to elicit aesthetic reactions along the lines of frustration, indifference or boredom, but these are aesthetic reactions nevertheless. And as designers, we are free to aim for other kinds of reactions if we like.*

– Jonas Löwgren (in Fishwick et al) *"Perspectives on Aesthetic Computing"* (2005, p 7)

I cannot but agree. Aesthetics are always there. They occur in design whether we like it or not, whether we aim for it or not. We can not possibly ignore such an unavoidable influence on how people react towards our designs; we must consider aesthetic issues whilst designing. And we must not let our students treat aesthetics as a secondary or tertiary issue, or just something that "happens", or something that is related to visual appearance only. We must teach our students how to relate to, and aim for aesthetics of interaction. The question is then, returning to Fällman (2008), what is *"beautiful, harmonic, and fitting in the digital world"*?

## RESEARCH QUESTIONS

Given the discussion above, I found it both worthwhile and interesting to explore teaching and learning activities related to aesthetics of interaction. In this, I have concentrated on the "classical" questions regarding what, why and how, or more precisely:

- What topics could be relevant in a course on aesthetics of interaction?
- Why would interaction design students benefit from such a course?
- How can aesthetics of interaction be taught, using constructive alignment as a framework?

This research being an *exploration*, rather than a comparative study means that it is a systematic attempt to investigate different aspects of these topics. I am not claiming that one teaching approach is more superior than another in every respect, but nevertheless I have found, and am offering, a possible approach to teaching aesthetics of interaction, as is being described in Part V (Explorations) and discussed and evaluated in Part V (Teaching and Learning Aesthetics of Interaction).

## RELATED WORK

This section is divided into three parts. First, the interaction design community's view on aesthetics of interaction is presented, including a subsection on the locus of the aesthetics; is it in the user's mind, in the artifact or somewhere in between? Is it always present or does it only occur in use? Second, moving slowly towards the issues of teaching interaction design, "materials" in interaction design are presented, arguing that every designer must know his or her materials. In the last section, current approaches to teaching aesthetics of interaction are presented.

## AESTHETICS IN INTERACTION DESIGN

In the last decade, a number of different approaches, ideas and concepts related to aesthetics of interaction design have been presented, many of which will be described below. Just as Pye (1978) implies, there is no consensus on this notion.

*"It need not surprise us, either, that people do not unanimously agree about what is beautiful and what is not, for they do not unanimously agree about anything whatever."*

— David Pye in *"The Nature and Aesthetics of Design"* (1978, p.

101)

Starting with Hallnäs and Redström, they have explored the notion of aesthetics of interaction for several years, in several projects. In 2002, they proposed that aesthetics is a matter of an “inner logic” as follows:

*“It is a basic axiom here that it is through the force of its inner logic, its consistent appearance, that a thing receives depth in its expression and thus its strength to act as a placeholder for meaning.”*

*Lars Hallnäs and Johan Redström in “From Use to Presence: on the Expressions and Aesthetics of Everyday Computational Things” (2002, pp. 115-116)*

To some extent, we could see this as an argument for coherency, a coherency so deeply inscribed in the artifact that it becomes inherent. In their later work, they discuss the connection between these coherency-related aesthetics and the design process, stating that aesthetics “...plays a basic role here as we go from the abstract to the concrete, from ideas about functionality to expression of function, from requirements to suggestions.” (Hallnäs and Redström 2006, p. 51), seeing aesthetic as the basis for design. Moreover they have applied and explored this view in a series of designs, e.g. the Slow Technology design programme which questions efficiency; instead artifacts are deliberately designed to be slow in the sense that they encourage reflection. E. g. it can be hard to see what an artifact is, find out how it works and why, and what the consequences of using it are. As a result “*Slowness then comes as a consequence of a techno-aesthetical design philosophy that focuses on reflective and conscious use of the technology as such.*” (Hallnäs and Redström 2001, p. 203.) More recently, Redström (2008) has explored what he refers to as tangled interaction; adding layers of interaction onto everyday things such as a pillow that can communicate, and a radio that starts to malfunction if the nearby energy consumption rises. In this, he explores the struggle that occurs when combining old materials with “new” ones such as computational technology, resulting in a changed relation between physical form and interior complexity. This, Redström states is “*a basic aesthetic issue in interaction design*” (Redström 2008 p. 1).

Somewhat along the lines of Slow Technology is Gaver’s, Beaver’s and Benford’s (2003) idea of utilizing ambiguity as a resource for design. They see ambiguity as a tool for asking questions about use, context and relations. The authors state that “*The rich aesthetic and conceptual potentials of ambiguity have long been exploited in the arts*” (Gaver et al 2003 p. 1) and then analyze the qualities of ambiguity in several contemporary examples

from art and interaction design, stating that things are not ambiguous in themselves; instead ambiguity is “*a property of the interpretative relationship between people and artefacts.*” (Gaver et al 2003 p. 3). This opens up a design space; this relationship can be toyed with, used to get users to question and sometimes reinterpret information, relationship or context.

Similar attempts to open up the design space by questioning ingrained ideas have been made by Dunne (1999) who critically comments on the way we design, use and relate to (or rather not relate to) everyday electronic objects. Using estrangement, alienation and narratives to explore a new role for the electronic object, Dunne carried out a series of designs, e.g. *Electroclimates*; an abstract radio in the form of a pillow, that displays nearby radio frequencies as flickering patterns of light and distorted sound, thus in a sense eaves-dropping on its environment. Another design is *Thief of Affections*, a cane that takes weak electronic signals from pacemakers and turns them into vaguely erotic sounds, in this forcing(?) its user to take on the role of as being bad or perverse. Again commenting on the invisible, ubiquitous buzz of radio signals, Dunne also designed the *Faraday Chair*, creating an empty, non-electronic, space. Dunne defines all of these objects as being post-optimal, stating that

*“In a world where practicality and functionality can be taken for granted, the aesthetics of the post-optimal object could provide new experiences of everyday life, new poetic dimensions.”*

– Anthony Dunne in “*Hertzian Tales, Electronic Products, Aesthetic Experience and Critical Design*” (p. 29)

Dunne has further explored these post-optimal objects together with Fiona Raby (2001), labeling it Critical Design; i.e. using “*speculative design proposals to challenge narrow assumptions, preconceptions and givens about the role products play in everyday life.*” (Dunne and Raby 2007).

It is often commented that critical design becomes “useless” in the sense that apart from stating its point, the artifacts designed are hard or impossible to use. A recent counter-example in interaction design is the Static!-project (Backlund et al 2006), where the authors point out that “*To find new ways of working with energy in design, we need to rethink this distinction between aesthetics and engineering as to make way for a more general understanding of energy as material in design.*” (p. 3). Consequently, energy is used as a material affecting both the technical functions and the aesthetic expressions of the designs, e.g. in the *Energy Curtain* (Ernevi et al 2005, Backlund et al 2006 pp. 4-5 ); a curtain that – if drawn – collects

energy from the sunlight, so that it can light up the room at night. Thus it allows for the user to “collect” and “save” light for later. In addition it has versatile visual aesthetics; from being a seemingly ordinary type of fabric it turns into a display for a dynamic, glowing pattern in the evening.

Whereas the above-mentioned examples in some sense are related to opening up design spaces, asking questions about life and society, there are also several designers who explore the relation between emotions and aesthetics. Most remarkable here is possibly Norman who has turned from a rather function oriented stance (1998) towards “emotional design” (2002, 2003), stating that *“Technology should bring more to our lives than the improved performance of tasks; it should add richness and enjoyment”* (2003, p. 101). In short, Norman’s argument is that *“attractive things work better”* (2002, 2003) because of the extra pleasure they provide. To Norman, attractiveness can appear on three different levels, preferably all: *Visceral* (how something looks and what it signals), *behavioral* (pleasure and effectiveness of use) and *reflective* (rationalization and intellectualization). All three levels should be taken into consideration when designing. Another interaction design example of studying emotions is the work of Picard, who has covered a wide range of emotion-related topics in her research, from frustrating the user on purpose (Riseberg et al 1998) via affective computing (Picard 2000) to robots with emotional intelligence (Picard, 2009). Overbeeke, Djajadiningrat, Hummels and Vensveen (2002) take a similar stance. Promoting perceptual-motor skills and emotional skills they state:

*However we are not promoting “ease of use” as a design goal. Interfaces should be surprising, seductive, smart, rewarding, tempting, even moody, and thereby exhilarating to use. The interaction with the product should contribute to the overall pleasure found in the function of the product itself.”*

– Kees Overbeeke et al in *“Beauty in usability: Forget about ease of use!”* 2002, (p. 10)

According to Overbeeke et al, the way to attain this is to provide experiences, to consider temptation rather than affordances, beauty of interaction rather than a beautiful appearance, enjoyment of the experience rather than ease of use. In their view, aesthetics of interaction is a combination of the physical and virtual qualities of an artifact together with the resulting interaction. Easy of use is not the primary focus:

*A user may choose to work with a product despite it being difficult to use, because it is challenging, seductive, playful, surprising, memorable or rewarding, resulting in enjoyment of the experience. No musician learnt to play the violin because it was easy.*

– Kees Overbeeke et al in *“Beauty in usability: Forget about ease of use!”* (2002, p. 11)

In line with this idea, but focusing on tangible artifacts Djajadiningrat, Matthews and Stienstra (2007) see aesthetics of interaction as the quality of experience in interactively engaging with a product. (p. 658), concluding that *“By ignoring the experience that arises from physical movements, a major part of the aesthetic potential of interactive products is neglected.”* (p. 671). Similarly, Djajadiningrat and colleagues have explored the aesthetics of tangible systems in a series of papers. In a paper with Wensveen, Frens and Overbeeke Djajadiningrat (2004) states:

*“We are intrigued by three other factors which we think play a role in aesthetics of interaction. The first is the interaction pattern that spins out between the user and product. The timing, flow and rhythm, linking user actions and product reactions, strongly influence the feel of the interaction. The second is the richness of motor actions [since] current creative programs exploit a very narrow range of motor skills. [...] The third factor in aesthetics of interaction is freedom of interaction. [...] we have become interested in products that offer a myriad ways of interacting with them. Interaction in which there is room for a variety of orders and combinations of actions. Freedom of interaction also implies that the user can express herself in the interaction. This requires that the product allows for such expressive behaviour – not constraining the user – and may even take advantage of it.”*

– Tom Djajadiningrat, Stephen Wensveen, Joep Frens and Kees Overbeeke in *“Tangible products: redressing the balance between appearance and action”* (2004, p. 297)

In the aforementioned paper the authors describe a series of student experiments aimed at exploring the tangible dimension, stating that today's interactive interfaces with their very different functions still only just require different types of pushing (e.g. buttons), resulting in a poor tangible experience. In addition, the output is also often very similar. *“With little differentiation in appearance and actions, there are no ‘hooks’ for the perceptual motor system to get a grip on a product’s interface.”* (Djajadiningrat et al

2007, p. 660). Consequently, the recommendation is the design of a flowing movement, contributing to efficiency of function and resulting in the user's pride of her or his skills. (Djajadiningrat et al 2007). In this tradition, Frens (2006) has explored what he calls *rich interaction*; the combination of form, interaction and function, resulting in a camera with very "tangible" interaction. On aesthetics Frens however concludes that *"if from the start both usability (ergonomics/human factors) and aesthetics are used as criteria for form, interaction, and function combinations, aesthetics no longer has to be opposite to usability."* (p. 27.).

Overall, there is a tendency towards re-introducing the body in interaction design. Dourish (2004) writes about embodied interaction, the way we encounter physical and social reality in our everyday lives, pointing out the difference between metaphors for interaction design, taken from the real world (e.g. the "trashcan" on our computer "desktop") and real world objects as mediums for interaction. Klemmer, Hartmann and Takayama (2006) make a similar exploration, defining five "themes" for embodied interaction design, all related to the experience of tangibility: *Thinking through doing; Performance; Visibility; Risk and Thick Practice*.

Some designers within this area place themselves in the tradition of pragmatist aesthetics tradition which is based on Dewey's (2005) ideas on the aesthetic experience; experiences that are significant: *"that meal, that storm, that rupture of friendship."* (Dewey 2005, p. 38). According to Dewey, the aesthetic experience is also signified by a very distinct start and a satisfying fulfillment. Based on Dewey's ideas Wright, Wallace and McCarthy (2008) suggest a framework for experience centered design, by focusing on user experience and meaning-making, and by aiming for a holistic experience encompassing sensual experience, emotional experience, spatio-temporal experience and the narrative structure of the experience.

*"...our approach to aesthetic interaction does not imply that what is needed is some alternative methodology to user-centered design. Rather it suggests a different sensibility towards it, a different way of relating to familiar precepts such as know the user, iterative design,*



*and user involvement. It requires us to see these familiar things in terms of felt life, empathy, and the aesthetics of everyday experience."*

*– Peter Wright, Jayne Wallace and John McCarthy in "Aesthetics and Experience-Centered design" (2008, p 19)*

Similarly, Petersen, Iversen, Krogh and Ludvigsen (2004) have combined this with Shusterman's (2000) development of Dewey's ideas; the notion of somaesthetics, i.e. involving the bodily experience, e.g. what is sensed by the senses but also how the body moves and operates, in one's appreciation of the aesthetic. Based on this Petersen et al summarize aesthetic interaction as follows:

*"...a pragmatist approach to the aesthetics of interactive systems implies that aesthetics is tightly connected to context, use and instrumentality; circumscribing our perspective on Aesthetic Interaction."*

*– Marianne Graves Petersen et al in "Aesthetic Interaction – A Pragmatist's Aesthetics of Interactive Systems" (2004, p. 271)*

Moreover, they state that the aesthetic experience is a new perspective on HCI (compare with e.g. the system perspective). This, the Aesthetic Experience-perspective aims to promote imagination and play through improvised interaction. For example, one of their designs exemplifying this is a remote control that uses gestures instead of buttons to control a music player. Another is an interactive environment where a ball is used for picking up and moving projected documents. In line with the quote above, Petersen et al stress the point that the aesthetical experience *"...emerges from the personal and interpersonal sensations, experiences and reflections that is connected to the system in context"* (Petersen et al 2004, p. 271). Or, to put it differently, that the designer cannot design the experience. Fiore, Wright and Edwards (2005) too, adapt pragmatist aesthetics, and address the issue of not being able to design the experience by focusing on empathy, exploring techniques seeing designers could use in order to design for blind people.

*"A pragmatist way of seeing requires us to understand the experiences of the blind person in relation to ourselves and it is here that we identify empathy. In other words, we see how the designer's expression of empathy in the object designed [...] is connected to the experience of the user or perceiver."*

*–Salvatore Fiore et al in "A pragmatist aesthetics approach to the design of a technological artefact", (2005, p. 131)*

Similar to Petersen et al (2004), Schiphorst (2009) addresses the issue of somaesthetics by designing a set of interactive textile sculptures, soft(n) who respond to different types of touch with vibrations, sound and shared light patterns. Schiphorst explores touch and touching both from a motoric perspective – she lists twelve different types of touch, from the gentle one-finger tap to the open-handed slap – as well as from a tactile perspective, elaborately choosing or designing textile textures and shapes.

Both Schiphorst's (2009 and Petersen et al (2004) thus rely on play and playfulness as a result or means of their aesthetic approach. The aesthetics of play have mostly been discussed in the game design community; e.g. Lundgren et al (2009) discussing properties of gameplay as well as aesthetic ideals. In gameplay design several researchers link gameplay experiences to emotion, e.g. LeBlanc (2006) proposes a three layered structure where *mechanics* evoke *dynamics* which in turn evoke what he calls *aesthetics*, which in that context are the desired emotional experience(s) of playing the game. Similarly Järvinen (2008) states that the emotional responses that a game triggers can be seen as a part of the aesthetic experience of playing it.

## The Locus of Interaction Aesthetics

There is a never ending debate regarding where the aesthetics actually reside; is it a property inscribed in the artifact or something in the user's mind (*"beauty lies in the eye of the beholder"*), or is it perhaps located somewhere in between?

The first view, presented by for instance the American philosopher G. E. Moore (1903) represents analytic aesthetics, i.e. that objects can be analyzed from an aesthetical standpoint regardless of context; *"...it is necessary to consider what things are such that, if they existed by themselves, in absolute isolation, we should yet judge their existence to be good"* (Moore 1903, § 112). Discussing the connection between the good and the beautiful and how to judge these he states:

*"To assert that a thing is beautiful is to assert that the cognition of it is an essential element in one of the intrinsically valuable wholes we have been discussing; so that the question, whether it is truly beautiful or not, depends upon the objective question whether the whole in question is or is not truly good, and does not depend upon*

*the question whether it would or would not excite particular feelings in particular persons."*

– George Edward Moore, in *"Principia Ethica"*, (1903, § 121)

In interaction design we can find similar views in the works of Hallnäs and Redström (who both happen to have studied philosophy in addition to being interaction designers) see aesthetics as an underlying logic inscribed into an artifact.

*"Aesthetics, as we understand it, is concerned with how material builds expressive things, that is, it is a logic of expressionals. It follows that good design from an aesthetical point of view basically is a logical question, not primarily a question of psychology, ethnography, sociology, etc."*

–Lars Hallnäs and Johan Redström in *"From use to presence: on the expressions and aesthetics of everyday computational things"*, (2002, pp. 115-116)

Others agreeing are Baljko and Tenhaaf (2008):

*"...a designer cannot design an interaction, because interactions depend crucially on the human interactants, who cannot be designed a priori. At best, a designer can design interactive media that affords certain types of interactions with the goal of eliciting interactions that have certain characteristics, provided that the behaviors of its human interactants fall within a particular scope."*

– Melanie Baljko and Nell Tenhaaf in *"The aesthetics of emergence: Co-constructed interactions"*, (2008, p. 5)

Landin (2009), defines aesthetics as something that one can focus on throughout the design process, as a basis for design decisions, stating that *"Aesthetics of interaction is seen as something for which the conditions are set at the same time as a device or system is designed."* (p. 26). Furthermore, Landin comments on the difference between the designed artifact and the experience of it:

*"There is an important difference between an expression and an experience of interaction. To say that we when designing a computational artifact define certain expressions of interaction is neither to say that people will experience something that corresponds or answers to those expressions (feeling accomplished, for example). Nor that people will*

*identify the expressions (describe the device as having an expression of accomplishment). People's feelings and experiences are individual and today, we know too little to specify them in terms of design requirements."*

– Hanna Landin in "Fragile and magical interaction forms: an approach to interaction design aesthetics." (2006, p. 50)

The pragmatist phalanx, on the other hand, see the aesthetics as something inherent in the user's experience and in the context of use. Pragmatism is based on the thoughts by philosopher John Dewey, whose ideas evolve around the aesthetic experience, described as follows:

*"...we have an experience when the material experienced runs its course to fulfillment. [...] A piece of work is finished in a way that is satisfactory; a problem receives its solution; a game is played through; a situation, whether that of eating a meal, playing a game of chess, carrying out a conversation, writing a book or taking part in a political campaign, is so rounded out that its close is a consummation and not a cessation. Such an experience is a whole and carries with it its own individualizing quality and self-sufficiency. It is an experience"*

– John Dewey in "Art as Experience (p. 36-37)

Similar versions of his standpoint are expressed by his followers, e.g.:

*"Thus it becomes meaningless to think of aesthetics of artifacts in themselves. They might contain an aesthetic potential, but its release is dependent on context and use."*

– Marianne Graves Petersen et al in "Aesthetic Interaction – A Pragmatist's Aesthetics of Interactive Systems" (2004, p. 271)

*"...somaesthetics reinvigorates the field of aesthetics by reclaiming the lived experience of the body and particularly the notion of cultivating the self through attention to experience. A pragmatic aesthetics gives precedence to enactment by referring to the importance of experience to produce or enact the aesthetic response."*

– Thecla Schiphorst in "soft(n): Toward a Somaesthetics of Touch" (2009, p. 2429)

Lastly, there are some designers stating that the aesthetics appear only in use and is thus not inherent in the artifact or a part of the user's experi-

ence, but instead somewhere in between. This is expressed by Lim et al (2007), who are presenting a pragmatist-influenced stance by stating that “...our perspective of interaction, [is] that interaction is not something inherent only to the artifact but something that emerges through the inter-plays between people and artifacts.” (Lim et al 2007, p. 244).

Löwgren (2007b) too, places the aesthetics in the no-man’s land when discussing his use/experiential qualities: “*pliability is not a property of the artifact itself, nor is it a psychological or physiological property of the user. Pliability appears in use.*” (Löwgren 2007b, p. 14). Löwgren continues to state pretty much the same thing as Baljko and Tenhaaf (2008, see quote above); we cannot design pliability in itself, only the conditions that hopefully afford it.

## INTERACTION DESIGN MATERIALS

*In the design process we define how material shapes things, builds things. We have to know the material, how it builds, its expressiveness etc. That involves processes of construction as well as general understanding of basic materials as design materials.”*

*- Lars Hallnäs and Johan Redström in "Interaction Design: Foundations, Experiments" (2006, p. 105)*

When talking about design materials and education it is necessary to take a step backwards, looking into one of the most influential design educations ever; that of the Bauhaus, a design school open only fourteen years, 1919-1933, examining only some 1200 students (Vihma 2003, pp. 116-117). Here, the explicit goal was to educate combined craftsmen and artists, and in order to do this, a new type of education was created, setting the standard for most design educations since . On of its most influential teaching practices was the *Vorkurs*, or preparatory course where students should learn basics of form, explore materials and look into different crafts. (Wick 2000, p. 92-93). What is interesting here is how the different teachers of the course approached the subject<sup>18</sup>.

The first years, when the course was taught by Johannes Itten, focus was on visual elements like form, color, contrast, composition. Albeit very pedagogical, and instructive in these aspects, no part of the preliminary course was however concerned with actual design issues; Itten found it very hard to see visual arts and design as compatible; he was teaching art. This put him in conflict with some students or teachers. (Wick 2000, ch. 5).

The next teacher, Lázló Moholy-Nagy looked more into materials instead. Among other things he developed exercises to heighten the student's haptic sense, e.g. collages of materials arranged according to how they felt. He also developed a series of exercises on creating different types of surfaces; the task was to take a material, for example paper, and create – design – a surface using different tools and techniques. He also let his students make sculptures, ranging from static and compact to moving, hollow and fragile ones, playing with equilibrium in all its aspects. Combined, all these design exercises led to an understanding of the properties and behaviors of various physical materials. (Wick 2000, ch. 6). Yet another step away from art and towards craft (or what was since become industrial design) was taken by the next teacher, Josef Albers. Albers was very influenced by Dewey's thesis learning by doing, and his own slogan was "*Experimenting takes priority over studying*" (Wick p. 174). Consequently, his approach to teaching students about materials, and training their vision and feel for proportion, harmony etc, was to let them experiment with simple materials like paper, wire, rubber, cellophane etc. The results were reflected upon individually and in class discussions; this was Albers' way to let students learn. As for exercises, his most novel contribution was material exercises where students had to explore what each material was suitable for (e.g. paper is suitable for folding), and material exercises with a focus on economy and labor; the results should be created with no loss and with a well designed process that resulted in as little work as possible. This gave students a very good understanding of when and how to use materials and it of course prepared them for designing things for mass production. (Wick, ch. 7)

Note the three teacher's view on the different aspects of material in the word's more abstract sense. To Itten it was the visual expression that was interesting, to Moholy-Nagy that plus the haptic properties of a surface and the behavior of materials, to Albers all this plus a deep knowledge of how different material's properties and how they could be used. These issues (as well as others) reappear in many types of design and art, e.g. architecture and sculpture.

Now, if one wants to be like Albers, giving students a deep knowledge of their materials' properties and behaviors, one must first define the materials. Which *are* the materials of interaction design, and how can we explore them, learn about them, and teach them?

Since interaction design is the design of interactive things it presupposes a certain "intelligence" in the artifact, so that it in fact can interact

with the user, not only react. Crawford (2003) describes it as being able to “listen”, “think” and “speak” to the user in some sense. The intelligence needed for the thinking part is provided by code, making computational technology an inherent part of the interactive artifact, thus being a design “material” one cannot avoid as an interaction designer. Hallnäs and Redström (2006 pp. 101-118) state:

*“Computational technology is central to the interaction design practice. Not mainly as a methodological tool, but as the basic technology that constructs the things we design; it is what builds these things as computational things.”*

*- Lars Hallnäs and Johan Redström in “Interaction Design: Foundations, Experiments” (2006, p. 105)*

The fact that code is not a physical material is not strange per se; just as one can write music which then appears when playing the piece, one can write code which expresses itself in execution. Correspondingly, Dunne explores electronic objects in *Hertzian Tales* (1999), stating that *“the electronic object is on the threshold of materiality.”* (p. 25). Further, the very first sentence in Löwgren and Stolterman’s *Thoughtful Interaction Design* (2004) is: *“The shaping of digital artifacts is an act of design.”* (p. xi). Similarly Cooper and Reimann define interaction design as follows:

*“Simply put, interaction design is the definition and design of the behavior of artifacts, environments and systems, as well as the formal elements that communicate that behavior”*

*- Alan Cooper and Robert Reimann, in “About Face 2.0: The Essentials of Interaction Design” (2003, p. xxix)*

However, the interaction designer’s main material is not only code, or computational technology; we design *interaction in itself*. And, more importantly, we use code as one of our major means to shape interaction; compare for instance two cell-phones with each other. From a certain point of view they are very alike; they are used as phones, cameras and messaging tools, they are roughly of the same size and have roughly the same means of input and output. Nevertheless they differ greatly, and that is not just a matter of graphics and appearance but in how code has been written to shape how the phone reacts on input, and which input has to be made in order to get a certain result. Is there a shutter sound or not when a photo is taken? Is the search algorithm smart and fast? Do animations run smoothly? Is the interaction sequence smooth, without unnecessary



actions, when adding a person in the address book? Is it possible to delete not only entire SMS-conversations, but also parts of them? How long does it take to boot it? Is navigation easy? This in turn affects not only interaction but also use over time, and a user's feelings towards the phone. As a consequence, interaction can be seen as a very elusive design material in itself:

*"To develop such insights about material properties is not easy, especially when it comes to interaction. The material we deal with is not tangible like plastic, metal, wood, or visual elements that constitute familiar building blocks in traditional design fields. The material we need to understand for interaction design is flexible, ungraspable, and phenomenal."*

– Youn-kyung Lim et al in *"Interaction Gestalt and the Design of Aesthetic Interactions"* (2007, p. 245)

Interaction in itself has its own qualities, which deserve to be investigated, experimented with. Interaction also brings with it something else – change. We design interaction with and interaction of complex systems. They act, react. They have – we inscribe in them – a behavior of their own, which is expressed in the interplay between user and artifact. Thus, our designs change over time. A pair of scissors will always look the same, more or less, whereas a GUI will change on the user's request. When I am inserting this very sentence in the middle of an older text, the screen changes, adapts to what I write. My words appear and the following lines flow down in such a way that the layout of the page now has changed. By adding a paragraph I can instantly change the layout of the entire document. An other aspect of time in interaction design is how some softwares get used to us, giving us default values based on what we normally select or enter. Yet another is that interactive products also have a tendency to change over time as a result of improvement, e.g. many websites are being redesigned and improved regularly (e.g. Facebook), on others content changes regularly (e.g. Wikipedia and any news site), and softwares tend to be released in a new version every once in a while. Regardless if we consider them or not temporal aspects are always part of our designs; they are not static, they are dynamic.

As a consequence, we can see interaction and temporality as design materials, both closely intertwined with code. And, conclusively, any interaction design education must let their students explore these unique materials;

interaction, temporality and the complex behavior that is the result of this. The three questions the interaction designer needs to ask are thus;

- How should it behave, act, interact?
- Which temporal changes can interaction result in?
- How is this being expressed?

Note how issues about material, look and feel are embedded in the first and third question, encompassing some of the industrial designer's issues.

Below, interaction and time – framed as design materials – and the current interaction design views on them will be discussed. However, computational technology is left out of the discussion, since discussing the “shaping” of it is slightly out of bounds for this dissertation's topic as well as a vast discipline in itself.

## Interaction

There are several authors who have written excellently about interaction and different aspects of it. One example is Dourish (2004) who discusses different ways and reasons for interacting, another is Blumer (1986) who explains symbolic interactionism as how humans relate, make meaning of, interact with and learn to interact with objects. Moggridge (2007) in turn, provides a historical survey on how interaction has been designed from the 1960ies and onwards, interviewing many of the most influential designers.

Another approach is that of the pattern language; expressions and frameworks describing phenomena, problems and solutions in a certain area of design – cf. Alexander et al (1977) on patterns for architecture, Björk & Holopainen (2005) on patterns for game(play) design, Gamma et al (1994) on patterns for programming and many more. Within interaction design, Borchers (2001) describes patterns in general and presents patterns for interactive music whereas Tidwell (2005) presents a pattern collection for GUI design and Graham (2003) presents patterns for web usability. These pattern collections are however more like toolboxes (containing tools like “wizard”, “canvas plus palette” etc.) that are used to create the interaction and possibly the experience of it. In this, they are a bit too low-level, describing building blocks of interaction, rather than interaction itself. Nevertheless they definitely have a place in interaction design and may well be useful tools.

Despite their other merits, none of the abovementioned works cover properties of interaction in itself, but there are some authors that have. Rullo (2008) defines aesthetics as *"...an immanent quality of our experience with interactive systems that emerges as an interactive process and that may influence our attitude toward the situation or activity at hand."* (p. 3) , consequently defining aesthetics of interaction as *"a process of appropriation and engagement with technologies based on interpretation of the experiential and subjective variables that interplay throughout the interaction."* (pp. 3-4). She proposes a combination of an analytical perspective with a design perspective on aesthetics by supporting design with an analysis of what she calls soft qualities of interaction. The latter are related to interaction dynamics such as access, separation/interpenetration, interferences, varying visibilities, overlapping, layering etc (cf. Rullo 2007). However Rullo's qualities are developed with ambient computing systems in mind.

Vedel Jensen, Buur and Djajadningrat (2005) have instead explored movement: *"[We have] developed a set of preliminary design techniques, which with some success supports our strategy of 'designing actions before product'."* (p. 17) by analyzing products in terms of interaction styles, and by applying Laban's denotations of movement (cf. Hutchinson 1977), encompassing factors like *weight, flow, space* and *timing*. Similarly, Hallnäs and Redström (2006, pp. 77-100) discuss interaction in terms of acts; distinguishing between what we do, how and why. Acts are seen as entities that shape interaction sequences.

Lim, Stolterman, Jung and Donaldson (2007) aim to *"develop an understanding of interaction as its own distinctive entity, something emerging between a user and an interactive artifact."* (Lim et al, p. 239). They are looking closer into how to shape the interaction itself according to one's own aesthetic intentions.

*"In order to grasp and articulate an interaction gestalt, we define an initial set of attributes which can form various interaction gestalts. This set of attributes will provide a conceptual tool for designers to form a particular interaction gestalt with which they expect to create aesthetic interactions that potential users may experience in a desired way. "*

*– Youn-kyung Lim et al in "Interaction Gestalt and the Design of Aesthetic Interactions" (p. 247)*

These attributes are not experience qualities, but instead descriptions of how the interaction gestalt manifests itself. In all Lim et al (2007) list eleven interaction gestalt attributes – related to one or more of the key factors time, space and information – and their extremes. They are as follows (quoted from Lim et al. pp. 248-249):

- *Connectivity* (independent-to-networked)
- *Continuity* (discrete-to-continuous)
- *Directness* (indirect-to-direct)
- *Movement* (static-to-dynamic)
- *Orderliness* (random-to-orderly)
- *Proximity* (precise-to-proximate)
- *Pace* (slow-to-fast)
- *Resolution* (scarce-to-dense)
- *Speed* (delaying-to-rapid)
- *State* (fixed vs. changing)
- *Time-depth* (concurrent-to-sequential)

Unfortunately the gestalt attributes above are not explained in detail, and some of the examples used to clarify the explanations are already outdated web designs. Anyhow, the idea is “*to bring into interaction design the traditional design way of thinking and manipulating the attributes of what is designed.*” (Lim et al 2007, p. 249) So, the designer can start out thinking about the design of the interactions per se, without considering their physical or graphical form first. One can ask: what should the level of *Proximity*, *Movement*, *Connectivity* etc. be in this application? Why? How should this manifest itself? Hereby, one can focus on designing the interaction gestalt, letting the rest of the design adapt to this, rather than the other way around, e.g. routinely constructing a GUI, making graphic design choices that affect the interaction gestalt and the temporal aspects of it. Or, as the authors put it: “*We believe that it will open up designers to think more clearly about the dynamic nature of interactions, and to explore various different forms of emerging behaviors over time through interactions.*” (Lim et al 2007, p. 250).

In a following paper, Lim, Lee and Lee (2009) refine the list of attributes down to seven; *Concurrency* (concurrent-sequential), *Continuity* (continuous-discrete), *Expectedness* (expected-unexpected), *Movement range* (narrow range-wide range), *Movement speed* (fast-slow), *Proximity* (precise-proximate) and *Response speed* (delayed response-prompt response). Why or how they’ve made this refinement is unfortunately not explained. These attributes were tested for two things; is the interactive

attribute even perceived, and if so, which feelings does it evoke. Based on input from 106 test persons, their conclusion was that “*the interactivity attributes we identified are all recognizable and create some distinctive and meaningful emotional effects.*” (Lim et al 2009, p. 108); they also present a table mapping pairs of emotions (e.g. heavy/light, deep/shallow) to attributes. Using this mapping could also be used when shaping interaction, they suggest.

Meanwhile, Löwgren has been working on his concept of use qualities (2002), partly together with Stolterman (Löwgren and Stolterman 2004), later renamed experiential qualities (Löwgren 2007a, 2007b), later some have been turned into aesthetic interaction qualities (Löwgren 2009). The use qualities, as presented in Löwgren and Stolterman (2004) are use-oriented qualities “that most people recognize”. They are as follows:

- **Motivational qualities:** *Anticipation, Playability, Seductivity, Relevance and Usefulness* (the latter being useful in the widest sense, e.g. playing a calm game is useful if you want to relax).
- **Interaction qualities:** *Pliability, Fluency, Immersion* and *Control/Autonomy*
- **Qualities of sociality:** *Social Action Space, Identity and Personal Connectedness*
- **Structural qualities:** *Transparency, Efficiency and Elegance* (e.g. a combination of power and simplicity as described by Gelernter 1998)
- **Qualities of meaning-making:** *Ambiguity, Surprise and Para-functionality* (the latter explained and explored by Dunne 1999, in short aiming for reflection by commenting on an issue).

The idea with the use qualities is that they provide “*proposed tools for questioning, elaboration, and making informed choices*” (Löwgren and Stolterman 2004, p. 104); they are not meant to serve as a checklist for evaluation, and they are not a complete taxonomy, especially since they can be interdependent in several complex ways.

Note that, unlike Lim et al (2007), Löwgren and Stolterman (2004) also take emotional aspects into account. Consequently, Löwgren (2007a, 2007b) later refers to the use qualities as being experiential, slightly redefining them as a “set of experiential concepts that are strongly oriented towards how the interaction feels.” (Löwgren 2007a, p. 2).

In his later works, Löwgren has also explored *Fluency* further, defining it as “*...the degree of gracefulness with which the users deals with multiple*

*demands for their attention and action.*" (Löwgren 2007a, p. 3), as well as *Pliancy* (Löwgren 2007b), which is *"a tightly connected loop between eye and hand, between action and response."* (p. 3), i.e. the users feel as if they physically interact with the digital information in a very direct and tangible way, even though the input may be non-tactile, e.g. a mouse. He has further listed *Fluency* and *Pliability* together with the qualities *Rhythm* and *Dramaturgical Structure*, defining all of them as aesthetic interaction qualities (Löwgren 2009).

Unlike any of the above-mentioned authors, Landin (2009), looks into overlooked and unintended aspects of interaction, such as *anxiety*, *suspiciousness* and more. An example she gives is an ATM: the intended use is to use it for cash withdrawal. However the unintended use is to equip it with a card reader and a camera to skim people's card numbers and codes. Albeit an unintended and unwished interaction, it is still there, and it affects the user's notion of the ATM and it also affects the intended use; in fear of skimming many users cover their fingers while entering their code, sometimes making mistakes when inserting the code as a result.

In short, Landin's research evolves around two key concepts, interaction form and expressions of interaction, and how these can manifest themselves. Interaction form is *"the way in which a design relates interaction (what you can do with a device) and function (what the device can do for you) to each other."* (Landin 2009, p. 31). This, the coupling between interaction and function, implies that the interaction form encompasses not only the spatial/tangible and temporal dimensions but also any possible way of interaction, e.g. intended use, handling (e.g. cleaning the device) misuse and unexpected use (e.g. using a hand saw as an instrument rather than a tool). This means that it also takes implicit aspects of interaction and function into account. According to Landin, interaction forms can have different properties, i.e. different ways in which the coupling between function and interaction relate (Landin 2009, pp. 35-45). Examples of the forms Landin describes are for instance *fragile*, *changeable*, *magical* or *indistinct* forms. The *fragile* form is a result of a breakdown between interaction and function, e.g. when a computer crashes, or the fact that a web page may look and work very different depending on what browser and plug-ins you've currently got installed. According to Landin, this fragility is almost inherent in any computational device. Another form property, very common in interactive designs, is *changeable* form, e.g. when a website or a software changes its layout and interaction design from version to version; suddenly new functions appear, or new ways to interact with them,

and old ones may have been omitted. Other examples are *illusionary* form (e.g. a fake internet bank) and *magical* form (as in devices we cannot fully understand or control) and *indistinct* form (as in devices where it is unclear what outcome a certain action will have or the use of unclear labels like “ambient color scheme”).

According to Landin, the coupling between interaction form and expressions of interaction is how a certain form can express itself in different contexts. Expressions give impressions; everything we can register about an artifact. How it looks, smells, feels, acts, sounds... interacts, reacts. Choosing and designing expressions is inherent in any design process. However, Landin – just like Lim et al and Löwgren – points out that even if we are used to assessing and discussing certain expressions of everyday things, we lack established terms for describing interaction and the expressions related to it, an issue that Landin, too, sets out to investigate.

*“The concept of interaction form gives us a conceptual tool to discuss different ways of relating interaction and function to each other in a design. However, that relation is also being expressed in one way or other through and by the design. One can look at it as if an interaction form and all properties of it are defined in a design process together with how that form and its properties will be expressed in every different context, planned or not. Expressions of interaction is then a designerly way of discussing and reflecting on how a design expresses interaction form in certain contexts of use. The point is that even though it is somewhat abstract and intangible, interaction is expressed in a design and we should be able to discuss how.”*

– Hanna Landin in “Anxiety and Trust and other expressions of interaction.” (2009, p. 46)

In the list of proposed expressions of interaction (Landin 2009, pp. 52–68) we find *Anxiety, Alienation, Indifference, Confusion, Imagination, Dependence, Suspiciousness, Thrill* and *Trust* of which a few will be described in more detail below. However, she states that “*These are only a few examples. [...] Some of them are chosen since they are rather typical of interactive devices, others to encourage reflection on aspects that might be overlooked.*” (Landin 2009, p. 52).

Another thing important to point out is that these expressions are not synonymous with emotions; even if we find expressions of *Suspiciousness* all over a software for instance (e.g. when Facebook<sup>49</sup> suggests new friends to you, and you are not sure how or if you know them, or why Facebook

suggests them), it does not mean that all of its users act or are suspicious all of the time, just that some of them may, because the design in some ways implies it.

Among the more unusual expressions of interaction we for instance find *Thrill* (Landin 2009, pp. 65-66). An example of *Thrill* is bidding on things on auction sites – an *indistinct* form since it is unclear if the placed bet will be the highest. The possibility to get something one really wants, possibly even making a bargain can result in *Thrill*, or behaviors related to it, e.g. checking the status very often, being ready to place a higher bid. The more control offered (placing more than one bid, bid on more than one item, withdrawing bids etc.) the more likely it is to keep *Thrill*; removing these options may weaken *Thrill*, resulting in frustration or another expression – *Anxiety* (Landin 2009, pp. 52-55). Another example of *Anxiety* is the lack of feedback one gets in some programs (often results of an *indistinct* form), or functions – sometimes designed to help – that promote errors, like auto-completing fields which sometimes result in emailing the wrong person etc. This can result in more or less anxious behavior like double-checking in the Sent-folder to check if the mail was sent to the right person, or to hesitate and check the recipient once extra before sending the e-mail.

### Using These Texts in Teaching

Whereas Rullo's soft qualities are applicable for ambient computing, the others' are more general. E.g. one could let students analyze the acts of interaction according to Hallnäs and Redström (2006), and then define that as an interaction style according to Vedel Jensen et al (2005), and reapply it on something else to see what happens and how the attitude and use may change if changing interaction style. As for using Lim et al's, Löwgren's and Landin's thoughts on interaction as a basis for teaching, they are interesting both because they are different and because they are alike. This means that these three types of notions are interconnected, and that one could choose the most appropriate view as a basis for a design discussion or design process. For instance, one can try to apply Lim et al's gestalt attributes when designing, aiming for a certain goal, and toy around with them to see how a change affects the final expression – which can then be discussed or analyzed using Landin's and Löwgren's concepts from the two different perspectives of what the user does and how that appears (expressions of interaction) and how or what the user feels/experiences (experiential use qualities) whilst doing it; these are not necessarily the same thing and realizing this is interesting in itself. One can also try



to map these findings back to the interaction form when trying to find out how and why they occurred.

## Temporality

The word “temporality” has been defined as both “*the state of existing within or having some relationship with time*”<sup>20</sup>, or “*the quality or state of being related to time as distinguished from space*”<sup>21</sup>. Thus, temporal aspects are those elements in a design that are related to time, in contrast to any other properties, like form, material, sound, weight, etc. Time is a central component in books, movies and other kinds of narratives. The use of time in interaction design however, varies from ignoring its existence to explicitly using it as a design material; the later being far more unusual than the first. For example, most programs where the user generates content (e.g. word processors, drawing programmes, code editors etc) are oblivious of how time flows; if the user is inactive time in a sense “stops”. These kinds of programmes display no sense of time whatsoever. In contrast, a mailbox or a chat log can be seen as recordings of time; we can move back and forth through the messages, remembering what we did or felt at the time. In most email programs we can also shuffle these fragments of time by sorting the mails according to some other preference than the time and date they arrived, e.g. according to author, subject or a thread.

In information visualization time can instead be one of the dimensions to be visualized, meaning that time here is seen as data rather than time in itself; it is being turned into graphics rather than remaining as time (unlike in real-time simulations of events).

The one genre of interaction design where time and temporality is used creatively as a design “material” is within game design. The simplest examples are level games like *Tetris*, which speed up the course of events on each level, until it goes so fast that the player inevitably loses – but perhaps making a new high score. On the other end of the scale is *Braid*<sup>22</sup> (2008), a game entirely based on different uses of time. Different parts of the game utilize different aspects of time; in some one can rewind and redo, in others time runs back- or forwards depending on how the player avatar moves, in one time can be slowed down locally, in one the player has cooperate with an earlier version of him- or herself in order to solve the puzzles.

Other aspects of how time can be used are different simulation and tycoon games, where the player can decide how fast the time shall pass. One

example is *Zoo Tycoon*<sup>23</sup> (2001), a game where the aim is to build and run a zoo that both attracts visitors and treats the animals well, preferably so well that they breed. Here, time can be stopped entirely, but in this mode, the player can only build things. Animals and visitors are frozen in time, which means that no money is earned and no new animals are born. In order to achieve this, the player has to start the simulation again. Additionally it is possible to control the speed of the simulation too; if one lets the clock run slow, there is plenty of time for keeping everything in check, but it can be a bit boring, and the cash flow is slow. Sometimes cash runs out, in which case it can be a tactic to speed up time for a while until enough money has been earned to make a certain investment. To slow down time temporarily, has also been used in shooter-games like *Max Payne*<sup>24</sup> where one can slow down time temporarily by entering “bullet time” in order to get more time to aim correctly.

The opposite example is *World of Warcraft*<sup>25</sup>, an online fantasy world. Here, time runs at its normal speed, and unlike many other games, time keeps running regardless if you are logged on or not. In this, it is coupled to the “real” time outside the game, e.g. the annual Feast of Winter Veil is celebrated in December. More importantly, it affects play and players in their daily lives. Players often schedule play sessions with in-game friends (sometimes living in other time-zones!), resulting in comments like “No sorry can meet you on Monday because we’ve planned a raid”. It can also mean that it is sometimes hard to quit playing at a certain point in time; unlike other games where the current state is saved until the next time, one must in *World of Warcraft* take a chance (to kill an enemy, find a treasure first or whatever) when it appears; when logging in again two days later it can be too late. A similar take on this is the one-player game *Animal Crossing*<sup>26</sup> (2001), Here too, time passes on even if you are logged out. Some events occur only on special times, like in the afternoon, or on Thursday evenings, meaning you have to be playing then in order to experience them. If you are gone for too long, spider webs and fallen leaves start accumulating, and your neighbors get sad.

As the above examples indicate, the interaction design community has not quite acknowledged the use of time as a design material, although they see it as an inherent part of interaction design. Jones (1992) strongly criticizes this:

*Design-by-drawing, the traditional design method, depends almost completely upon accurate modeling of dimensions in space. The time*

*dimension, if we may call it that, is left to take care of itself. [...] At this point designers need to acknowledge their relative ignorance of 'temporal design' and can perhaps learn from the 'time arts' (music, dance, theatre, film, novel, poetry, etc) how to compose-in-time with some sense of beauty. To design in time is, more so than when designing objects, to design life itself, the very form of existence...*

– John Chris Jones in “Design Methods” (1992, p. xxx)

Albeit there are plenty of HCI-related texts on topics like how fast users can detect changes, or the maximum response time we can have in a certain system; e.g. Seow's (2008) discusses all aspects of time in interfaces; how it is perceived, when and how to visualize it, how to formulate it etc. However there is a lack of texts proposing how to creatively utilize time in design.

Arguably the researchers drawing from socio-cultural phenomena (e.g. Bolter & Gromala 2003, Manovich 2002 and Laurel 1991) are the ones that pay most attention to temporality, using time as a dramaturgical instrument. Manovich, author of “The Language of New Media” (2002) where parallels between interaction design and cinema are drawn, writes:

*“The notion of interaction as theatre makes us notice another dimension of this play-like behavior. As I will describe [...] various sensorial responses which a mobile generates in following our actions are often not single events but rather sequences of effects. As in a traditional theatre play, these sequences unfold in time. Various sensorial effects play on each other, and it is their contrast as well as the differences between the senses being addressed – touch, vision, hearing – which together add up to a complex dramatic experience.”*

– Lev Manovich in “Interaction as an aesthetic event” (2006 p. 5)

Manovich's ideas on sequences could be seen as Lim et al's (2007) gestalt attributes applied, in particular the time-related attributes *Movement*, *Pace*, *Speed* and *State* (see pp. X). Similarly, Löwgren and Stolterman (2004) discuss the dynamic gestalt of an interactive artifact, claiming that an artifact must be analyzed in use before analyzing the different parts of it.

*“Digital artifacts are every bit as temporal as they are spatial. In order to perceive the whole, or the dynamic gestalt, of a digital artifact we need to experience it as a process, which is to say that we need to*

*try it. The gestalt of a digital artifact emerges in the interaction with the user over time. "*

*– Jonas Löwgren and Erik Stolterman in "Thoughtful Interaction Design" (2004 p. 137)*

The temporal flow that occurs in interaction can appear very different; calm, fast, jerky, stressful, and in addition the overarching combination of these temporal aspects, the work flow can be described as being boring, interesting, repetitive, fun or something else. Löwgren & Stolterman (2004) also couple the dynamic gestalt to the notion of character, as described by Janlert & Stolterman (1997), i.e. the idea that complex artifacts can be made easier to understand or accept if they are given a distinct character. Löwgren (2009) also defines *Rhythm* as an aesthetic interaction quality, encompassing everything from sub-second interactions, like tapping on a keyboard, to longer cycles of use.

In contrast, Redström (2001) explores the idea of starting out with time as the center of design:

*"To consider time as the central design variable means that one starts with the temporal structures that arise from computation and how to manifest these in space, and not from how to make three-dimensional objects dynamic using computational processes."*

*– Johan Redström in "The Design of Everyday Computational Things" (2001, p.38)*

Redström, together with Hallnäs explored time as the center of design in their Slow Technology design programme (Hallnäs & Redström 2001; 2006) where time is used in design as a means to provoke reflection. The opposite of Slow Technology is of course fast technology, i.e. the dominant view on time and temporality in HCI and interaction design today, featuring efficiency and ease of use. One example of Slow Technology is the *Doorbell*; a normal doorbell except that it in fact executes code; when pressed it plays a fragment of a very long melody. Only over time, and only if we reflect on the doorbell's behavior, we can figure out which melody it is. As the authors put it:

*"It should not be technology that is tiresome and time consuming, but technology that stretches time and slow things down."*

*- Lars Hallnäs and Johan Redström in "Slow Technology Designing for Reflection" (2001, p. 203)*

Somewhat similarly, Wright et al (2008) see the "Spatio-temporal thread" as a distinct part of experience, stating: "Experience is always located in a time and place. Space and time pervade our language of experience." (p. 5)

## Temporal Themes

Based on examples from other media, as well as from interaction design, Theo Hultberg, with some help from myself, discerned different ways to use time, hereafter referred to as Temporal Themes (Lundgren & Hultberg 2009). Similarly to how Lim et al (2007) describe interaction in terms of gestalt attributes, we think that temporality can be described and discussed in terms of these themes: *Live Time*, *Real Time*, *Unbroken Time*, *Sequential Time*, *Fragmented Time* and *Juxtaposed Time*. We are, however, aware that these six themes described here are not necessarily the only possible ways to describe the temporal aspects of an artifact or activity, nor are they entirely distinct. Still, the themes could be used to analyze and describe a design.

**Live Time:** This is the time we live by, the one that runs continuously, with the same pace as ever, second by second, regardless if we want it to or not. You are reading this text now, in *Live Time*. It is impossible to control; it is what it is, but on the other hand it is predictable. Examples of *Live Time* are *World of Warcraft*<sup>25</sup>, but also a live broadcasting of a football match.

**Real Time:** If we record the live football match and watch it later, we watch a *Real Time* version of it. A minute is still a minute, but it is no longer connected to the time in the "real world"; we could watch this recorded game whenever we want. Similarly the *Real Time* in a game, e.g. a racing game is not coupled to the time of day you play it; you could play in the middle of the night but on the race track the sun is shining brightly anyway.

**Unbroken Time:** Thus is when the time sequence is still unbroken, but when the pace of it may change, perhaps even the direction of it<sup>27</sup>. Examples are games where the pace of time can be controlled, like *Zoo Tycoon*<sup>23</sup>. Other examples are simulations or records of events that can be fast forwarded or slowed down according to interest.

**Sequential Time:** This is when the chronological order remains, but when parts of the time sequencing have been removed. This is used in computer games with an underlying narrative, e.g. *Syberia*<sup>28</sup> which plays out at a series of places interconnected with a railway; but the parts where one travels between them is omitted.

**Fragmented Time:** This occurs if the time sequence is cut up and shuffled, possibly with some parts left out. This is used in any story that mixes memories or previous events with the ongoing story, or leaps into the future.

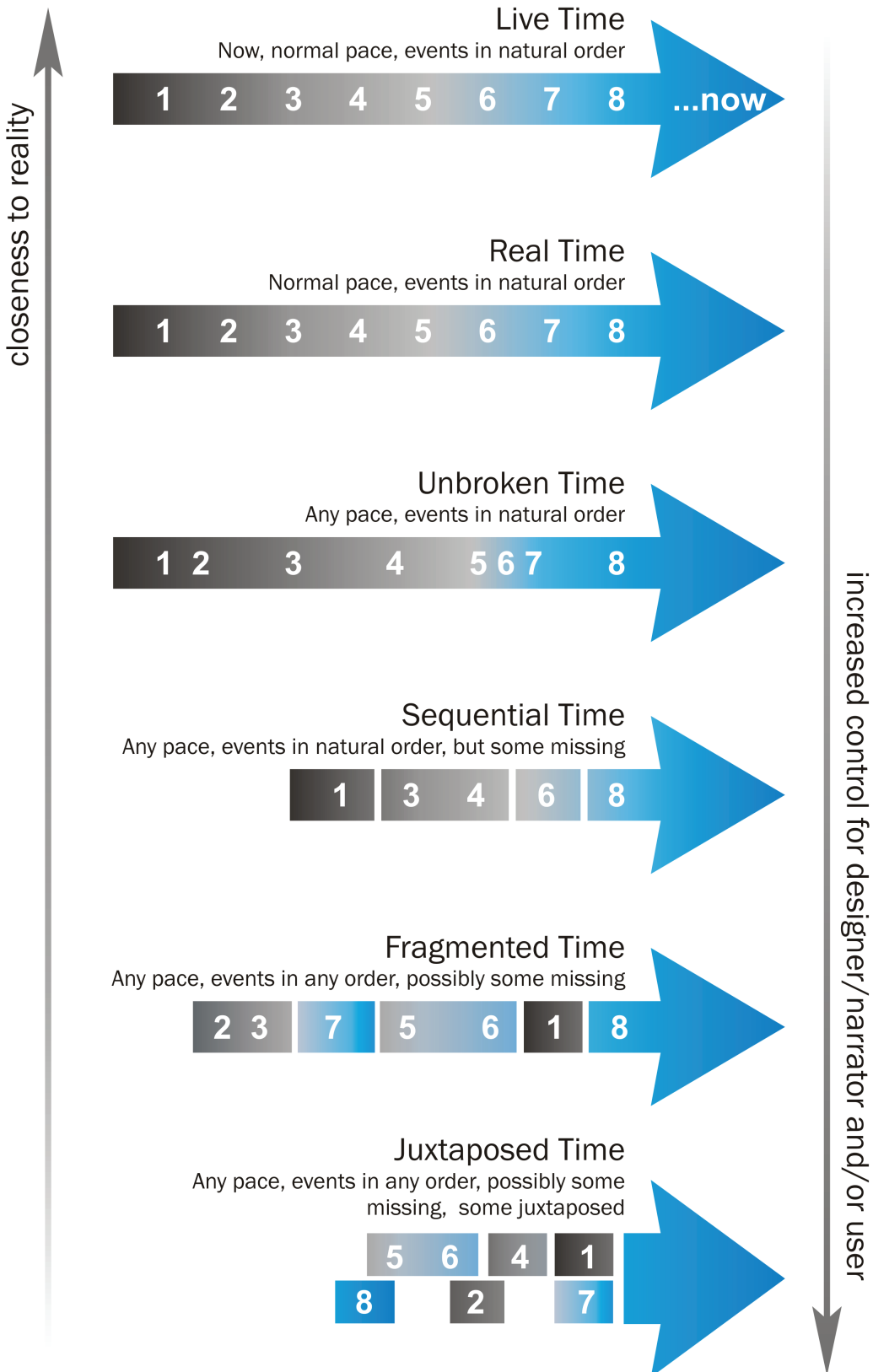
**Juxtaposed Time:** This is when different parts of time run, or are shown, in parallel. An example is the movie *Time Code*<sup>29</sup> (2000), tagline “*Four cameras. One take. No edits. Real time.*” On a four-split screen four protagonists move towards the movie’s finale. Also, any time traveler meeting her- or himself experiences *Juxtaposed Time*.

It is worth noting two very opposite properties here; the closer we get to reality, i.e. to *Live Time*, the less control the designer has, as opposed to in *Sequential*, *Fragmented* or *Juxtaposed Time*. Compare live footage from the Olympic games with the post-olympics documentary describing them; most events are omitted, others are shown in different order, some parts are compared in juxtaposition and a narrative is added.

When testing the Temporal Themes concepts we described the examples from movies and games etc to ten interaction design students who then got thirty minutes to come up with examples of simple drawing applications. Despite the inspirational examples, most of the ideas (almost three quarters) seemed to use *Real Time*, and a few *Live Time*. Many designs did not utilize time at all, but instead had to do with the canvas behaving in different ways. Albeit just a brief test, it suggests that it is really hard to break out of the *Real Time*-convention without some kind of conscious effort. Both during and after the exercise students commented that they had realized that they used to take the linear progression of time for granted, but that the exercise had opened their eyes to new ways of thinking about time in interaction design.

## Teaching Temporality

There are several ways of introducing time and temporal aspects and how they affect design. For instance, one could analyze a design in terms of Lim et al’s (2007) time-related gestalt attributes Movement, Pace, Speed and State, and see how the design changes when these parameters are changed. Or, one could use the Temporal Themes (Lundgren and Hultberg 2009) as a design tool; they can help students to acknowledge time as a design material, considering it actively during design instead of passively.



One simply takes an application or artifact, invented/designed or not, and asks What happens if we add a certain temporal theme to this design? The outcome is often a range of surprisingly novel features of which some are of course much more viable than others. Nevertheless it works excellently as a method for idea generation as well as an eye-opener when it comes to time. Yet another way is to let students analyze small games and compare the use of time in them, seeing how that can result in different experiences, e.g. expressed in terms of Löwgren and Stolterman's (2004, see pp. 37-38) use qualities.

## CURRENT APPROACHES TO TEACHING AESTHETICS OF INTERACTION

Albeit there are quite a few interaction design exercises published (cf. Baumann et al 2007 for a rather diverse list for instance), most of them are related to either teaching a specific design method (e.g. Eriksson et al 2006; Harrison et al 2006; Jones 1992; Jones et al 2008), or a certain aspect of interaction design, like game design (e.g. Fullerton 2008, Lundgren 2008b) or GUI-design (e.g. exercises in Preece et al 1994).

There are only a few works explicitly stating that they aim to teach aesthetics of interaction. For instance, Djajadiningrat, Gaver and Frens (2002) describe two exercises/design tools aiming for *"an aesthetics of interaction, in which the emphasis shifts from an aesthetically controlled appearance to an aesthetically controlled interaction, of which appearance is a part."* The aim is to create richness in interaction and in role. (Djajadiningrat et al 2002, p. 66). One of the exercises is *Interaction Relabelling*, which is a design task aimed at exploring interaction per se, as the participants are given one mechanical item, in the described case a toy revolver, and are asked to describe and demonstrate it as if it were something else, in the example an appointment calendar – resulting in interactions like firing a gun at someone to book a meeting with them, or emptying the gun of ammunition to cancel all meetings. In this it highlights the richness of interaction with mechanical things, as opposed to interacting with, say, the GUI of a cell phone or PDA. The second exercises is that of *Extreme Characters*, where the task is to come up with a skewed, possibly negative, strange or disturbed fictional character and design something according to their needs (rather than to those of the average, normal, well-adapted user). As a result, novel interaction may be invented. The latter exercise can however also be seen as a sheer methods-exercise.



Djajadiningrat et al (2007, pp. 669-671) also describe other aesthetics-related design exercises carried out with students in industrial design or interaction design. One example is an exercise concentration on movement; the task is simply to design “a walnut” that expresses a certain emotion as movement. In another paper (Djajadiningrat et al 2004) report a “pure” industrial design exercise where students are asked to design small objects expressing three dimensions (e.g. heavy-light, old-new, slow-fast); they were to make two objects who shared two of the characteristics, but differed in the third dimension, e.g. designing one sculpture expressing heavy+new+slow and the other then heavy+new+fast. Although a good design exercise, highly related to aesthetics, it is not related to interaction; “we were still too much focused on design for appearance as this exercise tried to find meaning purely in the appearance of objects, and did not consider action at all.” (Djajadiningrat et al 2004, p. 298). However, it could be retargeted towards more interaction.

Hallnäs and Redström (2002a) describe *Abstract Information Appliances*, which is; “an investigation of computational technology as a design material where we try to expose basic aesthetical issues by focusing on the expressions rather than practical functionality, and where the aesthetics of computational things in use are in focus.” (Hallnäs and Redström 2002a, p. 2). They present two exercises toying with the notions of expressions versus computational powers and the functions it can bring. In the first, an expression is given, e.g. a tube with a marble in it, and the task is to find functionalities coupled to its expressions (actually a quite abstract version of Interaction Relabelling), adding technology. In the second, an appliance is given, e.g. a cell phone, its functions are simplified into one, e.g. “talking to yourself”, and a new physical object is designed. Hallnäs and Redström (2006, ch. 8) also describe a couple of exercises on what they call act design, i.e. focusing on the “act” part of interaction. In the first exercise, the acts of using of a doorbell are considered using extreme or even impossible inhabitants or visitors (e.g. Elvis). In a second step, one designs in order to transform the user’s behavior. Other of their exercises relate to how expressions, and how materials sometimes steer expressions of use and thus use, and acts of use, in itself. By exploring strange or impossible materials, use will change.

Landin (2009, pp. 70-80) describes two exercises, one focused on interaction form (e.g. *fragile form*; see pp. 28-40 to find out more on Landin’s concepts) and how to weaken or strengthen it, and one focused on expressions of interaction; here the task is to instead look at how a software presents itself in terms of e.g. *Suspiciousness* or *Alienation*.

In addition there are also a number of exercises where the authors do not explicitly declare that they are related to aesthetics, but they could still be seen as dealing with specific aspects of aesthetics. One example is Vedel Jensen and Stienstra's (2007) exercise where students designed interactive sculptures as a means to explore tangibility and experience. Vedel Jensen, Buur and Djajadningrat (2005) also describe a series of exercises exploring tangible interactions. E.g. they let students examine phones from different eras (from the 1870ies until now), define their respective interaction styles and then apply these interaction styles to a modern cell phone. Similarly, Martin and Roehr (2010) describe a series of exercises aimed at exploring tangible interaction design, e.g. designing physical mobile characters expressing action verbs (e.g. dance).

In contrast, Chang et al (2007) describe a "minimalist design exercise" where students redesigned existing products like audio recorders or answering machines, with a minimal number of input and output channels.

## Footnotes, Part I

- 1 See ACM's home page: <http://portal.acm.org/portal.cfm>
- 2 These searches were made the 28th of April 2009. The numbers keep increasing.
- 3 The quote that ACM's curriculum for HCI is out of date was retrieved from <http://www.acm.org/education/curricula-recommendations> 2010-03-12, lower right corner
- 4 Interaction Design Association's (IxDA) homepage can be found at: [http:// www.ixda.org](http://www.ixda.org)
- 5 IxDA's intentions regarding a repository for teaching can be found at: <http://www.ixda.org/about/participate>

- 6 ERIC (Education Resources Information Center) website: <http://www.eric.ed.gov/>
- 7 Ariadne website: <http://www.ariadne-eu.org/>
- 8 Connexions website <http://cnx.org/>
- 9 Edna website: <http://www.edna.edu.au/>
- 10 Carnegie-Mellon University's interaction design programme:  
[http://www.design.cmu.edu/show\\_program.php?s=2&t=3](http://www.design.cmu.edu/show_program.php?s=2&t=3)
- 11 Copenhagen Institute of Interaction Design /The Danish Design School's interaction design programme: <http://ciid.dkds.dk/education/curriculum/>
- 12 Delft University of Technology's interaction design programme: <http://www.tudelft.nl/live/pagina.jsp?id=b4c76e5e-3a59-4be9-a050-c847d3a5fbb2&lang=en>
- 13 Malmö Univeristy's interaction design programme:  
<http://www.edu.mah.se/TAIND/syllabus/#courses>
- 14 Royal College of Arts' interaction design programme:  
<http://www.interaction.rca.ac.uk/course>
- 15 Umeå Institute of design's interaction design programme:  
<http://www.dh.umu.se/default.asp?P=2145&DML=10447>
- 16 TU Delft's interaction design programme: <http://www.tudelft.nl/live/pagina.jsp?id=b4c76e5e-3a59-4be9-a050-c847d3a5fbb2&lang=en>
- 17 Business Week's section on innovation and design:  
<http://www.businessweek.com/innovation/>
- 18 For a thorough review of the pedagogy and teaching and learning activities at Bauhaus, see Rainer K Wick's excellent book "Teaching at the Bauhaus", Hatje Cantz Verlag, Ostfildern-Ruit, Germany
- 19 Facebook ([www.facebook.com](http://www.facebook.com)) is a site for social networking; based on the friends you have already connected with, and the information you have given about schools and workplaces you've been at it will find and suggest possible new friends to you, that it thinks you may already know.
- 20 First definition of temporality from New Oxford American Dictionary (NOAD) (2006). Oxford University Press. (2000)
- 21 Second definition of temporality from Merriam-Webster online:  
<http://www.merriam-webster.com/>
- 22 Braid. Microsoft Studios, (2008), <http://www.braid-game.com/>
- 23 Zoo Tycoon. Microsoft Game Studios, (2001), <http://www.zootycoon.com/>
- 24 Max Payne, Remedy Enetrainment / Gathering of Delevopers (2001),  
<http://www.rockstargames.com/maxpayne/splash.html>
- 25 World of Warcraft, Blizzard Entertainment, (2004) <http://www.worldofwarcraft.com/>
- 26 Animal Crossing. Nintendo, (2001), <http://www.animal-crossing.com/>
- 27 Theo Hultberg, the main genius behind the themes does NOT think that Unbroken Time can be rewound – I do. As for you, you will have to make up your own mind!
- 28Syberia by Benoît Sokal, developed by Microïds, published through The Adventure Company (2002) <http://www.syberia-series.com/en/>
- 29 Time Code, Red Mullet Productions, (2000), <http://www.imdb.com/title/tt0220100/>

# HOW DESIGNERS TEACH

*In this section I introduce the concept constructive alignment as a framework for course design, and discuss it in relation to design teaching and design learning.*

## PART II



Does teaching design differ from teaching other subjects? With its practical focus it is rather different from inherently theoretical subjects, and over the last century a distinct teaching tradition has emerged. How well does this tradition, this teaching practice, align with general ideas on teaching? Here, I will introduce constructive alignment as a framework for course design, and relate it to design teaching.

## CONSTRUCTIVE ALIGNMENT

Constructive alignment is a two-dimensional idea, based on what the teacher does (alignment) and what the student does (constructing meaning and thus knowledge via their learning activities). In short it can be described as follows:

*“A good teaching system aligns teaching method and assessment to the learning activities stated in the objectives, so that all aspects of this system accord to support appropriate learning.”*

*John Biggs in “Teaching for Quality Learning at University” (p. 11, 2nd ed.)*

This is by no means an original opinion – any more. Over the last decades, this approach has been researched thoroughly and has resulted in a solid body of research on how to design courses, teaching and assessment. The general idea is to state intended learning outcomes in such a way that it is clear to the students what they should know after the course – i.e. what they should be able to demonstrate that they know – and then address it in teaching. Lastly, this, and only this, should be assessed (c.f. for instance Biggs 2003; Ramsden 199; Laurillard 1993; Bowden and Marton (1998); Gronlund 2004; Jacques 2000). Note that the term *learning objectives* is sometimes used as a synonym to *intended learning outcomes*; here I have chosen the latter term since learning objectives is very similar to learning objects, which are also discussed in this dissertation.

Not only does constructive alignment help teachers formulate what they want students to learn and design the course accordingly, it also helps students by clearly stating what they will (or at least ought to) learn in a course. Moreover it is inherent that the constructive alignment should encourage active learning.



A significant example is the Bologna system, which is an aspiration to unite higher education in 46 countries, among them Sweden. The system aims to facilitate student and teacher exchange, prepare students for their future careers and “offer broad access to high-quality higher education, based on democratic principles and academic freedom” according to the official website<sup>1</sup>. To clarify what high quality means in this case, ENQA (European Association for Quality Assurance in Higher Education) has published an official document on standards and guidelines claiming that the quality assurance of programmes and awards are expected to include, among other things, “development and publication of explicit intended learning outcomes”, “careful attention to curriculum and programme design and content” and “monitoring of the progress and achievements of students”. (ENQA 2005, p. 16) In alignment with this student assessment procedures are expected to “be designed to measure the achievement of the intended learning outcomes and other programme objectives”, “be appropriate for their purpose, whether diagnostic, formative or summative”, and, among other things “have clear and published criteria for marking”.

So much for alignment; what the teachers do. In turn, students are expected to, encouraged to, construct meaning. In a study in the 1970ies Marton and Säljö (1976a, 1976b) explored the concept of learning styles, finding the two styles *deep learning approach* versus *surface approach* learning. In the first case, one engages in the topic, trying to understand e.g. via analysis, relating knowledge to what is already known, trying to apply what is being learnt etc. If applying the surface approach one is instead just memorizing facts and what seem to be the most important points. Deep learning can however be encouraged by the teacher when planning and running the course, if including teaching and learning activities that prompt deep approach strategies, e.g. relating knowledge, explaining it, applying it in practice, analysis and reflection.

But – how does this relate to design educations today? In this next section we will get a very brief introduction to the roots of today’s design education, followed by a overview over how design is being taught today, finding out how or if today’s design education differs much from the currently so advocated constructive alignment.

# BAUHAUS AND ULM: THE ROOTS OF MODERN DESIGN EDUCATION

When discussing the current way to teach design, it is important to point out that this is a tradition begun somewhat 150 years ago. In the 19th century, when mass production of household products came into play, the craftsmen found themselves out-competed. As a reaction, the Arts & Crafts Movement, based on Ruskin's ideas of being faithful to the material, was founded, and it was later followed by other movement like Jugend and Art Nouveau (Vihma, p. 47-68). The general idea was to provide products that were tasteful, hand-made, and hence of high-quality. Art schools did not provide this kind of training. As a result, many arts and crafts-schools were founded, aiming to improve the taste of the craftsmen, in turn raising their status.

In Germany, there was a heated debate on art school reform. The agitators claimed that the art school as institution was outdated, unable to educate modern artists, since it did no longer contain any training in the practical crafts. The pedagogical motif for this was that art has to be practiced, it cannot be taught as a theoretical subject, and that there was a distinct need to add workshop training in particular to any artist's education. Lastly, the reformers advocated a unified art school, promoting cooperation and exchange between practitioners of different crafts. This debate came to affect the pedagogy in art schools and industrial design schools even today. And it led to the founding of one of the most influential design schools in the 20th (and even 21st?) century – the Bauhaus (Wick 2000, pp. 55-61).

When Bauhaus was founded in 1919, the ideological pillars were the idea of the *Gesamtkunstwerk*<sup>2</sup> ("total artwork", an interdisciplinary effort), education in the crafts, in form and in theory and science; e.g. material science, anatomy, art history etc. (Wick 2000, ch 4). Bauhaus also fostered a strong sense of social awareness and created a cooperative and creative atmosphere.

*"The Bauhaus wants to educate architects, painters and sculptors of all levels, according to their capabilities, to become competent craftsmen or independent artists and to form a working community"*

*of leading and future artist-craftsmen. These men<sup>3</sup>, of kindred spirit, will know how to design buildings harmoniously in their entirety."*

*- From the Program of 1919as translated by  
Rainer K. Wick, "Teaching at the Bauhaus", p. 69*

A full Bauhaus education took five years. The first course which every student had to take, was a preliminary course, the *Vorkurs*, which among other things aimed to introduce the students to different crafts. Since one of the most prominent ideas was that every student should learn a craft, the school consisted of a number of workshops; woodwork, metalwork, weaving and printing just to mention a few. So, after the *Vorkurs*, the students got to choose which workshop they wanted to spend the next three years in. Each workshop had two leaders, a master of form (an artist) and a master of craft (the latter to ensure that the students learned all the down-to-earth trick of the trade. (Wick 2000, pp. 34-38). Note how these characteristics still exist in design education; typically an introductory year or more before specialization.

When the Bauhaus was closed down in 1933, after only fourteen years its students and teachers went on teaching at its successors, spreading its ideas on design education over the world. Several of them re-united in Ulm, where the *Hochschule für Gestaltung* opened in 1955. Initially the curriculum at Ulm looked very much like that of the Bauhaus; the rector Max Bill was a former Bauhaus student. Later however, another phalanx, led by Tomás Maldonado took over. Maldonado's view on art and design was that no artistic schooling was necessary for the designer. Unlike Bill, and the Bauhaus, he did not see the designer as a link between art and craft, or someone who took aesthetical values from art and adapted them to craft. Instead, everyday things had their own aesthetics, and **design was its own discipline**, the discipline concerned with form. A designer should take the taste and needs of the modern consumer into account and design items accordingly, items that could be mass-produced. The designer should also work as a part of a team, cooperating with technicians, scientists, sales people etc (Vihma, 2003, p. 153-155).

*"...these things are also tasks for the engineer, or the architect, or the scientist. But the designer is not competing with all these specialists; on the contrary, he complements their work, and also controls an important area of no-man's-land between all these specialties. He takes as his starting point the purpose and function of the thing to be designed; his design has to be optimized from many viewpoints at*



*once; his point of departure is the planning of the whole creation, in its complex interaction with its environment. [...] The designer is not an engineer and he is not an artist: his professional qualifications are of a new and unique kind..."*

Horst W. J. Rittel<sup>4</sup> in "Werk" 1961  
(As quoted in Lindinger 1991, p. 94)

Maldonado and his co-rectors changed the direction of the school, leaving the old "arts and craft"-motto behind, instead focusing on the combination of design and science. Another important part of the curriculum was the cooperation with companies like Braun, and Lufthansa as well as the interest in system design; designing more than one product, e.g. a series of products, or even the form-profile of an entire company, like Peter Behrens once had done with AEG. (Vihma 2003, 155-158).

Somewhat 40-50% of the students came from other countries, not only in Europe, but also from the U.S., Japan and other countries. When going home they brought the Ulm-ideology with them, and many of them also became design teachers. (Lindinger 1991, p. 9), which makes Ulm one of the most influential design schools.

As a result we still today have design schools that apply the principles of seeing design as its own discipline, not subordinate to art, but rather closer to science than art; that educate students in different design materials, e.g. by letting them try things out in an introductory course; that favor work in smaller studios or workshops; that strive for cooperation with industry. And, most importantly, seeing design as something that must be taught not only in theory, but always, an unavoidably so, in practice.

## TEACHING DESIGN TODAY

The basis for how designers teach comes from Baumann's (2004) doctoral thesis entitled just this: *How Designers Teach*. Here, Baumann analyzes and summarizes qualitative interviews made with twelve design teachers, teaching architecture, electronic music, art and design, arts theory, performance, media design, industrial design and last but not least interaction design.

I find Baumann's study to be an interesting piece of work. He writes: *"One of the expectations we had at the beginning of this research was to find*

*one or a few didactical approaches that are familiar in design education. [...] It was our aim to make use of [this] in our HCI education.*" (p. 315). However Baumann found that the design teachers he interviewed faced exactly the same open questions as he did. Instead of one approach, a wide range of approaches emerged. This is interesting because it shows two things. Firstly, that there are the same issues in most types of design education, regardless of design discipline. Secondly that a certain design-specific teaching and learning activity may work regardless of discipline, i.e. in interaction design teaching too. Actually this is often the case in the interviews; a certain opinion, method or approach is stated several times, by teachers teaching different disciplines. Hence, Baumann's study serves to show how other design educations may affect interaction design teaching, and in this it is an important piece of work.

The most relevant parts of the thesis will be summarized below. Two of the twelve interviewees, Pelle Ehn and John Zimmerman represented interaction design teachers, whereas Fiona Raby, who also teaches interaction design in short projects, mostly teaches architecture. The comments from these three have been taken into special account below.

## TEACHING METHODS

When it comes to teaching methods, Baumann concludes that there seems to be a wide range of design education methods (Baumann 2004, pp. 78-79) from which each teacher takes his or her own favorites, i.e. whatever works best for them, sometimes modifying it for their purposes. Baumann's full list of teaching methods (Baumann 2004, p. 72) is as follows (however grouped by me):

### **Practical work**

- Problem-based learning
- Workshops, group work
- Practical exercises
- Project work
- Interdisciplinary projects

### **Theory**

- Lectures
- Readings and discussion
- Guest speakers
- Excursions

### **Teacher-student-contact**

- One-to-one tutoring
- Walk-and talk
- Individual email threads
- Teacher personality
- Group teaching
- Coaching of teams
- Studio based teaching

**Feedback**

Bi-directional exchange  
 Exchange between students  
 Final critique sessions  
 Hearings  
 Competition or pitch  
*...plus what is mentioned under  
 Teacher-student-contact...*

**Analysis and reflection**

Readings and discussion  
 Action-production-reflection  
 Project hand-over  
 Presentation hand-over

“Teaching method” is to be interpreted very widely. However, throughout Baumann’s text, and according to his conclusions, some themes are re-occurring; studio-based teaching, one-to-one tutoring and lectures – but never standing alone; always supported by practical work. *“Different forms of practical exercise and feedback are central to design education”* Baumann writes, whereas *“Lectures are a necessary add-on to provide information and generate awareness and appetite for different aspects of the discipline. They cannot stand alone...”* (p. 78)

During a workshop Baumann et al (2007) suggest a set of properties for design exercises and projects of which some of the most important are that: they should be relevant and “real”; have a clearly defined design space; separate implementation from design result; allow time for reflection; and allow for peer-critiquing. Notably, Baumann et al also note that even then, exercises may go wrong, e.g. if students are not motivated, if students or teachers have a very strong idea on that there is only one “best” solution or if the outcome has been specified to clearly (turning the exercise into implementation rather than design). As a result Baumann et al they suggest a set of guidelines of which most deal with specification: of the task and the design space; of the intended learning outcomes; of the various actors and their tasks, context of use etc. They also address learning in a statement: worth considering:

*Design exercises must focus on the understanding of materials and the application of skills rather than preparing a specific solution to a specific problem.*

– Konrad Baumann et al in *“EISH – Exercises in Studying HCI”* (2007, p. 4)

As for interaction design education, both Ehn and Raby use Problem-Based-Learning, which is also used in other types of education, e.g. medicine. Another technique, probably quite unique for design education, is

project handover, where an exercise is divided into distinct phases. Students then carry out the first phase, hand their work over to someone else whilst they themselves get someone else's work to carry on with, and so on throughout the phases. From a learning point of view, this means that students learn to cooperate, learn to communicate the key aspects of their design and also learn to capture someone else's key aspects. (Baumann 2004, p 319).

Further, Baumann's study shows that the dichotomy between theory and practice causes some problems, for instance on balancing these two in teaching – students should be very educated in both, but there is rather time or resources for this. Another is that some students see theory as a “cooking recipe” rather than a basis for thinking – but then again theory sometimes “get in the way” of getting something done. There must be a connection between design and reflection. Some of the solutions proposed are to closely intertwine practice, theory and research, for instance by suggesting that all teachers should research and vice versa, or that all teachers should run their own design-office part-time. Some teachers use examples of their own work in class, whereas others do not, or prefer to talk about students' work (Baumann 2004, pp. 112-134).

## Theory: An Open Climate, Interconnectivity and Activity

Many of the approaches the design teachers describe rhyme well with current educational research. The approach of letting students work quite freely in studios with much supervision is very much in line with what Biggs (2003), adducing McGregor (1960) calls a Theory Y climate, which is basically to give students creative freedom, lots of autonomy and self-assessment (as opposed to Theory X which is a distrusting attitude with rules, controls and no autonomy for the students). Of course these are extremes; most teaching climates are somewhere in-between. (Biggs 2003, pp. 64-67). Biggs advocates leaning towards Theory Y in teaching and setting up a learning climate, since this will encourage learning. Admittedly, this may lead to some students slacking and/or cheating, but, according to Biggs *“the educational benefits outweigh that risk.”* (p. 65). He states: *“Theory Y [produces] high trust, high risk and high value – if it works”* (p. 65). In order to make a Theory Y approach work, Biggs (2003, ch 4) advocates a couple of strategies. Hereby he introduces *interconnectivity*, which is created by building on what students already know, (e.g. by drawing from reality) and by relating new content to old, expressing the larger structure of the topic,

giving students a conceptual framework to build upon. Laurillard (1993) like Biggs advocates a kind of interconnectivity and alignment when she addresses the issue of adding new material to a course. She points out the importance of making sure that each new part of a course must be integrated with the rest by analyzing whether prerequisite skills and knowledge are already covered, or if prior teaching is necessary, and to plan a follow up on the students have learned in this new part (Laurillard 1993, p 213).

As for theory versus practice Biggs also presents another Theory Y-friendly strategy, which is to introduce activity as a part of learning (and as opposed to the typical lecture-setting where one teacher lectures for an hour whilst students sit and take notes). His examples include:

- *Concept maps* where one creates webs of concepts and how they are interrelated – a little bit like a mind map but created after the lesson with careful placing of the concepts.
- *Tutorials*; here much of the work is done by the students (e.g. carrying out tasks) whereas the teacher merely supervises (see section on Supervision below).
- *Exercises and excursions*.
- *Seminars* where students present something they have read or investigated; however Biggs comments that although each student will learn what he or she presented, they may not be good presenters, which means that the rest of the class do not learn it!
- *Buzz groups*, i.e. giving an ad-hoc group of students a topic to discuss in class; this provides a break from lecturing and can be the basis for a discussion when the teacher collects the answers.
- *Problem-solving groups*, where students are given information/data and some kind of problem. The problems should not have obvious solutions so that different groups tend to come to different conclusions that then can be debated in class. (Biggs 2003, ch 4)

Looking at Baumann's findings we can see that exercises – often in form of problem-solving in pairs or groups or at least the whole class addressing the same problem in different designs – seem to be the most common activity.

As mentioned, lectures are used as a supplement to practical work in design education. This is very much in line with current thoughts on encouraging cognitive high-level activities in order to encourage deep learning, as favored by e.g. Biggs (2003), Ramsden (1992), Bowden and Marton (1998), Marton, Hounsell and Entwistle (1986).

Biggs (2003) points out cognitive high-level activities like analyzing rather than simply comprehending, explaining rather than describing, and so on with reflecting, applying and hypothesizing as the most desired activities. However hypothesizing may not be the prime goal in design but instead something like applying and taking further. Then again, designing is a high-level activity in itself. A deep learning approach will come naturally if the learner sees a value in learning, so good teaching is partly about creating value, for instance by rewarding students, showing how the knowledge is applied in the real world (such as in Problem Based Learning), or of one can somehow bring students to find pleasure in the learning process itself, i.e. by making a learning task “fun” so that students make it for its own sake.

Ramsden (1992) too, is very critical towards the typical lecture for various reasons.

*“The idea that lectures ensure ‘that the ground is covered’ is false. The ground is covered for the lecturer, perhaps, but not for the students. [...] Students are usually very passive and dependent during lectures. [This] provide[s] an excellent basis for surface approaches. We have seen how deep approaches are associated with activity and responsibility in learning – exactly the opposite conditions to those obtained from most lectures.”*

*Paul Ramsden in “Learning to Teach in Higher Education” (1992 pp. 154-155*

However Ramsden does not rule out that it is possible to give a good lecture, or the possibility to use lectures to introduce new topics or present relations between concepts. Thus he is not entirely against lectures although he thinks teachers should “do less of it, and for shorter periods” (p. 156).

Consequently, both Biggs and Ramsden ought to be all in favor of more hands-on activities like excursions and lab work. However both take a slightly skeptical stance; not against the activities per se, but how they are often carried out. Biggs writes: “...the activities need to be specifically and overtly linked to the declarative knowledge they relate to.” (Biggs 2003, p 89). Ramsden comments that practical work often provides an impressive list of things to be learned, e.g. hands-on practical skills, seeing connection between the practical and the theoretical etc., but then presents evidence that firstly, students can learn many of the listed things in other ways (e.g. cooperating with others or how to interpret test data) and secondly doing does not necessarily bring knowing with it.

*"Just as in lectured it is taken for granted that students will learn if they are presented with information, so in practicals it is taken for granted that students will learn if they do things. [...] But doing things does not imply understanding processes of enquiry or relating practice to theoretical knowledge. Just as it is possible to reproduce ideas and facts without understanding them, so is it possible to learn things without understanding the reasons for doing them. "*

*Paul Ramsden in "Learning to Teach in Higher Education", (1992 p. 164)*

The problem is, according to Ramsden, that the average practical, like laboratory work, is teacher dominated still. The teacher does too much of the work in formulating the task, e.g. explicitly stating the problem and deciding on the procedure (Ramsden 1992, pp. 163-164). It should be noted however that Ramsden's arguments are related to a science-context with laboratory work in chemistry or physics, rather than to the more open problems in a design education context. Laurillard (1984) however comments on how students often solve a problem in the context of the course and its teacher, trying to solve a problem in a way that pleases the teacher. The latter occurs in design teaching just as well as elsewhere – perhaps even more so.

## GROUP WORK

Nine of Baumann's (2004) interviewees incorporated group work in their teaching, however not agreeing on the ideal group size. Notably, Zimmermann, Ehn and Raby did not agree on this, and neither did the architectural teachers. To me, this suggests that the ideal group size is not discipline-dependent but task-dependent. Still, seven of the interviewees suggested group sizes somewhere between two and eight people, which is well in line with research (Jaques 2000). According to Ehn, all work at his education is group based, partly as a way to save resources. Ehn also mentions the typical issues when having groups in an interaction design education; the varying background of the students, resulting in the risk that they, when working in groups, get stuck doing what they already know (e.g. programming) instead of learning something new *"This is an unsolved dilemma"* Ehn says (Baumann 2004, p. 85). The usual pros (inspiring, increases social competence) and cons (grading is hard, slackers) associated with group work are mentioned, but in addition there was a design specific comment:

large groups (20 or more students) can be used in projects simulating a whole production process where there are several large sub tasks. Grading groups was made in many different ways, although giving everyone the same grade was the most common approach.

## Theory: Small Groups Learn via Defined Tasks

Jaques (2000) summarizes the research on group sizes and how they affect work structures, influence etc, concluding that the larger the group, the stronger is the need for structure, rules, organized means of communication and leadership. “...in the small group it is easy to think but difficult to feel, in the large one the opposite is likely to be the case.” (Jaques 2000, p. 7). It seems that the smaller group is preferable although it has its drawbacks:

*“The number of students in each group has a profound influence on the kind of interaction that can be attained. The smaller the size, the greater is the likelihood of trust, close relationships and consonance of aims among members. These advantages may, however, be offset by the lack of variety and the greater probability of a ‘poor mix’.*

*– David Jaques in “Learning in Groups. A handbook for improving group work” (p. 156).*

In reference to this, Jaques states that the heterogeneous mix of students work best, providing a good basis for interaction, and suggests that the teacher/tutor creates the group on the basis of factors like e.g. background, age, gender, expressed interest, nationality etc.

The best way to deal with the problems of having slackers in groups, or having groups that do not learn because they do not engage in the task is to increase motivation, which can be done in several ways; by providing clear goals and/or let students set their own goals; by providing multiple goals to increase success; by aligning these multiple goals; and, lastly but most important, to create tasks that pose a tempting challenge. In addition the aims of working in group on that certain task must be clear; it can be both aims related to pure skills as well as to personal insights about one’s behavior in groups, or aims related to practicing work group. (Jaques 2000, pp. 80-91).

As for grading, Jaques gives several suggestions. One is to let the students in the group negotiate, dividing a certain amounts of points according to their contribution – if so the grading criteria should be known – sometimes discussed and decide in the group – in beforehand. Another



possibility is that the tutor gives a grade to the group as a whole, and that the students grade each other in terms of having contributed above average/average/below average on the different parts of the project, which will indicate if there are some over- or under-achieving students deserving a higher or lower grade. If the project is based on a case study, one can make an individual exam with questions formulated in such a way that the answers will reflect the student's engagement in the work on the case. If the work process too, is being graded, Jaques recommends techniques like observing the group, or asking the group to explicitly present their process. (Jaques 2000, ch. 9).

Regardless of method, asking the group as a whole results in a certain risk of being polite, not speaking up, whereas asking students individually may result in them exaggerating in order to get a higher grade, or possibly some individuals with low self-esteem under-estimate their contribution.

## FEEDBACK

One common type of feedback in design educations is "crits" (which stands for "critique session") where each student's work is analyzed and criticized in class, either by the teacher or some other kind of expert only, or by the fellow students. Baumann quotes one of the interaction design teachers, Zimmermann on this: *"The idea behind the crit model is that students don't need to encounter every mistake and every good solution but they learn a lot from looking at and analyzing the work of others."* (Baumann 2004, p. 75). However the critique against crits is that they focus on an end result, rather on the learning process or on successful design methods or good ways of working.

Many of the teachers also give written feedback together with grades, and many provide continuous feedback sessions (Baumann 2004, pp. 239-254). At some point in time all educations provide one-to-one tutoring. One person, Rob van Kranenburg has a somewhat original approach to feedback by talking his students for a walk, one and one, once a week. *"Every walk takes an hour or so [...]. We walk around the park. There are eight people, so it takes a day."* (Baumann 2004, p 77).

Baumann himself summarizes: *"It is coaching, tutoring and feedback which makes the difference between a simple training-on-the-job and a real education in a design school."* (Baumann 2004, p 316).

## Theory: The Richer and Earlier the Better

Ramsden lists the ability to give appropriate assessment and feedback as one of the six key factors in successful teaching (Ramsden 1992, p. 99). He also reports about findings by Entwistle showing that student failure was coupled to not getting feedback on their progress (i.e. continuously); students did not realize that they were in danger and when they finally did, it was either too late to make up for it, or the feedback was insufficient in showing them how to improve (Ramsden 1992, p 193). In his own inimitable way Ramsden states:

*"It is impossible to overstate the role of effective feedback on students' progress in any discussion of effective teaching and assessment. Students are understandably angry when they receive feedback on an assignment that consists only of a mark or grade. I believe that reporting results in this way, whatever the form of assessment is cheating students. It is unprofessional teaching behaviour and ought not to be tolerated."*

– Paul Ramsden in *"Learning to Teach in Higher Education"*, (1992 p. 193)

Bowden and Marton (1998) too list feedback as an important factor in effective learning as follows: *"active engagement by learner with problematic aspects of the subject [and] frequent qualitative feedback on the way learners are dealing with such issues"*. (Bowden & Marton 1998, p 135).

How to give feedback however, is a totally different issue. Feedback can be given verbally, for example in class when discussing a subject, as written comments on assignments or tests, it could be given by the teacher or by peers, for instance in "crit"-sessions that are so common in design education. Orr, Blythman and Blair (n.d.) point out the advantages of the crit, e.g. that students get to see each other's work, get to train their analysis skills and their skills in discussing design "on their feet". They state that (p. 6). However they also point out the crit's weak points; most importantly that shy or quiet students may not benefit as much – there is an imminent risk that some people, including the teacher, dominate the discussion too much – and that it is essential that the critique is well-argued and constructive. Moreover they point out that crit-sessions take lots of teacher-time in account, and that one needs to organize the crit in such a way that all works are being discussed a quite equal amount of time.

As for peer assessment in general, it seems to work quite well according to Biggs (2003), partly because students by grading someone else's

work gain insight in what is important, but also because they step up when being graded by each other (however this may be a culture-dependent effect). (p. 229-231).

As for constructive feedback Orrell (2006) comments that yes, feedback is agreeably *“the cornerstone of all learning”* (Orrell, p. 441) but quotes research that shows that students are often dissatisfied with the feedback they get. A problem is that teachers see feedback as something postscript to teaching and learning, rather than a part of the process; this latter approach is however not common in design teaching. Consequently, students are hardly ever to reflect upon and act on the feedback they get. Another issue is that teachers when giving feedback tend to give negative feedback, and that they, although they assess students’ understanding, in their feedback tend to teach content or comment on presentation. Orrell’s study showed that there was an inconsistency in what teachers thought about feedback and how they actually did give feedback – and that feedback is normally given as a means to justify a grade rather than to help students improve.

## GRADING

Almost all of the interviewees use different grading scales, from pass/fail to sophisticated systems. Nine of the twelve think that it is possible to grade design skills. Means to do this is to check final result against initial briefing (sometimes set by students), or to use final crits, sometimes in front of the entire class and/or with external people (e.g. from the industry) as critics. Six of the teachers let students help on the evaluation of each other. Some grade only on the final deliverables, whereas others base their grade on a continuous evolution or some kind of overall picture. To some extent they all comment on that the grading is still somehow intuitive and subjective. One person, Rob van Kranenburg, strongly dislikes grading:

*“But what I will do is to say; if you participate and if you listen, if you will do a performance you will get [the highest grade]. You are third year graphic designers, you have skills and projects and stuff, we cannot grade like this any more, right? You can grade yourself. What I would really want is to get rid of these grades whatsoever. The*

*institution has to do it, so I have to do it, but I really, really hate it.  
So I give points really for motivation."*

*Rob van Kranenburg in Konrad Baumann's  
"How Designers Teach", (2004, p. 246 )*

When it comes to what is being graded (i.e. grading criteria) notions like holistic approach/parts fitting together, function, originality, positive surprise, mastering of tools/craft, and presentation are mentioned. (Baumann 2004, pp. 239-254). Five of the interviewees explicitly value non-design related factors like active participation, commitment and energy.

## Theory: Writing and Assessing Objectives

Following the idea on constructive alignment, Biggs (2003) writes *"Finally the assessment tasks address the objectives, so that you can test to see if the students have learned what the objectives state they should be learning"* p. 27). Bowden and Marton (1998) phrase this similarly by stating that *"assessment should be such that students are motivated to undertake the kind of learning we espouse"* (Bowden & Marton 1998, p. 161) .

According to e.g. Laurillard (1993, pp. 183-187, Biggs 2003 p. 45, Gronlund 2004, p. 3) Ramsden 1992 pp. 129 – 134), the key concept of successful teaching is to write so-called intended learning outcomes, which is (seemingly!) simply to express what the students should/will know at the end of the course, and in effect how they can show that they have learned this.

*"The purpose of expressing aims and objectives is to improve the quality of education in two senses. The activity should enable teachers to think more critically and deliberately about student progress, and the manner of its connection with what they do in their teaching. Secondly [this] should make clear to students exactly what they have to learn to succeed, and what they can leave aside."*

*– Paul Ramsden in "Learning to Teach in Higher Education" (192, p. 130)*

Gronlund (2004, p. 3) declares: *"Clarifying our intended learning outcomes provides a basis for instructional planning and sets the stage for both teaching and assessment."* Laurillard, in turn, suggests approaching this by first establishing aims with the course and then turning an aim into one or more intended learning outcomes by defining how the teacher will know that the student has reached the aim. She characterizes the objects as being:

*"1. Precise, in the sense that a decision about whether the student can do it can be easily agreed.*

*2. Necessary, in the sense that without the objective the aim could not be said to have been achieved.*

*3. Complete, in the sense that they cover the academic ground implicit in the aim."*

*– Diana Laurillard in Rethinking University Teaching: A Framework for the Effective Use of Educational Technology (1993, p. 184)*

However, there are many types of outcomes, i.e. comprehension, higher-level-thinking etc. Gronlund (2004) lists and describes how to write these, but despite the fact that he includes "Writing Performance Objectives for Problem-Solving Projects" (ch. 10) and "Writing Performance Objectives for Skills and Products" (ch. 9) neither entirely covers the fuzzy problem of expressing and assessing design skills as Gronlund is discussing clearly defined procedures, skills and problems. In any case, the type of assessment has to be chosen in accordance (alignment!) with what fits the subject (Ramsden 1992, p.125)

As for assessment methods particularly suitable for design education, there are a few. One is so-called performance assessment (Biggs 2003, p 156; Bowden & Marton 1998, p. 165-167). This is the approach that students should study for the test, i.e. the test should be constructed in such a way it is impossible to pass without having achieved the intended knowledge – like in a driving test. This approach can be used in sports and arts, like design. However this depends on the teachers' possibility to set a public, clear standard describing what has to be achieved, and it also brings with it that very different student performances may well be within the standards, which makes it harder for a teacher to judge and assess them. This is a typical problem for any interaction design teacher running an open project course.

One common type of assessment within design education is the portfolio which in some aspects (depending on the demands on the portfolio content) is a form of performance assessment.

Biggs (2003) discusses portfolios, and describes them as follows:

*"In a portfolio the student presents and explains his or her best 'learning treasures' Students have to reflect and use judgment in assessing their own work, and explain its match with the unit objec-*

*tives. When students give their creativity free rein, portfolios are full of complex and divergent surprises...*"

– John Biggs in *"Teaching for Quality Learning at University"* (2003 p. 189)

Biggs comments that grading portfolios can be interesting and more rewarding than assessing "look-alike assignments", but that students' ambitions need to be kept in check. Biggs also gives valuable advice on how to set up a portfolio assignment. The most important points include:

- Stating the number of items, and the intended size
- Making sure that each item addresses a different learning objective
- Consider whether some item(s) should be compulsory

Biggs (2003) also presents several examples of self assessment and peer assessment, and states that they can be useful since they very clearly demonstrate the criteria for good learning, and trains them in value judgments. When it comes to self-assessment good students unfortunately tend to under-assess themselves whereas bad students over-assess themselves. However good agreement relies on a very clear grading structure. (Biggs 2003, p. 191).

## THE IDEAL DESIGN EDUCATION: STUDIOS AND SMALL CLASSES?

Most of Baumann's interviewees – including the three interaction design teachers Ehn, Zimmermann and Raby – advocate a kind of education that is run in an academic setting, but in the form of design studios/master classes. All advocate practical project work and several favor having students with a variety of backgrounds. It seems that implicitly all prefer smaller classes, say 25 students; one interviewee, Günter Doeming, specifically states this by explaining why he left a position as a university teacher: *"When I left we had 2500 students and 50 teachers – a ratio of one teacher to fifty students. In this situation you cannot educate the students individually, you lose the personal contact."* (Baumann 2004, p. 225). Ehn mentions the Bauhaus as a role model, not surprising since "his" education at K3 in Malmö was based on his "Manifesto for a digital Bauhaus" (Ehn 1998) where he suggested a critical but also creative combination of technology and aesthetics, uniting design, art and culture with new tech-

nology, forming a new society. Consequently he describes this education as being oriented towards coaching, learning-by-doing and reflection in action, featuring committed students with varying backgrounds. (Ehn 2002). Ehn, Raby and another person also point out the education at the Royal College of Art (RCA) in London as a role model for interaction design education (see below).

All but one of the other interviewees prefer to place the design education at the university. The advantages are closeness to research and a greater freedom when it comes to supplementary courses. One criticism against small schools or studios is that one dominant teacher can influence the entire education and skew students towards a certain movement or ideal, leaving little room for individuality.

So, it seems that The RCA (Royal College of Arts in London), as described in Baumann (2004, pp. 99-106) is the ideal education, covering all of these aspects. It is studio-based, and each studio takes 12 students, of which some are first year students and others are second year students. Every student is highly influenced by its leaders' beliefs, which is why students get to apply for the studio that attracts them the most, however the teachers have the last say in which student goes where. Students may change studio after their first year, taking their second year in some other studio that suits them better. This approach is very similar to that at the Bauhaus. In the studio that Raby runs together with Anthony Dunne, each student runs one over-arching project per year, but this project is adapted to different sub-themes like field work, analysis, prototyping, strategy development and/or detailed design. Also, every year/project has a theme; a (kind of place) in combination with something, e.g. a word or notion.

## Reality: Group Work, Heterogeneity and Interdisciplinarity

But – is this how interaction design is actually taught today? Looking into *interactions'* special issue on education (interactions XII.5, September / October, 2005) one can find a number of HCI or interaction design-like educations are being presented by their representatives, and we can quickly see that there are several of different approaches; I will just present a few here: One example is The Human Computer Interaction Institute at Carnegie Mellon University. Here it is said that *"the best results in interactive system design are obtained through interdisciplinary work, specifically from the disciplines of behavioral science, computer science, and design."* (John 2005, p 28). Crit sessions are used as a pedagogical tool, there is an

emphasis on group work and since the students come from heterogeneous backgrounds there are several elective classes. In addition there is a fruitful collaboration with industry, both as reviewers of the education and as clients in group projects.

At Stanford, the aim is to create an education that, unlike arts-inspired educations like RCA, is *“grounded in the technical competence of computing, operating within the structures and constraints of a computer science department.”* (Winograd & Klemmer 2005, p. 30). Here, traditional education is complemented with intensive interdisciplinary group projects. Students from different departments are mixed in groups. The aim is to foster design thinking, and the focus is on process of design and innovation rather than on technologies and tools.

In Eindhoven the overall goal is to provide students with the *“skills and capabilities for conceptualizing, designing, implementing, and evaluating new products, services, and applications that exploit the possibilities of new technologies for the benefit of users in the domain of information and communication technology.”* (Janse et al 2005 p. 33). Here too, interdisciplinarity is a virtue. Only 20 students/year are accepted. One fourth of the education is group work on a design case, and thereafter each student goes on a nine-month industrial apprenticeship.

In Hamburg focus lies on *“the development of interactive software. In the Hamburg tradition of software development (e.g. STEPS), we take a process view, emphasizing the importance of participatory design and intertwining development with use.”* (Obendorf et al 2005, p. 36). Here, focus on programming is much stronger than in the other educations mentioned, and students learn from projects mixing software and usability.

In Gothenburg, where I teach (Lundgren et al 2006), ca 40 students are accepted each year, of which several come from other countries than Sweden. Most, but not all, have a background in engineering; the program thus aims towards bringing design education to computer science. Our education is based on four things: working in heterogeneous groups, learning from each other and to work in teams; prototyping; student exhibitions, boosting work but also pride and self confidence; alternating between clearly formulated problems and open problems, i.e. alternating between designing towards a goal and design as exploration.



These are just a few examples, but they clearly differ – from each other and from the RCA role model (?) – in several ways. However we can see a few reoccurring themes, like interdisciplinary, group work and crits or some other kind of peer review or presentations.

## Footnotes, Part II

- 1 The official website for the Bologna system can be found here: <http://www.ond.vlaanderen.be/hogeronderwijs/bologna/about/>
- 2 The *Gesamtkunstwerk*, or total artwork is an idea strongly promoted by Wagner and other artists in the 19th century; the general idea is to unite several disciplines into a greater whole, e.g. an opera consisting of song, music, costumes, wings etc.
- 3 In the Bauhaus statutes from 1921 those to be educated were “*artistically gifted men and women*”. (Wick 2000, p. 69).
- 4 Rittel was a teacher at Ulm, and also served as Rector together with Maldonado and Herbert Ohl in 1960.

# METHOD: ACTION RESEARCH

*Here, I describe the principles of action research and give an outline of how my own research has been conducted, discussing why the outcome is useful.*

## PART III



The aim of this research was not to make a comparative study, trying to empirically prove what students learn, but rather to explore my three research questions regarding which topics could be relevant in a course on aesthetics of interaction, why students would benefit from investigating these topics and finally how aesthetics of interaction can be taught, using constructive alignment as a framework. As such, it was also a means to improve my own teaching practice in the context of teaching aesthetics of interaction. Consequently, I chose action research as method; a natural approach for me as designer, since the iterative and active approach in action research very much resembles the generic approach to design, for instance as described by Jones;

*“One of the simplest and most common observations about designing and one upon which many writer agree, is that it includes the three essential stages of analysis, synthesis and evaluation. These can be described in simple words as ‘breaking the problem into pieces’, ‘putting the pieces together in a new way’ and ‘testing to discover the consequences of putting the new arrangement into practice’. Most design theorists agree that it is usual to cycle many times through this sequence...”*

– John Chris Jones in “Design Methods”, (1992, pp. 63-64)

This is regarded a standard approach in for instance user interface design (c.f. Moggridge 2007, Preece et al 2002), game design, (c.f. Fullerton et al 2004 and Salen & Zimmerman 2004). It is also a very common approach within software design, e.g. being an essential part of the Rational Unified Process (RUP), an iterative software development process used by many companies worldwide.

## ACTION RESEARCH

Similar to the iterative design process, action research, is a form of self-reflective research where the active practitioner studies, analyzes, reflects on and improves his or her practice, in this case teaching (for alternative, but similar definitions of the term, cf. Costello 2003 pp. 4-5). Typically, action research is cyclic, with a problem-solving emphasis – just like design.

*Action research, being concerned with the improvement of educational practices, understandings and situations, is necessarily based on a view of truth and action as socially-constructed and historically-embedded. First it is itself an historical process of transforming practices, understandings and situations – it takes place in and through history. Any action research study or project begins with one pattern of practices and understandings in one situation, and ends with another, in which some practices or elements of them are continuous through the improvement process while others are discontinuous (new elements have been added, old ones have been dropped, and transformations have occurred in still others). Similarly, understandings undergo a process of historical transformation. And the situation in which the practices are conducted will also have been transformed in some ways.*

– Wilfred Carr and Stephen Kemmis in *“Becoming Critical : Education, Knowledge and Action Research”* (p. 182).

There are different views on the different steps in the cycle, but they all include the main steps *planning – acting – observing – reflecting*. Bassey (1998) lists as many as eight steps;

1. Defining the enquiry.	<i>What is the educational situation like right now?</i>
2. Describing the educational situation.	
3. Collecting and analyzing evaluative data.	
4. Reviewing the data and looking for contradictions.	
5. Tackling a contradiction by introducing some aspect of change	<i>How could it be changed?</i>
6. Monitoring the change.	<i>What happens when change is introduced</i>
7. Analyzing evaluative data concerning the change.	<i>– did the improvement work?</i>
8. Reviewing the change and deciding what to do next.	

According to Carr and Kemmis, the action part is the very part of the cycle where we probe into the future, proposing change: *“the taking of a step which reflection alone cannot justify”* (Carr & Kemmis 1986, p. 185).

As any other research method it has its pros and cons. One advantage is that it is an approach directed explicitly towards practitioners, and that

it highlights what Donald Schön (1983) called reflection-in-action. This means that teachers themselves can be in the forefront of educational research; they research themselves instead of being the subject/object of research – where should educational research be carried out if not in the classroom? This of course also points out the gulf between educational practice and pedagogical theory and research. Unlike general theoretical pedagogy, the action researcher's findings are directly applicable to his or her teaching situation, attempting to solve her or his actual problems. (Costello 2003, pp. 15-26) The latter is of course also a counter argument; that the findings are not possible to generalize and thus "useless" as research. This can in turn be countered by carefully describing the context of the study, so that others can "*explore the relevance of these aspects to their own research.*" (Costello 2003, p. 46), i.e. possibly counter eventual differences when applying the findings. Other ways to generalize findings are if new theories can be generated on the basis of action research, or if the research results in products or instruments that can be used in other settings (Herr and Anderson 2005, p. 6).

Another counter argument against action research is that of the validity and reliability of the data collected. As in any research project, this can partly be countered by using triangulation of data, i.e. collect data from many different sources (Costello 2003, p. 45; Herr and Anderson 2005 p. 56, 61). Robson (2002) even specifies different types of triangulation, e.g. data triangulation, observer triangulation, methodological triangulation (combining quantitative and qualitative research) and theory triangulation. He also suggests other approaches like peer support, checking back with subjects and negative case analysis – playing the devil's advocate (Robson 2002 pp. 174-175).

Herr and Anderson (2005 pp. 55-57) discuss quality criteria for action research as follows: *Outcome Validity* is the extent to which the instigated actions lead to a change or to solving the problem that was the reason for the study. *Process Validity* concerns whether the problems/issues are framed and solved in such a manner that we can learn from it. *Democratic Validity* is related to how all the stakeholders are involved in research. *Catalytic Validity* is concerned with how the action research process/project affects researchers and participants in such a way that they reorient their way of looking at reality, aiming to change and improve it. *Dialogic Validity* it what peer reviews bring.

Yet another concern is ethical: it is right to use students as guinea pigs? However – students are used as guinea pigs anyway, every time a course runs for the first time. Secondly we have all the common ethical



issues that arise when people are subjects of research, which are best countered by openly telling the students that they are taking part in an experiment, being open about the idea behind the teaching and learning activities, asking permission to use material, and ask for anonymous contributions if possible.

## THE ITERATIVE RESEARCH PROCESS

In Part IV my exploration of how to teach aesthetics of interaction will be described. However a quick overview and discussion of the importance and usefulness of this research may be necessary.

The work presented in this dissertation was carried out in three steps, all building on each other. First, aesthetics was encompassed in a 15 ECTS-credit course entitled “Interaction design project” where our master students finished off their first year with one large project. In the introductory part of this course I used to run a couple of exercises related to aesthetics (of which several made it to this dissertation).

When choosing topic for this dissertation (i.e. narrowing down from just teaching interaction design to teaching aesthetics of interaction) the insights gained from this course in particular, and my other self-developed course Graphical Interfaces in general served as a basis for the design of the course Aesthetics of Interaction. It ran the first time in the fall of 2008, and albeit some things worked well, others could still be improved. Between the two courses I took a great step in exploring aesthetics of interaction and the teaching of it; both I and my students had been struggling with the multi-faceted set of opinions on aesthetics of interaction presented in various papers. Somewhere in the process of writing a paper on aesthetics of gameplay together with my colleagues Staffan Björk and Karl Bergström (Lundgren et al 2009) we decided to refer to certain kinds of games as fulfilling certain aesthetic ideals. Taking the notion of aesthetic ideals and applying it onto current interaction design approaches to aesthetics served for me as a way to sort this issue out, both for me and my students in the second version of the course Aesthetics of Interaction in the fall of 2009 as will be described in detail in parts IV and V. Simultaneously I tried to integrate aesthetics in an international course entitled Chalmers Inter-

action Design Challenge, which only proved that aesthetics of interaction in its wider sense is not something that can be taught in a lesson or two.

A rough time line looks as follows (note that exercises are listed in the order they appeared in each course, note also that all courses also contained other exercises that did not quite fit this dissertation):

When	Context	What
Spring 2006	Interaction Design Project course	Exercises: <i>Informative Art and Designing Emotions</i>
Spring 2007	Interaction Design Project course	Exercise: <i>Animal Expression Transfer</i>
Spring 2008	Interaction Design Project course	Exercises: <i>Informative Art and Animal Expression Transfer</i>
Fall 2008	Aesthetics of Interaction course	The course itself. Exercises: <i>Designing Emotions, Expressions of Interaction, Informative Art, Design the Apple, Calculator on the Runway, The New Office Assistant</i>
Spring 2009	Interaction Design Project course	Exercise: <i>Character of Things</i>
Spring 2009	Writing	Developing the concept of aesthetic ideals of interaction.
Fall 2009	Chalmers Interaction Design Challenge course	Exercise: <i>Animal Expression Transfer</i>
Fall 2009	Aesthetics of Interaction course	The course itself. Exercises: <i>Design the Apple, The Schizophrenic iPod, Informative Art, The New Office Assistant, Expressions of Interaction, Designing Emotions, Calculator on the Runway, Face... what?!?</i>

The results, in short, are a set of exercises teaching different aspects of aesthetics of interaction, the notion of aesthetic ideals in interaction design, and an offered syllabus for teaching aesthetics of interaction.

Looking at the above process in terms of action research we can see it as a cyclic exploration and as for relevance in terms of outcomes, the exercises and projects described are certainly “products” that can be reused in other settings, i.e. in other types of interaction design courses as will be discussed more in detail in Part V. Additionally, my way of teaching “Aesthetics of Interaction” is a case description that others can analyze and alter to fit their own educational context, hopefully applying or being inspired by the proposed syllabus presented in Part V.

The conclusions drawn are based on the following information channels:

- My *own observations*, recorded in my teacher’s diary. These observations are based on what students do, what we discuss in supervision and on the outcome of exercises etc.
- The *material* students hand in; exercises, essays, home work etc.
- The *feedback* sent in from students; in early experiments and the first version of “Aesthetics of Interaction” in form of emailed comments they were instructed to send after each event, in the second version of “Aesthetics of Interaction” in the form of anonymous MUD-cards, small anonymous notes asking what the students had found hard/unclear and which insights they had gotten, respectively (cf. Biggs 2003, p. 195).
- The concluding *oral presentation* that all students had to make after handing in their portfolios; they were encouraged to talk about a design process that they’d found interesting or challenging or instructive somehow.
- A concluding *questionnaire*, given to the students of both versions of “Aesthetics of Interaction” as formal course evaluation during the last meeting. It can be found in the Appendices.

None of these information sources is reliable in itself (e.g. asking students for written non-anonymous comments opens up for polite comments in some contexts, but nevertheless worked well in my Swedish context under the circumstances that all but one student already knew me from another course) but in combination they can serve to give a pretty detailed



ing for Emotions

the feeling about  
think many feelings  
be almost the same like  
ous etc. but is it really an  
nts?

**MUD: Designing for Em**  
Hard/unclear

To really  
evolve  
up with

Insights?

Fun

case study on teaching Aesthetics of Interaction. Discussing validity in the terms of Herr and Andersson (2005 pp. 55-57) this detailed case study fulfills the criteria for Process Validity; something (many things!) can be learnt from the described process. Outcome Validity is present too, especially in how the exercises were improved. As for Democratic Validity the students were informed that the course was a part of my research, they will get a digital copy of the dissertation and, most importantly, any student work presented in relation to the exercises is published with the written consent from that student. As for Catalytic Validity – participants getting new insights – it was the whole point with running Aesthetics of Interaction in the first place, and in many cases took place during the first two lessons when students realized that aesthetics of interaction is not necessarily related to visual beauty. Many of the students comments, who will be shown further on indicate this, most eloquently this one:

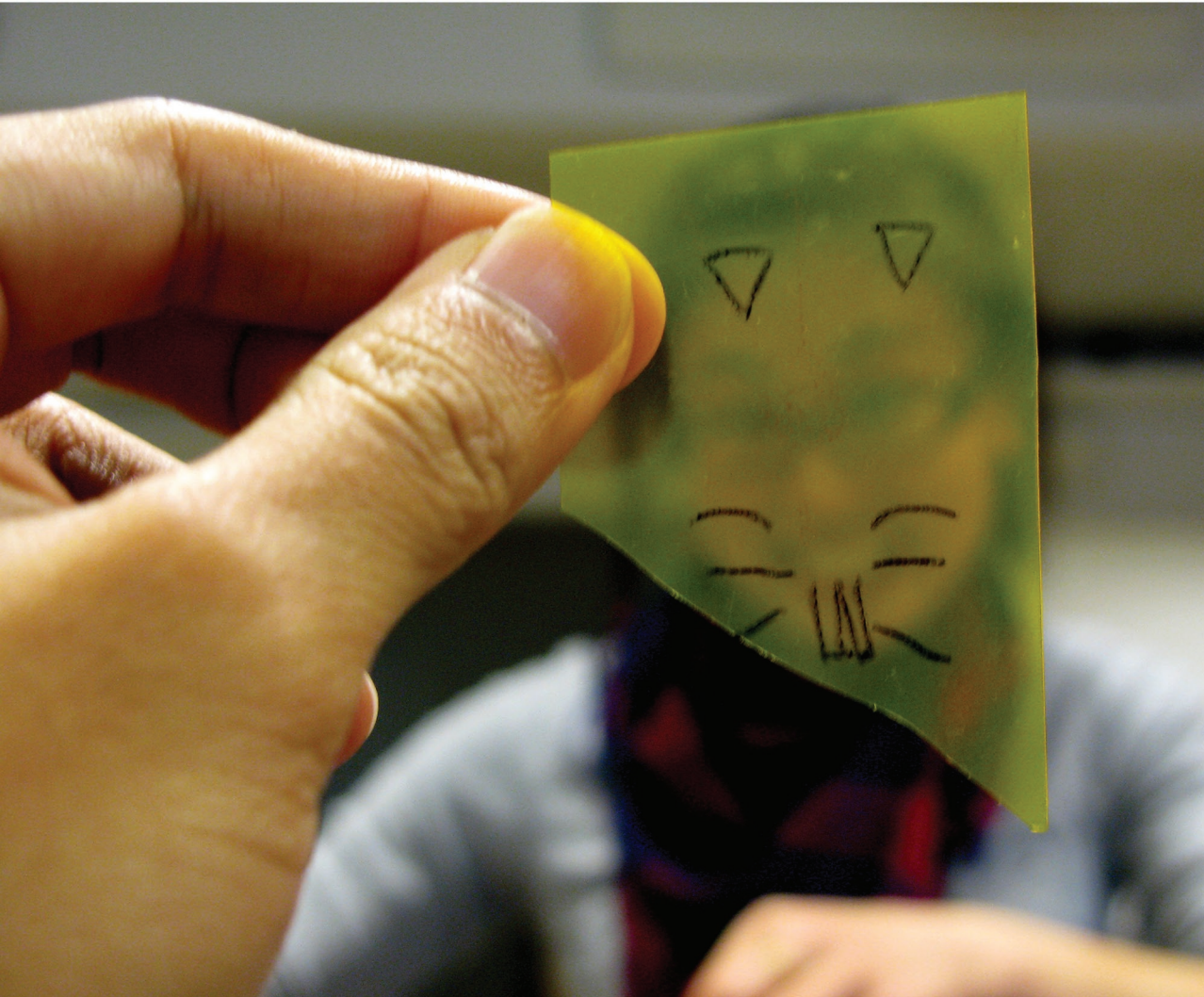
*“I began the course hoping that I would learn how to make beautiful, functionalistic software. I do not believe I have learned this. Instead, I have learned many other, more interesting, things about aesthetics, design, and myself as a designer.”*



# EXPLORATIONS

*Here, I describe the work with the two versions of the course “Aesthetics of Interaction”, the concept of describing and teaching aesthetics of interaction as aesthetic ideals and, lastly, the work with ten exercises highlighting various aspects of aesthetics of interaction.*

## PART IV



I started teaching in 2003, and over the years I've been involved in a number of different courses at the master's programme for interaction design at Chalmers University of Technology. The first course I ran myself was "Graphical Interfaces" (co-teacher 2003-2004, course responsible 2005-2007, and probably 2010 and onwards, cf. Lundgren 2009a), followed by "Aesthetics of Interaction" in 2008 and 2009 (and probably 2010 and onwards) and the course/contest "Chalmers Interaction Design Challenge" in 2009. I also worked as a co-teacher in the courses "Interaction Design Project" in the years 2003 and 2006-2009. Thus, planning and teaching the course "Aesthetics of interaction" is very much based on my teaching experiences from these courses and how interaction design is taught at Chalmers University of Technology (cf. Lundgren et al 2006).

The order of the segments in this section are based on the actual order in which the research was carried out; early experiments first, followed by the first version of "Aesthetics of Interaction" (AoI1), followed by the intermediate process of exploring and formulating aesthetic ideals, later utilized in the second version of "Aesthetics of Interaction" (AoI2). Lastly, ten design exercises dealing with various aspects of aesthetics of interaction are presented. I have chosen to place them there, as a collection, rather than scatter them throughout the previous sections.

## EARLY EXPERIMENTS

I was teaching long before I chose the particular subject of teaching aesthetics of interaction; it was a decision slowly growing out of my teaching interests. Therefore, I developed and tested a few design exercises related to aesthetics long before developing an entire course in the subject. The ones most suited for teaching aesthetics of interaction are described in the Exercises-section.

In all cases the different exercises were run in the context of a course called Interaction Design Project. This is a 15 ECTS-credit course spanning the entire spring, and it ends with an exhibition where students show the projects they've carried out in the course. The course always starts with a few introductory weeks featuring theoretical issues like aesthetics combined with a few practical exercises, of which some are described in the Exercises-section (p x-z), namely *Animal Expression Transfer*, *Character of Things*, *Designing Emotions* and *Informative Art*. The course is open for

interaction design students only and there are some 35-50 students each year. In the years 2006 and 2007 we also ran a class project on aesthetics, called Physical Poets; it was a combination of exploring aesthetics in terms of coherency as well as working together in large interdisciplinary groups. It will not be described in this dissertation since it is slightly out of scope; see Lundgren (2008a, 2008d) for more information on this project.

## THE CONSTRUCTIVE ALIGNMENT OF A DESIGN COURSE

In the spring of 2008, the first version of Aesthetics of Interaction – hereafter referred to as Aoi if the course in general is meant, or Aoi1 or Aoi2 if meaning the first or second version respectively – was developed.

Setting the objectives for this first version of the course, I defined it as being about giving students an understanding of central views and problems within aesthetics of interaction design, explored in practice. I wanted them to learn about the history of aesthetics in general, the history of industrial design and of course the current views on aesthetics in interaction design. Moreover I wanted them to be able to design with the aesthetics in mind, e.g. focusing on certain aesthetics. I also wanted them to be able to analyze the aesthetics of a design which in turn would help them motivate the aesthetic choices in their own designs. (See the Appendices for the complete list of intended learning outcomes.)

Based on the ideas presented on pages 57-73 (Teaching Design Today) on constructive alignment, and the idea to provide an open, trusting learning climate – which had worked well in earlier courses – the course outline contained a few lectures and excursions, but more exercises. This approach supported the intended learning outcome of applying theory to practice, but was also based on both how design is normally being taught and that current educational research advocates an interconnectivity between parts of a course, e.g. addressing lecture content in exercises and literature and vice versa. As a means to make students read and reflect upon literature, the texts came with questions that students had to answer, but they were also asked to discuss their answers in small groups. Additionally, peer-to-peer crits were chosen as a major means for feedback, alongside my own, unstructured, supervision during exercises. The rationale for using crits as was to give students an opportunity to train their

analysis skills, their ability to give constructive critique but also their skills in defending and discussing their own designs, as mentioned in the objectives. Looking at Baumann's (2004, p. 72) common teaching methods in design teaching the course thus featured quite a few, namely; *Lectures, Practical exercises, Excursions, Readings and discussion, Action-production-reflection, One-to-one tutoring, Group teaching, Feedback exchange between students and Final critique sessions*. Following the constructive alignment idea on assessing what had been taught the examination was a portfolio plus an essay, i.e. students demonstrating both their theoretical and their practical skills.

Larger group projects were omitted, with the rationale that the students – being close to graduation – should be able to design for themselves. However a few exercises were carried out in groups wholly or partly; the rationale for this was sometimes practical, but at the same time a means to provide variation and peer-to-peer learning/teaching. As a result the course was centered around deep learning since it featured high-level activities such as analysis, reflection and of course the creative activity to apply by designing.

As for the general context, Aol was (and is!) an electable course open for master students and PhD-students in interaction design, or very similar subjects (e.g. industrial design, intelligent systems design). The course was and is a 7,5 ECTS-credits course, spanning over eight weeks.

The typical student (i.e. 29 out of 30) in both Aol1 and Aol2 was an interaction design student having taken the mandatory courses “Graphical Interfaces”, “Design Methods” and “Interaction Design Project”. Most of them had also taken the courses “Physical Computing”, “Ubiquitous Computing”, “Interaction Analysis Methods” and “User Centered Design”. Being one of the last courses in a master's programme means that it is part of the student's fifth year in higher education; the students are 23 years or older and are expected to be pretty skilled in their chosen specialty (i.e. interaction design in this case).

As for the local conditions at the IT-University where course was ran it's worth mentioning that the students did not have access to the design studios when carrying out their exercises (these were occupied by the fourth-year students), but that they could use class rooms, group rooms or shared areas to work on their exercises.





*Above: AoI1 was a small, tight class. We used this small group room for most lectures and crit sessions.*

## AOI1: THE FIRST STEP

In some senses, the first version of Aol, AoI1 (Lundgren 2009c), was a trial version, but being based on a couple of already tested exercises and a quite solid design (as described above) it went very well, considering that it ran for the very first time.

AoI1 attracted ten students, five of them Swedish, plus one from Germany, one from Iran, one from Portugal and two from China. Four of them were female, the other six obviously male. It was a small, tight class, where several students knew each other well. In addition I had been their teacher in the “Graphical Interfaces”-course which meant that I knew them, and they knew me. Four of the AoI1-students also were very talented designers, and three of the students had a previous background in industrial design, and were very used to crits and giving and getting valuable feedback, being an asset during feedback sessions. Also this class was very ambitious in terms of execution; they would hand in computer-made drawings or animations. So, in many aspects this was a dream-class; small, dedicated, talented.

A full schedule for AoI1, as well as the first version of the intended learning outcomes can be found in the Appendices.

# LECTURES

In Aol1, there were four lectures in total, and the last three lectures were held in relation to a literature seminar where students discussed that day's texts (see "Literature" below). The topics were as follows; History of Aesthetics; History of Industrial Design; Aesthetics in Interaction Design – The Aesthetic Turn; and Aesthetics in Interaction Design – Personality and Gestalt. In this, they were based on a kind of historical outline, starting with aesthetics in Ancient Greece and ending with the latest papers on aesthetics of interaction. In retrospect, spending half of the lecture time on historical overviews was unnecessary; especially the first lecture on history of aesthetics could be shortened considerably. Consequently, more lecture time could be spent on the current situation. As one student wrote in his learning incident for the third lecture: *"The not so good: hard to engage in discussions when new concepts are "thrown" at you all at the same time with little time to take it all in."*

In the lecture that was best liked of the four – the last one – we discussed Lim et al's (2007) gestalt attributes in class, applying them in a small design exercise. This worked very well and lead to interesting discussions since all had had to read the text in beforehand. This indicated that a closer coupling between literature and lectures was needed.

Clearly, the lectures could be improved. The main issue here was that the lectures and their content was in a sense routinely; just presenting a matter in a chronological order and laying much weight on historical events and background; only half of the lectures were related to interaction design. Realizing this resulted in the idea to start out from a different angle, e.g. discussing the overarching issues of aesthetics (gestalt, *Gesamtkunstwerk*, attributes etc.) first and then carry on with interaction design, intertwined with history as supposed from separated from history.

# LITERATURE

Throughout Aol1, the students had to read nine texts. Each text was coupled to a specific lecture, and was to be read before the lecture. Each texts also had a few questions associated to it; things that were extra important to think about and discuss. As such they also worked as a kind of reading instruction of questions to be answered just for oneself.

The students were divided into study groups who together had to answer all the questions related to the specific texts, i.e. they had to distribute the questions amongst them, getting two each. Each question should



be answered in ca 300 words, and handed in prior to the lecture. The rationale for the latter was of course to make sure that students read the texts before class, and in most cases the first hour was also spent in the groups, discussing the texts, making sure that everyone had a basic understanding of their content.

A full list of texts and questions can be found in the Appendices, but in short it was excerpts from Gelernter (1988) on deep beauty, Hallnäs and Redström (2006) on computational technology as a design material, Dewey (1934) on aesthetic experiences, Reeves and Nass (2002) on mediated personalities, as well as papers by Hallnäs and Redström (2002a) on expression logic/coherency, Manovich (2006) on interaction design as part of a Gesamtkunstwerk, Udsen and Jørgensen (2005) on current views on aesthetics of interaction, Janlert and Stolterman (1997) on character as means for coherency and Lim et al (2007) on interaction gestalt attributes. All students but one had previously read texts by, among others, Hallnäs and Redström (2002b), Monö (1997), Petersen et al (2004) and Ziff (1979).

Unfortunately the students divided the questions in such a manner that they took two questions to the same text, having to read only one text carefully (or even at all). Hence, the “discussion” on each question was not so much a discussion, but rather a presentation but at least students got some insight in the text they had only skimmed. Having students actually read texts seems to be an everlasting issue. It could of course be solved by demanding that every student answers every question, but firstly, this does not necessarily foster reflection but rather skimming an looking for clues to finish off all texts in due time. As mentioned, the one text that everyone got a clear grip on was the one by Lim et al (2007), since we discussed the attributed quite extensively in class.

## EXERCISES AND CRITS

AoI1 consisted of ten exercises, of which seven were carried out in class. These seven were followed by a feedback-session. Of the other three, students chose two and put them in their portfolio. Most of them will be described in detail in the Exercises-section (see pp. 140-197) but in short they were:

- *Ex 1: Super Hero Gadgets:* To create a super hero and her or his logo and weapon. On form, gestalt and interaction.

- *Ex 2: Cartoon*: To turn a couple of photos into a cartoon, spanning over at least two days. On the rich vocabulary of postures, on symbols and semantics, and depicting temporality.
- *Ex 3: Designing Emotions*: To design a ticket machine that either expresses or evokes angst. On form, material, interaction and designing for emotion.
- *Ex 4: Expressions of Interaction*: To design interaction that appears in a certain way. On how interactions express themselves, highlighting the difference between interacting in a certain way and experiencing something in a certain way.
- *Ex 5: Temporal Paint*: Discussing and exploring time as design material. On temporal aspects and how they affect interaction.
- *Ex 6: Informative Art*: To create an artistic style and design informative art accordingly. On coherency and how temporal aspects affect expression
- *Ex7: Design the Apple*: To take the interaction aesthetics of e.g. Google and transfer them to e.g. a bike. On analyzing and applying someone else's aesthetics of interaction.
- *Portfolio exercise: Calculator on the Runway*: To create three different calculators with different personalities and thus appearance and behavior. On working with "personality" as a way to create a working aesthetic
- *Portfolio exercise: The New Office Assistant*: To make a coherent version of Microsoft Words helping agent, the Office assistant. On coherency.
- *Portfolio Exercise: The Cube*: To come up with a design suggestion for an existing installation in the city, a cube with four back projected screens. On designing something following your own aesthetic codex.

The general idea behind the exercises in AoI1 and their order was to describe a transition from "classical" design tasks considered with form and material, slowly shifting towards exercise dealing with interaction, temporality and personality. In this they aligned with how the lectures were structured. Also, the rationale for adding a few exercises on form and material was because few of the students had any formal training in this. As it turned out, including exercises 1 and 2 on form and material was not meaningful; either students already knew this, in which case they did not learn anything from the exercises, or they did not know it, in which case two exercises is far too little. Thus they are not described further, and nei-

ther is The Cube which is just “any” design exercise. For more information on them, see Lundgren (2009c).

The first seven exercises were feedbacked via peer to peer crits. Each student was responsible for giving another student written critique, and during the crit sessions each student presented their work, got their critique, agreed or sometimes defended their design, and then the class discussed the design. These crit sessions worked very well; critique was constructive and good.

The portfolio exercises differed from this format. They were not carried out in class – instead students chose two of them and put them into their portfolio. This meant that firstly, students did not get any supervision when carrying out these exercises. Secondly, I had decided that these should be delivered without a design rationale which, in retrospect, did not help grading. The idea was of course that the designs should speak for themselves, but the problem when grading is that if you are the only person seeing something and not understanding, you can’t be sure whether it really is unclear, or whether you’ve missed something fundamental. In retrospect I felt that the extra exercises put an extra burden on the students, and due to the lack of supervision and feedback when doing them, the learning process may not have been ideal either. If looking at the learning process, rather than the assessment process, it’s probably more valuable for the students to make all exercises in class, with feedback sessions, and then improve a few. However another reason for having these exercises – and without feedback – was to see how well the students could do on their own, i.e. to separate the wheat from the chaff, sorting out grades. Then again, one could question whether this is meaningful. I wasn’t exactly surprised to see that the students I already knew were the most skilled handed in the most well-designed portfolio exercises.

## EXCURSIONS

In Aol1 there were both few students and some extra money in the budget, which was spent taking the students to exhibitions. To get an overview over the history of industrial design and fashion design we went to a local museum, Röhsska Museum of Fashion, Design and Decorative Arts. One of its exhibitions is called “*The Röhsska Museum Design History 1851 to the present day*”. Thirty one different environments, containing parts of the museum’s extensive collection of furniture, textiles, ceramics, glass etc. present various aspects of design history, covering the development of the

art of design over the last 150 years. Students liked this visit since it gave direct feedback on what the same day's lecture had been about:

*"The most interesting thing was visiting the museum, and found the things what exactly you have talked about in the lecture. It is really nice, and new for me. It makes me understand much better."*

*"Great to actually see the products in real life, it gives a very different experience compared to only see pictures. Nice to have a guide from the museum."*

*"Going to the museum to get direct feedback on the lecture was very inspiring. Sometimes things look different in pictures and in reality, and one can really see how the designers have been inspired by each other."*

We also went to the Museum of Sketches in Lund, which features "sketches" – paper sketches, miniature sculptures, models, notes – of public art from the entire western world. My rationale for taking students there was to show how a design process can look, from an aesthetic point of view. This excursion too, was very appreciated.

*"Very impressing to see all the works. I don't know why, but I have never reflected on creating a painting or a sculpture as that kind of sketch process before. The visit really opened up my mind"*

*"The Museum of Sketches was awesome – really cool idea for a museum and very inspiring."*

One could however question the closeness between static public art and interactive items; from that particular point of view the visit may have been slightly out of bounds, albeit fun and inspiring. We also went to an exhibition on Chinese culture, with the aim to get insight in aesthetics of another culture, but the guide – who was not used to guiding in English – only wanted to talk about the history of China, which wasn't very relevant.

The most interesting exhibition however, was interesting much because of what happened there. It was an (unfortunately) temporary display of artist Eric Langert's sculptures in "My Animal Park". Langert takes everyday objects and scraps, and turns them into sculptures of animals. The idea was to discuss how form and materials can be reused and mean different things in different context, but I also let the students choose the

sculpture they liked the best and the one they liked the least (and their choices differed very much) where after we looked at them and they had to explain why. This was very fortunate, leading to interesting discussions. E.g. reasons for disliking a sculpture was that the students felt that something was wrong or didn't fit or *"in all other cases you see the animal first and the material then, in this case it is the other way around"*. Some were also disliked because they were "uncreative", e.g. an anteater made out of brushes – but this may possibly be a typical designer-reaction. As for what was considered "good", i.e. qualities the students liked, it was either that the design was very lifelike or impersonated the conceptual idea of the animal. Other appreciated things were design constraint like using only one material (or material from only one object) in a sculpture, or subjective things like facial expressions.

Without digging into this example further, it anyhow indicates that this concrete discussion as to why one likes or dislikes something was very valuable, because it opened up for different views, and in addition it forced students to try to articulate their opinions. Students found it valuable too:

*"Very interesting. Made me realize how hard it can be to actually know WHY you find something to be aesthetically pleasing. [...] Finally very clear that we all have different opinions on aesthetics, or at least don't agree on what is beautiful or not."*

*"What I learned today was that I'm starting to believe that aesthetics and form are highly related. Also materials and combination of elements are playing an important role in what defines something as aesthetically pleasing. [...] So to make an aesthetically pleasing artifact, there should be an emphasis on at least one factor (material, form, combination of elements and etc.) and a creative use of that in the design."*

A similar discussion should well be part of a course on aesthetics, but one can discuss the means of bringing it about. There were two advantages with Langert's exhibition; firstly his artistic aim was clear – to make lifelike animals out of everyday things – which was easy to assess; and secondly it was in a sense neutral ground. A possible variant is that students should choose and bring two artifacts, one "aesthetic" and one "non-aesthetic" to class for a kind of show-and-tell, but there is always the risk that students feel that they have to defend their chosen things. Then again that might be good.





Conclusively, the excursions were an appreciated element in the course, and they did bring some interconnectivity to it, especially the visit to Röhsska since it was so closely related to a lecture. As for which explicit things were learned in the excursions it's harder to say – I believe that their major contribution was to inspire (as the Museum of Sketches) or trigger thinking processes (like the discussion based on the sculptures in *My Animal Park*), i.e. to implicitly contribute to the learning outcomes of the course.

## ORAL PRESENTATION

The course ended with an oral presentation, both as a nice conclusion, and as a last learning experience where students could share their experiences. The task for the presentation was simply to describe a design process they had learnt the most from, which pitfalls they had run into and how they had solved them. The student's stories were interesting and inspiring – some thought-provoking, some fun. E.g. one student spoke about his problems with designing sad interaction in Expressions of Interaction, and how he got a *fantastic* idea a three o' clock in the morning: *"I was going to burn and mutilate a teddy bear!"*.

## PORTFOLIO

In Aol1, portfolios were used as assessment. They should contain the following parts, which were to be assessed:

- Improved and extended versions of three class exercises. The extensions were typically to enlarge the concept, e.g. create a series of informative artworks.
- Two of the three portfolio exercises.
- An essay: *"My view on aesthetics of interaction"*.
- The portfolio itself, i.e. putting together and presenting the other parts.

As for the three improved and extended versions students had different takes on this. Some saved time by improving (or rather not improving) and

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*Previous page:* When we discussed Langert's designs, Magnus liked the crocodile with the snow chains best because it looked "hard, edgy and dangerous", like the conceptual idea of a crocodile. Erik, on the other hand, preferred the one without chains because it was more life-like.

extending their most successful designs, others saw this as a chance to redeem themselves and therefore improved their worst designs, others just picked what they thought was the most interesting – and some of course applied all three approaches, one per exercise. From a grading perspective, the extensions increased grading time, and it is unclear to me how much these extensions actually improved learning, in several cases it felt more like tedious repetition, rather than taking the exercise further, which was the intention.

Letting the students design a portfolio according to their own aesthetic beliefs was a mixed pleasure – mostly because some were easy to use (having some kind of usability/functionalist ideal) whereas others were harder to use. One student had made a truly beautiful portfolio. It was shaped as a book, and one had to turn each page to get on. The experience of using it was very calming and book-like. She also got a very high grade for it. However, from a grading perspective, it was quite hard to use! There was no way to jump to certain pages, and no table of contents with quick links, so there was an endless flipping back and forth... Other portfolios – well designed in other aspects – proposed similar problems, especially one aiming at playful interaction which therefore was very non-effective. Here, one must of course ask oneself what is the most important; to facilitate grading or to let students express themselves. Then again one can let students express themselves in some other way and put some design demands on the portfolio, letting the design of it become an exercise in combining usability with own style.

The students themselves were quite satisfied with this examination form, giving comment like the following:

*"Very good. Good to improve exercises from earlier parts of the course."*

*"Good form to have the whole package"*

*"Too much work, couldn't [...] concentrate on the quality of it."*

## DEALING WITH CONFUSION

In the first version of the course, when the content was presented in relation to history, the students were confused; they felt as if I had dropped them in the woods without a compass. It was not clear to them how they



could find, or choose, their own aesthetic ideal. This made them very frustrated.

My solution to this was to give them a list of “all” the ideals we had covered during the first here lectures, and then asked them to choose three or less, and write them on Post-Its (see page 14) which we then placed and arranged on a whiteboard. This gave us a very sprawling definition that nevertheless served well as a starting point for discussion and reflection;

*Aesthetics of interaction is a matter of (creating?) a positive individual experience of an artifact which is a Gesamtkunstwerk characterized by usability, rhythm, richness and freedom of interaction.”*

Of course every student took this and skewed it according to their own beliefs, but it really helped them to have something to relate to.

## INTERMEDIATE: AESTHETIC IDEALS AS AIMS FOR DESIGN

The Aol1-students' frustration with the sprawling set of ideas on aesthetics bothered me, especially since I myself had a hard time sorting out all the different ideas presented by the interaction design community (see Related Work, pages 20-49). To some extent the students' frustration could be tracked back to my decision to spend only two lectures on these ideas, and to my own lack of a structured view, but nevertheless there was a need for a comprehensible framework.

Arguably, there is (was) one prominent meta-paper on aesthetics of interaction, Udsen's and Jørgensen's *The Aesthetic Turn* (2005), which was part of the literature for the Aol1-students. Here, the authors discern and describe four approaches as follows:

*The four approaches are: the cultural approach featured by endeavours from the humanities providing new cultural perspectives on digital interfaces; the functionalist approach viewing aesthetic qualities as an enhancement of interface usability; the experience-based approach featured by new ways of creating experiences through emotional friction, engagement and seduction; the techno-futurist ap-*

*proach featured by philosophy-based perspectives, rooted in the design of user experience in ubiquitous computing environments.*

– L-E Udsen and A H Jørgensen in “The aesthetic turn.

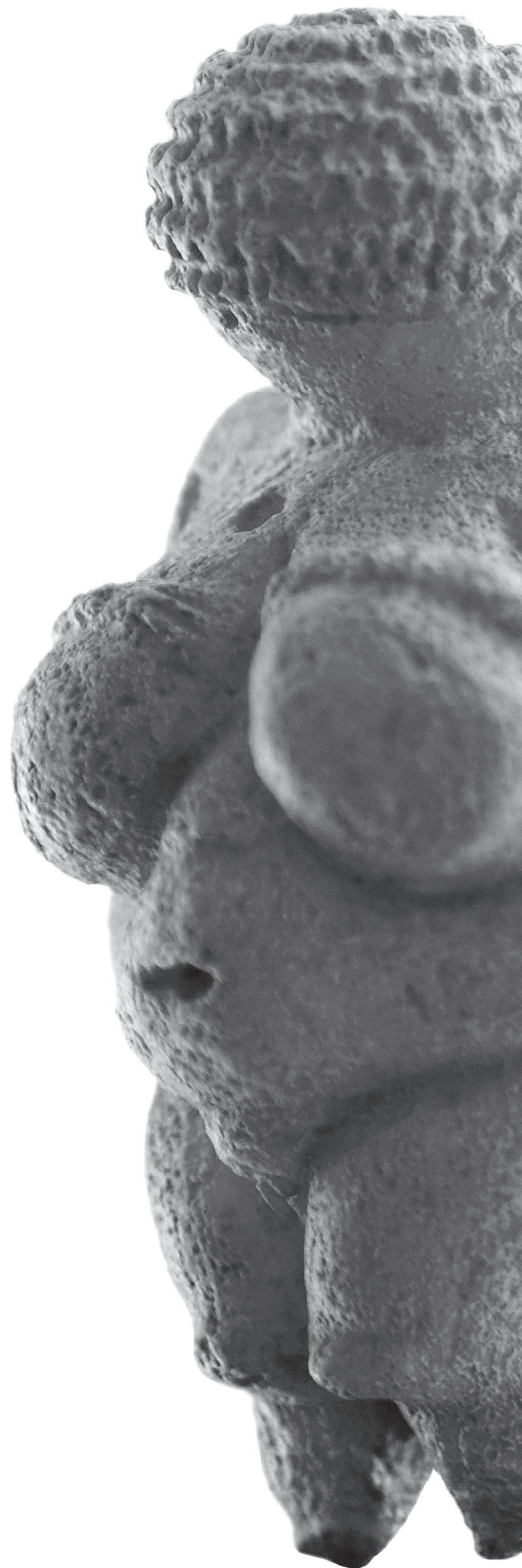
*Unraveling recent aesthetic approaches to human-computer interaction” (2005 pp.206-207)*

All of these approaches are inspired by, or grounded upon aesthetic ideals from other disciplines. The *cultural approach* explicitly borrows aesthetic ideals from art and culture, i.e. not from interaction design. Among the examples we find for instance Brenda Laurel’s *Computers as Theatre* (1991), Janet Murrays’ *Hamlet on the Holodeck* (1997) and Lev Manovich’s *The Language of New Media* (2002). In all of these cases aesthetics, notions ideas and terms are borrowed from theatre, movie-making, literature history and other disciplines and transferred into interaction design or something similar. As for the *functionalist approach*, based on traditional HCI and usability, these notions (as presented by Norman (1998, 2003), Cooper (2007), Preece (1994), Jordan (2000) and many others, essentially build on aesthetic ideas and ideals already present in industrial design (cf. Krippendorff 2006, Monö 1997, Vihma 2003), e.g. ideas on “*form follows function*”, consistency, transparency, semantics etc. The *techno-futurist approach*, in turn, has its roots firmly placed in philosophy, again a subject different from, and applied onto interaction design. This leaves us with the *experience-based approach*, which is “*featured by new ways of creating experiences through emotional friction, engagement and seduction*” (Udsen & Jørgensen 2005, p. X ). Here, the authors give examples of the work of Dunne (1999), Gaver et al (2003), Löwgren (2002) and others. However Gaver et al (2003) discuss ambiguity as a design virtue and build on examples from art and industrial design, whereas Dunne’s (1999) designs are a critical comment on technology, an approach featured for instance in a lot of science fiction literature, e.g. Shelley’s *Frankenstein* from 1818. Löwgren (2002) lists use qualities, of which some are aesthetic ideals in themselves, e.g. efficiency and functional minimalism, ideals stemming from industrial design (Vihma 2003, Woodham 1997).

Unfortunately this taxonomy did not really help the Aol1-students to get an overview, or to formulate their own beliefs. It was not natural to them to say “Yes, I agree with the aesthetics rooted in art and culture” or something similar, partly due to a lack of extensive knowledge in disciplines like philosophy, industrial design, drama or whatever.

Whilst pondering over this problem, I was writing a paper on aesthetics in gameplay (Lundgren et al 2009) together with my colleagues Staffan

Björk and Karl Bergström. Here, we discussed games that were different in that the user got very different experiences from them. After a lot of discussion back and forth, suggesting to name these different categories of games things like “styles” and “movements” (as in artistic styles and art movements) we settled for aesthetic ideals. Much of this inspiration came from Eco’s (2005) “On Beauty”, where large sets of comparative pictures are presented, showing how ideals of beauty have changed over time. E.g. the panel “Naked Venus” contains images of the 25 000 - 20 000 year old sculpture Venus von Willendorf, a fertility-oriented sculpture of a fat woman with enormous breasts and butt; more normally shaped women with rather small breasts by e.g. Tizian in the 16th century; and lastly a semi-porn image from the Pirelli calendar. Similarly, “Naked Adonis” starts out with Greek sculptures of naked athletes; via paintings of less muscular men, ending with a stained and sweaty and very muscular Arnold Schwarzenegger in Terminator. All of these images represent **aesthetic ideals**, not only in how the persons look, i.e. what was considered to be a beautiful woman or attractive man, but also the means of depicting them differ in the panels; carefully set and lit indoor scenes in the paintings from the 15th to 18th century, often with symbolic placements of artifacts, all painted with great detail, in comparison with the less life-like, more abstract depictions from the late 19th and early 20th century (e.g. Gauguin,



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*To the right: Venus von Willendorf.*

Photo by Matthias Kabel

Picasso, Matisse) and today's photographs. Not only has the means of depiction changed, so has also the aim; from telling a story to attempting to find new ways for art – sometimes provoking – to evoke awe, or something else.

I argue that within interaction design too, we can discuss aesthetic ideals, similar to how we discuss beauty ideals in art. In both cases the designer or artist sees the ideal as an aim, something to strive for. This means that when looking at the current writings (i.e. proposed ideals) on interaction aesthetics we can group them according to what the designers aim to achieve, rather than which other discipline the theoretical reasoning is based upon, as in Udsen's and Jørgensen's framework (2005). This also means that one, in prolongation, could apply relevant design methods or approaches from other disciplines onto interaction design in order to attain a certain ideal. Overall, this view can help in highlighting possible goals to design for; rather than setting the starting point first, one starts by defining the destination, the vision.

Furthermore, it is interesting to see how some of the most prominent ideals in interaction design can be found in other disciplines too, and in other times; it seems that some ideals are more viable than others. This of course also means that there are possibly already design methods or guidelines related to the ideal, which can be adapted to interaction design.

Below, six such prominent and quite exhaustive ideals are described in detail, including examples from other disciplines. This is of course my own subdivision, naturally not perfect, but created to help in the teaching of aesthetics by linking the current interaction design examples to a few historical examples and/or examples from other disciplines, showing that aesthetics is an overarching subject. The basis for my selection of examples is firstly that they help explaining the ideals, putting them in context, and secondly that I personally find them interesting for some reason, however there are plenty of other examples out there, just as good, or even better.

## COHERENCY

*Coherency – in its widest sense – is to strive for harmony and unity in design using some kind of underlying rationale for design – be it based on mathematics, adaptation to functionality, personality or something else.*

In interaction design, the strongest advocates for coherency per se are Hallnäs and Redström who have explored the notion of aesthetics of interaction for several years, in several projects. In 2002, they proposed that aesthetics is a matter of an “inner logic” as follows:

*It is a basic axiom here that it is through the force of its inner logic, its consistent appearance, that a thing receives depth in its expression and thus its strength to act as a placeholder for meaning.*

*– Lars Hallnäs and Johan Redström in "From Use to Presence: on the Expressions and Aesthetics of Everyday Computational Things" (2002b, pp. 115-116 )*

To some extent, we could see this as an argument for coherency, a coherency so deeply inscribed in the artifact that it becomes inherent. In HCI, the notion of coherency/consistency is discussed as being a basis for a functional system (cf. Beyer & Holzblatt), as are related discussions on how systems must adapt to their users' mental models (cf. Norman 1998; Cooper et al 2007; Preece et al 1994). Long time usability guru Jakob Nielsen too, lists coherency as one of the more important usability heuristics (Nielsen 1994). Similarly, Bruce “Tog” Tognazzini, partner of Nielsen-Norman Group, lists coherency as one of the first principles of interaction design<sup>1</sup> pointing out that a software design should be consistent in how it acts down from the smallest detail up to consistency in between products from the same manufacturer.

Coherency can also be seen as a means to attain gestalt, a notion often used in industrial design. According to Monö (1997) the gestalt is “an arrangement of parts which appears and functions as a whole that is more than the sum of its parts.” (Monö 1997, p. 33). And – “...the aesthetics of design can be seen as the effect of product gestalt on human sensations” (Monö 1997, p. 27). Similarly, Krippendorff (2006) describes semantics in industrial design as designing products to make users attribute certain meanings to them. Semantics can be used to describe purpose, express functions, exhort reactions or to identify the origins or nature of a product (Monö 1997 pp. 81-112).

Overall, coherency is one of the most wide-spread ideals, reappearing in almost any design discipline. In fact it is so widely spread, that it can be seen as an overarching ideal. At the same time it has a weakness: it cannot stand for itself. Coherent according to what? A duck? The intended function? An underlying story? Coherency must be combined with some other ideal or notion, which will become the objective of the coherency. That could be anything; usability, playfulness, yellow – or functionalism, as the case often is in industrial design and interaction design. Still, the versatility of this ideal – that it can be combined with many others, gives it a unique position. It is an aesthetic ideal overarching all others, being a prerequisite, the basis that any other ideal must build upon.

## Coherency by Numbers

In ancient Greek the dominating view was that beauty was equal with harmony and symmetry, with mathematics as the underlying logic. This view was for instance advocated by Plato (cf. “Timaeus” where Plato describes how the Soul is created via a complex calculation: “*In this manner there were formed intervals of thirds, 3:2, of fourths, 4:3, and of ninths, 9:8...*”). In Europe, the Greek view on proportion on symmetry lasted on through the Middle Ages, cf. Eco (2005, ch III).

Although outdated in the 17th to 19th century, the idea of basing beauty on numbers has reappeared again and again. With the rise of mass production and mechanization, a need for simpler shapes with more exact measurements arose, which highly influenced modernism in industrial design, in turn influencing and being influenced by abstract art like cubism and futurism. One striking example of this is the *de Stijl* movement, resulting not only in Mondrian’s and van Doesburg’s strict paintings, but also in architecture and furniture, e.g. Rietveld’s red-blue chair (Vihma 2005 pp. 87-102). In general, the *de Stijl*-members used only five colors; black, white, red, blue and yellow, and they preferred straight lines and straight angles, at least in paintings.

Another example is the designer Le Corbusier who in 1948, in the tradition of DaVinci and others created *Modulor*, a system based on standard human measurements, the golden unit and Fibonacci numbers. Overall, Le Corbusier was very interested in reducing forms down to basic forms, like the cube, pyramid, cone and sphere. (Vihma 2005, pp. 110-111). The same obsession with mathematics and numbers could also be found at the industrial design school in Ulm in the 1950s and 60s: discussions about form could be turned into a functionalist discussion by linking form



to mathematical justifications (Krippendorff 2006, pp. 297-302) Here, the focus on mathematics and consequently absence of symbols and ornaments partly had its root in anti-fascism and an absolute faith in rationality (Lindinger 1991, pp. 76-79).

*It is certainly true that at Ulm there was a fixation on geometry as a visual language. The emphasis on rationality favored mathematical thinking in design. [...] By excluding from our teaching, from the very beginning, not only art, but taste and fashion, we freed ourselves to some extent from the emotive and irrational characteristics of these fields of activity."*

– Herbert Lindinger in "Ulm Design: The Morality of Objects" (1991 pp. 78 and 79)

## Coherency by Narrative

Another basis for coherency can be an underlying narrative. Already in 1435 this was suggested by Leon Battista Alberti in his book *Della Pittura* (On Painting). Interestingly, much of the book deals with techniques, e.g. Alberti was the first to describe the linear perspective. Despite this, perspective and perfect proportions was not everything for Alberti; he also demanded that the composition of a painting should have an "*istoria*", i.e. a story, i.e. say something. To Alberti (1435), every single object within a painting should serve to tell this *istoria*: "...whatever the painted persons do among themselves or with the beholder, all is pointed toward ornamenting or teaching the *istoria*" (Alberti 1435, Book Two). Note how this coincides with industrial designer Rune Monö's definition of *gestalt*; "*an arrangement of parts which appears and functions as a whole that is more than the sum of its parts.*" (Monö 1997, p. 33)!

Sure enough, underlying narratives serve as a basis for design of lots of everyday things, e.g. much music is inspired by the narrative of the lyrics, Similarly, many games have a narrative structure (cf. Björk & Holopainen 2005, pp. 216-219) that help explaining their rules (so-called "designing by theme" cf. Lundgren 2006, pp 83-84); the same goes for many computer games too.

In interaction design, narratives have been used by Dunne and Raby, e.g. in the project *Technological Dreams* where the designers envision a future populated with robots that are needy, nervous or independent<sup>2</sup>. A common take is just this, to apply or somehow use personalities as a basis for design. Already in 1997, Janlert and Stolterman suggested that com-

plex things and systems would perhaps be easier to understand if they were given a certain character.

*"In ascribing a certain character to an artifact we make a very simple, but powerful description that frequently will be accurate enough to help us to manage the task of handling the artifact and to appreciate the consequences of our interaction with it."*

– Lars-Erik Janlert and Erik Stolterman in  
*"The Character of Things"* (1997, p. 300)

Similar conclusions have been drawn by Reeves and Nass (2002), proposing that we respond to mediated personas just as we do to real people. They have carried out experiments showing that if a computer program is given submissive or dominant traits people are more or less likely to like it depending on their own personality – and if the computer program changes its personality on the fly to fit that of the user they like it even more (Reeves and Nass 2002, pp. 89-99)! Norman (2003, pp. 56-60) too, discusses the personality of products, exemplifying with a video game device that in one version is *"a fast powerful tool for exciting visceral experiences"* (p. 56), in another version an informative assistant, in a third calm and authoritative.

## The Digital *Gesamtkunstwerk*

The idea of a permeating consistency in a interdisciplinary design environment is very similar to the notion of the *Gesamtkunstwerk*. The word means "total artwork" or "integrated artwork" and the idea is not new; it surfaced in the 19th century and has been fascinating artists ever since. The idea is to make every aspect of an object – the form, the details etc. – to accord, creating a conjoined whole. (Vihma 2003 p. 59). The idea was picked up and favored by the influential Bauhaus design school in the 1920ies, where students in their last year should bring their crafts to a building site (Wick 2000). One example is the Sommerfeld house in Berlin, built in 1920-21. Here, two of the teachers contributed with the architectural design, whereas the most talented students and some teachers supplied the interiors, e.g. wood carvings, a glass stained window, chairs, curtains etc. They were all related in design by an Expressionist zigzag style combined with the elementary forms of the circle, square and triangle. (Droste 2006 p 44-49). Other examples, this time designed by only one person, are Victor Horta's creation Haus Tassel in Brussels, built in 1893 (Vihma pp. 60) or Peter Behren's house in the jugend-colony Matildenhöhe



in Darmstadt, built in 1901. The latter is especially interesting, since Behrens later moved on to AEG, creating the world's first detailed corporate design designing everything from a typeface to buildings, all within one distinct design programme (Vihma p. 81-86).

In all of the examples above, the designers, artists or architects have this one aesthetic ideal in common; coherency down to the smallest detail, still taking outer constraints into account. There are examples in abundance, for instance Manovich (2006) referring to the LG Chocolate phone as being a *Gesamtkunstwerk*. Again, the consistency must be based on something; in Behren's and Horta's houses the jugend ideals are carried out, in the Sommerfeld house it's instead the expressionist ideals. In the LG Chocolate it is – according to Manovich – to unfold an interactive narrative. In many of Hallnäs and Redström's designs the ideal is to explore a notion e.g. looking at expressions explicitly (Hallnäs and Redström 2002b) or designing for reflection (Hallnäs and Redström 2001).

Again, regardless of main discipline all of the examples are interdisciplinary – as is any interactive design, combining coding with various ways of expressing code (GUIs, artifacts, sounds, graphics). Consequently every interactive design should strive to be a *Gesamtkunstwerk*.

## EFFICIENCY\*

*Efficiency is to adapt something perfectly to the task it should fulfill, so that this task can be carried out quickly and smoothly without any fuss or further ado.*

In Human Computer Interaction and interaction design most products are very complex in that they provide a very large number of functions (compare for instance the functions provided by Microsoft Word with those provided by a typewriter) and this inevitably means that an important part of the “functionality” is not the functionality per se, but the understanding of it – ease of use. Or, as put by Cooper, Reimann and Cronin (2007): “Don't

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\* (Note that I, by naming this ideal Efficiency have refrained from the more common terms functionalism and usability, although these are often, but not always, closely coupled to efficiency. E.g. a game has the function of enjoying and entertaining the user, so it can in that sense be very functional and usable, but it is hardly ever efficient; playing games is about deliberately spending time.)

*make the user feel stupid. This is probably the most important interaction design guideline.*" (p. 97). This is not very surprising since most commercial interactive products are designed – have to be designed – with efficiency and as a result usability as one of its primary objectives, if not the primary objective. Thus this aesthetic ideal is very strong in the interaction design community, and it is being advocated by many, e.g. Jakob Nielsen (2000) who has been writing about web usability in his Alertbox columns since 1995<sup>3</sup>. Other examples include most books on interface design, e.g. Preece et al (1994), Raskin (2000) and Cooper, Reimann and Cronin (2007), and the early writings of Donald Norman (1998).

Another aspect of interaction design, information visualization, combines functionalism with the visually pleasing and effective. The aim is to take abstract information and visualize it in a way more suitable for the human brain and eye, making it possible to – literally – overlook vast amounts of information. In this it very much based on human cognition and perception (Spence 2000). Interestingly one of the gurus in the area, Edward R. Tufte (e.g. 1990, 1997, 2006) sees beauty in functionalism, even naming his latest book *Beautiful Evidence* (2006). Similarly, Lev Manovich (the author of *The Language of New Media*, 2002) proposes infoaesthetics, discussing it on a dedicated website<sup>4</sup>. *"In the beginning of the 20th century modernist artists created new forms, new aesthetics, new representational techniques, and new symbols of industrial society. We need to do the same for INFORMATION society."* he writes.

## Efficiency in Other Disciplines

Like coherency the notion of efficiency is by no means new; obviously craftsmen of all times have designed everyday objects to be efficient. This is just common sense, a common sense expressed for instance in the 13th century the very influential philosopher and theologian Thomas of Aquino. He defined beauty as something being proportional, complete and clear in color(s). With proportional he meant that the material should be adapted to the form and, as an overarching principle, that all should be adapted to its purpose (Eco ch. III, part 6, p. 88).

Functionalism as an ideal surfaced in architecture and industrial design in the 19th century. *"Beauty is the promise of function"* claimed sculptor Horatio Greenough (Vihma 2003, p. 38). Cabinet makers and industrial designers started to design multi-purpose items, e.g. apple peelers that could also be used to pit the apple, or a sofa that could be turned into a bed. Slowly there was a shift from using decorative ornaments in general

to using ornaments that called attention to the construction (Vihma 2003). One of the voices behind this shift was architect Louis Sullivan who in 1896 made his famous statement:

*"It is the pervading law of all things organic and inorganic, of all things physical and metaphysical, of all things human and all things superhuman, of all true manifestations of the head, of the heart, of the soul, that the life is recognizable in its expression, that form ever follows function. This is the law."*

– Louis H. Sullivan in *"The tall office building artistically considered"* (1986)

Although slightly misquoted as *"form follows function"* this statement, or ideal if you wish, came to permeate much of the early 20th century design and architecture (Vihma 2003, pp 38-41). In the 1920ies functionalism shifted into modernism. The purpose was still to focus on use and functions, and design accordingly, but the form language was different, basic forms and shapes (spheres, cubes, cylinders cones and pyramids, and circles, squares and triangles respectively) should be the basis of form. Or, as expressed by Mies van der Rohe, rector at design school Bauhaus: *"Less is more."*

In Ulm – one of the most influential industrial design schools, descending Bauhaus – the first rector, Max Bill refined the vocabulary of functionalism in the 1950ies. Since Ulm as a design school and design role model highly has influenced industrial design today, the views taught at Ulm got a high impact. Former Ulm-student Klaus Krippendorff (2006) describes the functionalist view taught by Bill and his professors. Like at the Bauhaus, and in most contemporary design circles the motto was the Sullivan (mis) quote *"Form Follows Function"*. To Bill this function had four parameters:

- The *technical function*; to satisfy a purpose, e.g. a chair must be "sitabile"
- *Materialgerechtigkeit*, the *material function*; to "make use of materials in ways most fitting to their nature" (Krippendorff 2006, p. 299).
- The *production function*: to have forms suited for mass-production. This was a much more extreme take than that of the Bauhaus, where the ideal just was that a design should be massproducible. At Ulm the focus was truly on adapting products to simplify mass production processes. One example of this is breaking down larger

complexities into smaller units (Lindinger 1991, e.g. p. 85). IKEA serves as a good example of this.

- The *aesthetic function*: Everything else. This function, albeit as a negative definition, allowed for design decisions outside the boundaries of the other three, and could be “used” to carry aesthetic ideals, in the Ulm case “...such virtues as consistency, simplicity, symmetry, clarity, cleanliness, and honesty, none of which were captured by the other three.” (Krippendorff 2006, p. 300)

Note how Bill’s definition of aesthetics is in a sense negative; if something is not related to the technical, material or production function, then it is related to aesthetics.

## CRITICISM

*Here the main aim is to draw attention to, or comment upon something special – often an aspect of society. The designer wants to evoke thought and reflection, or perhaps insight. In order to achieve this, critical designs are often provocative.*

In interaction design, criticism and provocation can be found in the works of for instance Anthony Dunne who in *Hertzian Tales* (1999) critically comments on the way we design, use and relate to (or rather not relate to) everyday electronic objects (see p. 22 for examples). In this he discusses provocation as a means for design:

*“If user-friendliness characterises the relationship between the people and the optimal electronic object, then user-unfriendliness, a form of gentle provocation, could characterise the post-optimal object. The emphasis shifts from optimizing the fit between people and electronic objects through transparent communication to providing aesthetic experiences through the electronic objects themselves.”*

– Anthony Dunne in “*Hertzian Tales, Electronic Products, Aesthetic Experience and Critical Design*” (1999, p. 38)

One of Dunne and Raby’s more recent projects is *Do you want to replace the existing normal?*<sup>5</sup> designing for subtle needs. One of the designs, S.O.C.D. is a device for people enjoying pornography but feeling guilty about it. It is a combination of a screen, a black box, partly containing a DVD-player, and a dildo-like rubber object/tube for the user to hold. The

latter measures the user's arousal when watching porn on the screen. The more arousal, the more pixelated the image. Dunne and Raby define their work as Critical design, stating that:

*"Critical Design uses speculative design proposals to challenge narrow assumptions, preconceptions and givens about the role products play in everyday life. It is more of an attitude than anything else, a position rather than a method."*

– Anthony Dunne and Fiona Raby in "Critical Design FAQ" (2007)

Similarly, Gaver, Beaver and Benford's (2003) propose the use of ambiguity as a resource for design, hereby changing users relation to or views upon an artifact.

*"Thus ambiguity is a powerful tool for designers to raise topics or ask questions while renouncing the possibility of dictating their answers. By supporting this balance, ambiguity not only represents a useful resource, but a powerful sign of respect for users as well."*

– Bill Gaver et al "Ambiguity as a Resource for Design" (2003, p. 8)

Other examples are the related notions *Calm Technology* and *Slow Technology*. *Calm Technology* was proposed by Mark Weiser and John Seely Brown (1996). It was a comment on the emerging era of ubiquitous computing and critical in the sense that it commented on this invasion of computers in our everyday lives.

*"The most potentially interesting, challenging, and profound change implied by the ubiquitous computing era is a focus on calm. If computers are everywhere they better stay out of the way, and that means designing them so that the people being shared by the computers remain serene and in control."*

– Mark Weiser and John Seely Brown in "The Coming Age of Calm Technology" (1996, p. 7)

Slow Technology is Hallnäs and Redström's (2001, 2006) proposed design programme which questions efficiency; instead artifacts are deliberately designed to be slow in the sense that they encourage reflection.

*"Slow technology is not about making technology invisible, but about exposing technology in a way that encourages people to reflect and*

*think about it. This design challenge is, among other things, a call for more conscious aesthetics in technology..."*

*– Lars Hallnäs and Johan Redström in*

*"Slow Technology – Designing for Reflection" (2001, p. 204)*

Whereas all of the above mentioned designs are non-efficient, the STATIC! project (Ernevi et al 2005, Backlund et al 2006, Ernevi et al 2007) serves as a counter example; here the aim is to highlight (sic!) the use of energy in our everyday lives in a sometimes provocative way. One of the STATIC!-designs is for example the *Erratic Radio*, a radio sensitive to electromagnetic fields nearby; if too other electric appliances are used nearby it tends to tune out, more and more for each active appliance. As a consequence it can only be listened to when one is currently saving energy by not using one's microwave oven, computer or whatever. When testing the *Erratic Radio* (Routarinne and Redström 2007) it provoked alternative practices – e.g. moving the radio from the kitchen and all its appliances elsewhere – and alternative interpretations. However users were a bit too frustrated with it: *"Sometimes we had nothing on but we only got the buzz... I mean, should we go and call the neighbours and tell them to shutdown their appliances?...I don't know, but how many people just listen to the radio? Should I sit in the dark and listen to the radio?"* (Routarinne and Redström 2007, p. 7). Another STATIC!-design is the *Flower Lamp* (designed by Front Design and the Interactive Institute). It works as a display for energy consumption; when it is low the flower lamp "blossoms"; opens up and sheds light, but if the energy consumption increases again, its petals close.



## Criticism in Other Disciplines

In the early 20th century there were a number of different avant-garde movements; dadaists, surrealists, futurists all having that in common that they reacted against both the growing popular culture and the bourgeois, conservative, views on art. Instead they wanted to show new visions or versions of the world, question, and point out new things. (Eco 2005, XVII.2).

*"The beauty of provocation is the idea of beauty that emerged from the various avant-garde movements and from artistic experimentalism..."*

–Umberto Eco in "On Beauty" (2005, ch. XVII, part 2)

This meant that they were not very interested in what was normally regarded as beauty, i.e. the visual appearance; to them other aspects were more interesting. The Dadaists for example were strongly against rationality and logic and pro impulsiveness and spontaneity.

*"What we need are strong straightforward, precise works which will be forever misunderstood. Logic is a complication. Logic is always false. [...] DADA; every object, all objects, feelings and obscurities, every apparition and the precise shock of parallel lines [...] DADA; the absolute and indisputable belief in every god that is an immediate product of spontaneity..."*

– Tristan Tzara in "Dada manifesto" (1918)

One of the Dadaists was Marcel Duchamp who is famous for exhibiting everyday objects as art, especially a urinal (Fountain, 1917) and a bottle rack (1914). In this he criticized current notions of art and beauty, highlighting an object's interrelation with function. Of course Duchamp provoked many (actually the urinal was not displayed at the exhibition) but by exhibiting these everyday objects he also raised questions like: *Is this art? If so, what turned it into art? What is art? Who decides?* And, more importantly *Who is the artist?* (Eco 2005, pp. 377, 406). Duchamp was followed by others, e.g. Andy Warhol who turned pictures of Campbell's soup cans into art stating that *"a group of painters have come to the common conclusion that the most banal and even vulgar trappings of modern civilization can, when transposed to canvas, become Art."* (Bourdon p. 110).

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**To the left:** *The Erratic Radio and the Flower Lamp.*

Erratic Radio photo by Sara Routarinne, Flower Lamp photograph courtesy of the Interactive Insitute



Some seventy years later the Italian Memphis group stirred up the contemporary view on furniture. The group experimented with human relations and emotions in relation to products, and they deliberately broke against all convention by mixing materials, colors, patterns and forms in ways that many thought repulsing and others deeply inspiring (Glancey 2001; Woodham, p. 196-197; Vihma 176-179). Furniture designer Jasper Morrison recalls his impressions from their first exhibition: *"It was the weirdest feeling: you were in one sense repulsed by the objects, or I was, but also immediately freed by the sort of total rule-breaking."* (Zanko 1999).

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**Below:** A typical Memphis design, a bookshelf by Ettore Sottsass (1981).

Photo by Sailko



Another art-form with a strong tradition of provocation and criticism is performance art. *“Performance has been a way of appealing directly to a large public, as well as shocking audiences into reassessing their own notions of art and its relation to culture.”* (Goldberg 1988, p.8). Performances can take different forms, e.g. as happenings, live exhibitions or different manipulating the body (Goldberg 1988). An example of the latter, closely related to computer science, robotics and interaction design is the performance artist Stelarc. Under the motto *“The Body is Obsolete”* he comments on the relationship between the human body, mind and technology. On his website<sup>6</sup> he writes: *“We fear the involuntary and we are becoming increasingly automated and extended. But we fear what we have always been and what we have already become – Zombies and Cyborgs.”* As a means of commenting on this, he often performs with robotics, e.g. an artificial hand<sup>7</sup>, and he has also allowed his body to be remotely controlled via the internet. Another link between performance art and new technology are flash mobs which are basically happenings arranged via communication channels like email or other social media (Nicholson 2005).

## SENSING

*Here, the aim is to rich physical interaction, often coupled to a mental experience. Thus “sensing” has triple meanings; sensing as in feeling, experiencing, but also as in making sense of.*

In most other design disciplines, the designed objects are per definition physical (houses, furniture, pencils, cog wheels) etc. Thus, in these disciplines the physical dimensions and the physical handling of the artifacts are inherent. This is not the case in interaction design where many designed objects are non-physical – e.g. everything on a screen – and these often are handled via a slightly awkward input tool, e.g. using a mouse to move objects on a screen – there is no clear physical connection between them.

## Pragmatism and Somaesthetics as Philosophical Movements

As a consequence, most interaction designers advocating a more physical, tangible, palpable or pragmatic (there are terms in abundance) approach to interaction design, have turned to philosophy for inspiration. E.g. pragmatism is a major movement in American philosophy, concerned with how

meaning and truth are related to practical consequences or effects of actions or courses of events. Thus theory and practice cannot be separated. One of the most influential pragmatists – and the only one concerned with aesthetic issues – was John Dewey<sup>8</sup> (Shusterman 1992). In “Art as Experience” from 1934 Dewey discusses what he calls *aesthetic experiences*. By this he means experiences that are significant in a special way: “An experience has a unity that gives it its name, that meal, that storm, that rupture of friendship.” (Dewey 2005, p. 38). Such experiences are characterized by a couple of things; they have distinct starts and ends, and they are pleasing in some way.

*“In such experiences, every successive part flows freely, without seam and without unfilled blanks, into what ensues. At the same time there is no sacrifice of the self-identity of the parts. [...] In an experience, flow is from something to something. As one part leads into another and as one part carries on what went on before, each gains distinctness in itself. The enduring whole is diversified by successive phases that are emphases of its varied colors.”*

– John Dewey in “Art as Experience” (2005 pp.37-38)

Note that according to Dewey, the aesthetic experience could be entirely mental, e.g. working the solution of a tricky problem:

*“...we have an experience when the material experienced runs its course to fulfillment. [...] A piece of work is finished in a way that is satisfactory; a problem receives its solution; a game is played through; a situation, whether that of eating a meal, playing a game of chess, carrying out a conversation, writing a book or taking part in a political campaign, is so rounded out that its close is a consummation and not a cessation. Such an experience is a whole and carries with it its own individualizing quality and self-sufficiency. It is an experience”*

– John Dewey in “Art as Experience” (2005 pp.36-37)

A alternative view is Shusterman’s (2000) somaesthetics; combining Dewey’s pragmatic ideas with those from others Shusterman has created his own version of pragmatist aesthetics, among other things introducing the concept of somaesthetics (from soma = body), involving sensory knowledge. To Shusterman, somaesthetics is about involving the bodily experience in one’s appreciation of the aesthetic; what is sensed by the senses but also how the body moves and operates (Shusterman 2000, ch. 10).

*"Somaesthetics seems to cut across the whole range of aesthetics genres. This is because it treats the body not only as an object of aesthetic value and creation but also as a crucial sensory medium for enhancing our dealings with all other aesthetic objects and also with matters not standardly aesthetic."*

– Richard Shusterman in *"Pragmatist Aesthetics. Living Beauty. Rethinking Art."* (2000, p. 278)

## Sensing in Interaction Design

In interaction design, this idea of involving the bodily experience has been taken up by many of which some explicitly place themselves in a pragmatist aesthetics tradition, e.g. Fiore, Wright and Edwards (2005) take on the issue of designing for an experience one cannot have – in their case being blind – with various tools and techniques, aiming for designer empathy. Wright, Wallace and McCarthy (2008) in turn, base a framework for experience-centered design on Dewey's thoughts, taking sensual, emotional, spatio-temporal and narrative experience into account.

Building on pragmatist aesthetics and somaesthetics, Petersen, Iversen, Krogh and Ludvigsen (2004) state that the aesthetic experience is a new perspective on HCI (compare with e.g. the system perspective), and that this is about triggering imagination and play through improvised interaction, exemplifying with a few designs that involve extensive bodily interaction. Similarly, Schiphorst (2009) applies somaesthetics in her work soft(n); interactive textile sculptures who can communicate with each other as well as recognize different types of touch (e.g. tap, pat, hold, stroke, jab, knock, rub, knead etc.) responding with vibrations, sound and shared light patterns. Using textiles, the design is also very focused on choosing or designing textile textures and shapes. (See image on next page.)

Without placing himself in a pragmatist tradition, but rather starting out with Gibson's (1979) work on how we perceive the world and how affordances work, discussing tangibility, J.P.<sup>9</sup> Djajadiningrat together with various colleagues has explored the aesthetics of tangible systems in a series of papers (2000, 2003, 2004, 2007), e.g. advocating rich interaction; that interaction should be more complex than just pressing a button ten times, utilizing the human skill and potential in making very exact complex movement as well as freedom of interaction – allowing more than one way to achieve the same outcome (Djajadiningrat et al. 2004) as well as





the use of feedforward (as opposed to feedback) which is to communicate the purpose of the (physical) action. (Djajadningrat et al 2002). In addition one should utilize users' skills as well as their pride over these skills (Djajadiningrat et al 2007). Note that unlike Petersen et al (2004) Djajadiningrat's and his colleagues' work can easily be combined with efficiency. Accordingly Frens (2006) has designed a very tangible camera with plenty of feedforward. Along the same lines, Klemmer, Hartmann and Takayama (2006) present five "themes" for embodiment; *Thinking through doing*, exploring how body and mind co-produce action and learning; *Performance*, human agility and dexterity; *Visibility*, the role of physical artifacts in cooperation or collaboration; *Risk*, exploring trust, commitment, responsibility and attention and lastly; *Thick Practice*, exploring the design of interfaces that "are the real world" (p. 7). Dourish (2004) too, has explored embodied interaction, looking at how we encounter social and physical reality from different angles. E.g. Dourish distinguishes between real-world metaphors (e.g. the trashcan on the computer desktop) and real world objects.

## EMOTIONS

*Here, the aim is to evoke a certain emotion in the users. Typically, it's a positive emotion, e.g. pleasure, but emotions can also be used to create a rich experience which is not per definition pleasing, e.g. some designs deliberately want to scare or trouble users.*

In interaction design, Norman (2003) is discussing issues related to emotional design as follows:

*"In the 1980s, in writing "The Design of Everyday Things", I didn't take emotions into account. I addressed utility and usability, function and form, all in a logical, dispassionate way – ever though I am infuriated by poorly designed objects. But now I've changed. Why? In part because of new scientific advances in our understanding of the brain and how emotion and cognition are thoroughly intertwined. We scientists now understand how important emotion is to everyday life, how valuable. Sure, utility and usability are important, but without*

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**To the left:** Three of the soft(n) sculptures.

Photograph by Rui Gerra, courtesy of Thecla Schiphorst.

*fun and pleasure, joy and excitement, and yes, anxiety and anger, fear and rage, our lives would be incomplete. "*

*– Donald Norman in "Emotional design; Why We Love (or hate) Everyday Things " (2003, p. 8)*

Norman's (2003) key argument is how affections affect (sic!) our emotions and actions. He discusses three levels of design; the visceral, behavioral and reflective level. The *visceral* level consists of more or less autonomic responses to what is considered dangerous, nice, attractive etc, i.e. our reactions towards appearance. The *behavioral* level is related to use and experience how it feels how to use and how we feel using it, i.e. our reactions towards function, usability and performance. The *reflective* level in turn, is related to interpretation, understanding and reasoning. Unlike the other two levels, where affect is the emotional component, the reflective level is related to a wide range of emotions in combination with thought, and whereas the other two are immediate, the reflective level is related to long-term satisfaction (or dislike for that matter). All levels come into play when interacting with something, and hence all three must be addressed.

*"The result is that everything we do has both a cognitive and an affective component – cognitive to assign meaning, affective to assign value. You cannot escape affect: it is always there. More important, the affective state, whether positive or negative affect, changes how we think"*

*– D. Norman in "Emotional design; Why We Love (or hate) Everyday Things " (2003, p. 25)*

Similarly, Overbeeke, Djajadiningrat, Hummels and Vensveen (2002) state that *"Interfaces should be surprising, seductive, smart, rewarding, tempting, even moody, and thereby exhilarating to use."* (p. 10). In their view, aesthetics of interaction is a combination made out of the physical and virtual qualities of an artifact together with the resulting interaction (a Gesamtkunstwerk as I would put it). They also present a series of designs exemplifying this, e.g. two chairs that react to user activities by changing their appearance. Although their ideas are placed under *Emotions* in this taxonomy they are thus also closely related to *Sensing*.

A significant example of evoking emotions can be found in computer augmented toys. A couple of significant examples are Sony's robot dog AIBO, Hasbro's Furby (a small fuzzy toy), and ActiMates Barney, a purple dino-



saur. The latter is the oldest; it was developed by Microsoft in the late 1990ies. Barney had a clear educational purpose, interacting not only with the children but also with what was going on on a computer running Barney software, reacting on what the children do on the screen. During early stages of development it became evident that Barney's personality had to be altered; initially it was perceived as too bossy ("*Cover my eyes to play peek-a-boo!*") so its manner of conversation had to be altered adding friendly comments like "*I like playing with you*" (Strommen 1998).

In 1999 Sony released their robot dog, the AIBO, which unlike Barney and the furbies, could move around by itself. The first model was rather dog-like, and it evoked strong emotions in many owners; "I care about him as a pal" (Kahn et al 2002). In later versions, the AIBO has become more and more robot-like, not only in appearance but also in behavior, e.g. it plays music, record images, and even blogs! In addition it has to be trained by its user in order to develop mentally. Consequently, a series of studies (Kahn et al 2004; Melson et al 2005) show that children saw the AIBO as "more alive" than a plush dog, but "less alive" than a real dog, and that they were split on whether AIBO was more like a desktop computer or a live dog.

Another example of an animated artifact is the Iron Horse (Landin et al 2002, Lundgren 2006); a bike augmented with the sounds of a horse; not only does it make appropriate gait sounds (walk, trot, canter) but is also expresses behavior and personality in how and when it neighs and snorts etc. Just as with the Furbies, the AIBO etc, adding an animal character to an artifact resulted in an emotional response.

Other examples of emotions in interaction design are many computer games with underlying narratives where the narrative and the game world cooperate to create immersion (cf. Björk & Holopainen 2005, pp 205-208). Another goal for all game designers is to create a certain level of Tension (cf. Björk & Holopainen 219-222, Lundgren et al. 2009)

## Emotions in other Disciplines

During the Romanticism (late 18th to early or mid 19th century) the idea of the sublime was introduced as a new aesthetic ideal (Burke 1757 Part IV; Eco 2005, ch. XI) Sublimity is a mixed emotion; a quality of greatness or vast magnitude, evoking both pleasure and fear at the same time. According to the Romanticists art should not only express pleasing things, but also things that were threatening, scaring or mysterious; for instance nature was no longer portrayed as being sunny and green, instead as wild,

dark and/or untamed (e.g. storm, fog, dusk or dawn were among the popular motifs) ; neither was it portrayed exactly, but rather as an vision of how nature should be in its most sublime state. This fascination with the grand and intriguing also influenced music, Beethoven's Fifth being a prime example.

Inspired by Romanticism, the dark sides of life were depicted in art, e.g. illness, death, decay (Eco 2005, p. 330). The symbolists, for example, worked with a decadent, mystic undefined world with hidden revelations whereas the realists strived to depict people and environments exactly as they were; these artist left their studios and started painting real milieus, e.g. the pitmen coming home from work in the mine – their work was sometimes used as propaganda evoking emotions for lots of different causes.

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*Below: A typical Romanticist painting: Caspar David Friedrich's "Das Eismeer".*

*Note the wrecked ship to the right.*

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In industrial design, issues of emotion and pleasure have been discussed by for instance Krippendorff (2006), one of the originators of product semantics, a discipline defined as “*A systematic inquiry into how people attribute meanings to artifacts and interact with them accordingly.*” as well as the related vocabulary and methodology (Krippendorff and Butter 1989). According to Krippendorff “*Humans do not act on what and artifact physically is or displays but on how they sense it; what it means to them and what they wish to accomplish*” (Krippendorff 2006, p. 82). An example is how we attribute different meanings to the plate that is hung on the wall and the one we eat from, although they are in effect the same type of object. Jordan (2000), building on Tiger (1992, pp. 52-60) approaches the issue by defining and describing four different pleasures that a designed artifact could provide:

- *Physio-pleasure*: This pertains to the senses and the sensual, e.g. how something feels (not only when touching the surface but handling it as well, i.e. weight etc), smells (consider the scent of a new leather item for instance!), sounds (like the reassuring “thud” of a car’s door when being closed) etc.
- *Socio-pleasure*: This pertains to relationships. It could be either products that create or amplify relations, like an office’s coffee machine or Facebook, but it can also be things that express image, status or relationships with one’s peers; a brand new Corvette or a T-shirt with the logo of your favorite rock band.
- *Psycho-pleasure*: This pertains to mental issues; the pleasures of solving problems or tasks, being stimulated, being calmed down, being immersed etc. Most games are based on psycho-pleasures.
- *Ideo-pleasure*: This pertains to a person’s ideological values. According to Jordan, an example is the aesthetics of a product (as I understand him, aesthetics however only in the sense “does it go with the couch”), or the values it expresses, e.g. that a product is ecological or sustainable. (Jordan 2000, ch. 2).

Note that just like an object can be active on all three of Norman’s levels (visceral, behavioral, reflective), the same object can provide different kinds of pleasures, e.g. a wedding ring could evoke both physio-pleasure (the sudden slight extra weight on your finger, how it feels to play with), socio pleasure (in that it signals to the world that you belong to a family and have the status of being married) and lastly, its design may – from Jordan’s point of view – also be an aesthetic issue and thus an ideo-pleasure. A person’s special characteristics when it comes to the four pleasures should



be taken into account when designing according to Jordan. These characteristics are a mix between needs (e.g. to be socially accepted), preferences, abilities (e.g. being or not being physically disadvantaged, having a high or low cognitive ability), the person's issues and concerns as well as the context the person lives and works in, etc. (Jordan 2000, ch. 4).

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*Below: A user may find several pleasures in her favorite rock band T-shirt, e.g. physio pleasure in that it is comfortable, social pleasure in that it establishes a relationship to other fans and possibly even ideo pleasure if the group has a political message.*

Photo by The Studio



# PLAYFULNESS

*Here the aim is to invite to play, or to intrigue the user with a somehow clever, or challenging design.*

In interaction design, the notion of playfulness as aesthetic ideal has been stated by Petersen et al (2004). Building on pragmatism and somaesthetics, as described on p. X. they propose a new perspective on human-computer-interaction, namely that of “Aesthetic Experience” where the user is seen as an improvisator, the interaction is carried out as a form of play, and the interaction ideal is intrigue. Löwgren and Stolterman (2004) too, mention Playability as one of their use qualities, defining it as *“the addictive quality of a game that makes a player say ‘Just one more time!’”* (p. 132).

In my licentiate thesis (Lundgren 2006), I explored a set of tools aimed at designing computer augmented entertainment; mostly, but not necessarily, games. I there introduced the notion of tempting challenge as an essential property of interactive entertainment. An activity that is not challenging can be perceived as boring, soothing, calming or just perhaps nice, but not entertaining. In addition the challenge must be tempting to the user; he or she must be willing – wishing – to engage. For some, climbing the Mount Everest is a tempting challenge, for others solving the cross word in the New York Times is, and for a few, writing a Ph.D.-thesis is. One of the more interesting cases is The Interactive Quilt (Lundgren et al 2003, Lundgren 2006) designed by myself, Sara Johansson, Per Stenberg, Paula Thorin and Fredrik Nilsson. The interactive Quilt is a nine-patch quilt where the patches are actually buttons playing music from different genres. The initial grand idea behind the project was that the fabrics of each patch should communicate which kind of music that would be played, i.e. to create an intuitive interface. However it turned out that people’s conceptions about fabrics, genres and songs was highly indifferent. As a result no one could use the quilt efficiently, predicting the songs it would play when pressing a certain patch. Despite the lack of efficiency, and as a result of the built-in ambiguity (cf. Gaver et al 2003) and slowness (cf. Hallnäs and Redström 2001, 2006) people were intrigued by the Interactive Quilt and started exploring it, trying to figure out how it worked. In this it posed a challenge that tempted many; it was perceived as being playful and intriguing rather than strange, uninteresting or annoying.

In gameplay design, *Playfulness* is of course the one overarching ideal. Various aspects of games and how to design them have been described

by Björk & Holopainen (2005), Fullerton (2008), Parlett (1999), Salen & Zimmerman (2004) and many others. Game designer Wolfgang Kramer (2001) has listed fifteen properties of the “good” game, e.g. *Originality*, *Surprise*, *Equal Winning Chances*, *Creative Control*, *Tension* etc.

My colleagues and I (Lundgren, Bergström and Björk 2009) take this approach a step further by describing the most important gameplay properties (of which many but not all coincide with Kramer’s properties) and then using them to describe different aesthetic ideals of gameplay; the properties used or emphasized makes the difference between them. E.g. the aesthetic ideal of the *Light game* (i.e. family games that typically have rather simple rules and can be played rather quickly, e.g. Chutes and Ladders, Pictionary, Ludo and Monopoly) implies using gameplay properties like *Simplicity*, *Limited Play Time*, *Use of Chance* (which in turn reduces *Meaningful Choice*). The property of *Skill* is typically avoided, as is *Accurate Simulation*. Consequently *Reenactment* as aesthetic ideal (i.e. games which simulate historical events, almost always wars or battles) implies using gameplay properties like *Accurate Simulation* (which often negatively effects *Game Balance* and reduces *Simplicity*) and aggressive *Gamer Interaction* leading to *Gamer Elimination*.

## Playfulness in other Disciplines

Playfulness – in the sense that the artist wants to wow! the viewer, making him or her be positively surprised can be found in different types of art. One example is for instance the 16th century artist Arcimboldo, who created human portraits by combining everyday things, e.g. in his portrait “Summer”, a cucumber is used as the nose, an apple as the cheek etc. Other examples are the op-art movement where the artist’s played on optical illusions, and of course M.C. Escher’s impossible realities, e.g. a flight of stairs leading upwards but still somehow linked in a circle.

In industrial design, the works of the Memphis group (see p. 112) were to some extent playful, and a similar playfulness can be found in the works of for instance Alessandro Mendini, anthropomorphizing anything from cork screws to coffee machines. More recently the designers of Droog<sup>10</sup> design have created numerous playful designs, e.g. Marijn van der Poll’s *Do Hit* chair, which is a cube of 125 mm stainless steel delivered with a hammer; the owner can shape it anyway he or she likes. Another Droog design is Tobias Rockenfeld’s *Creatures* who are made of waste and broken toys, turned into small robots.

Two striking examples from architecture – of what gives a playful *impression* – are the works of Hundertwasser and Gaudí since both archi-





*Above: House "Waldspirale" in Darmstadt, Germany; a typical Hundertwasser design.*

texts used organic forms to a great extent. Hundertwasser's houses are also very colorful, this being a part of Hundertwasser's critique against contemporary architecture.

## REFLECTION: PROS AND CONS

These six ideals were discerned and taught in the second version of Aol. As ideals they have many advantages, e.g. that they are especially suited for teaching aesthetics of interaction, but there are also a set of disadvantages, e.g. that the collection is not by any means complete, and general issues, e.g. that several ideals can be present in a design and that the borders between ideals are sometimes fuzzy. All of this will be discussed in detail in Part V, on pages 203-209.





*Jocke, Erik and Andreas working on a lecture exercise; Aol2 featured several of these small exercises that both served as intervention, mental break and most importantly as a means to highlight or explore some aspect of the lecture's topic.*

## AOI2: A COMPLETE CASE

The second time around, planning Aol2, I made a couple of strategic decisions, based on Aol1. The first one was to alter the formulation of the learning outcomes, albeit not the intentions in them (see the intended learning outcomes for both Aol1 and Aol2 in the Appendices). Instead of focusing on the history of aesthetics, the history of industrial design and the current views on aesthetics on interaction, this was instead expressed as being familiar with the aesthetic ideals described in the previous section (pp. 101-125, e.g. *Coherency, Efficiency, Criticism, Sensing, Emotion* and *Playfulness*), since the ideals incorporate all of these elements.

To increase learning, the non-feedbacked portfolio exercises were removed; all exercises were to be run in class and given feedback upon. I also decided that this feedback should be given on designs plus design descriptions only, not on design rationales – I wanted the feedback to be in the context of not knowing what the designer had intended. In this I was hoping for even better feedback – a mistake as it would turn out (see pp 222-227 in Part V). Adapting to the thought of ideals I planned lectures and exercises accordingly, and I tried to make the lessons more interconnected and richer by adding small exercises or discussion points to them, as will be described below. MUD-cards<sup>11</sup> were used as a tool for students to give anonymous comments on lectures and exercises; the aim was to

catch what was hard or unclear in order to address it during the next lecture, but also to get some hints towards what students had found to be interesting.

Aol2 attracted twenty students, of which eleven were Swedish. In addition there were three students from China plus one student from each of the following countries; Austria, Estonia, Finland, the Netherlands, Poland and USA. Six were female, fourteen male. I had only met the students briefly before the course, running some design exercises in their “Interaction Design Project”-course. Unlike the students on Aol1, many of the students in Aol2 were taking more than one other class, over-achieving in that respect, which led to schedule clashes and some students spending less time than necessary on exercises, deliberately missing lectures or deadlines or handing in designs they knew were not very good. So despite the fact that many of the Aol2-students were good designers, their average grade was lower than for Aol1, despite the fact that the examination of Aol1 was tougher in that it required a lot more work.

The full schedule as well as the intended learning outcomes for Aol2 can be found in the Appendices.

## LECTURES

Aol2 contained six lectures in all, three on general topics, three on ideals in particular. They were as follows:

*Basic issues - aesthetics and interaction:* This lecture is notable because of a small exercise. The students were shown an image of a snail crawling on a flower (see next page) and were asked what was the most beautiful; the snail, the flower, the picture in itself or nothing/something else. The aim was to see what the student’s current standpoints were. Interestingly, we got all four answers in the class – it’s worth noting that at this point many students very strongly coupled “beauty” to visual appearance. Some liked the flowers because of their colors and shapes, others snails because they were more “functional”, some liked the photo in itself because it was well composed and had nice colors, and some saw beauty as something that could only be discussed in relation to art. All of these standpoints can be found in literature, and they served as base points for an interesting discussion.

The rest of the lecture covered the history of aesthetics in western art, the concept of aesthetic ideals and a general discussion on aesthetics of interaction.





*Qualities of Interaction:* This lecture covered, in turn, the ideas of Lim et al, Löwgren and Landin, respectively, as described in section X. As such it also served as an introduction to these texts. Each theory section was followed by a small exercise; we looked at Google in terms of Lim et al's gestalt attributes, and analyzed Bembo's Zoo<sup>12</sup> using Löwgren's and Landin's concepts respectively. It is also worth noting that this lecture was directly followed by the exercise "The schizophrenic iPod (see pages 195-196) which utilized some of Löwgren's and Landin's notions, as yet another means to help students become familiar with some of the notions. Drawing from the MUD-cards, students thought that this lecture covered too much to take in during one lecture, though. On the positive side several students reported insights like *"more views than expected on characteristics of interaction"*.

*Temporality:* This lecture was based on one of my own papers, Lundgren and Hultberg (2009). It was concluded the lesson with a small design exercise; students worked in pairs and were to apply the different temporal themes to either a search engine or a word processor. The topic spurred much spontaneous discussion; for instance it was pointed out that sometimes different subjects perceive a theme differently and in addition students suggested new themes. The designs created in the design exercise were also quite creative given the fact that the students only had some ten minutes to design. According to the MUD-cards students found this exercise in particular interesting since it presented aspects they had never considered before:

*"Little ambiguous and puzzling, however a new aspect of design"*

*"Hard to find things, but once one sees it it's a little bit of an aha-experience of thought like 'how smart'".*

*Coherency and the Gesamtkunstwerk:* This lecture covered coherency as an aesthetic ideal, as well as the notions of gestalt and *Gesamtkunstwerk*, as covered in Section X p X. The lecture ended with discussing whether interaction design is about designing *Gesamtkunstwerke*; one student com-

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*Left:* Lecture exercise picture. What is the most "aesthetic"? The flower, the snail, the photo or something else?

mented that it should be, but that it not necessarily is... interdisciplinary always, but sometimes this conjoined strive for unity is lacking.

*Aesthetic ideals I Emotion and Sensing:* This lecture covered the mentioned ideals as described on pp X. The lecture was also intervened with one design exercise; to make a pleasure analysis according to Jordan (2000) and then design a camera for either super models, retired upper class senior citizens or male teenagers from low-status suburbs which served as a basis of discussion related to Jordan's ideas. The exercise worked fairly well and I believe it helped students understand Jordan's concepts.

*Aesthetic ideals II: Criticism, Efficiency and Playfulness:* This lecture covered the mentioned ideals as described on pages X. It also featured a class debate on the Ulm stool – brilliant design or not?

In retrospect, one miscalculation made in the shift from Aol1 to Aol2 was that I thought I would have the same type of dedicated class, but as already mentioned several of the Aol2-students took other classes whose mandatory lectures clashed with mine, who were not mandatory. Based on the experiences from Aol1, the entire course was evolving around the lecture content in the sense that they were used the lectures to comment on both the literature in itself, students' literature answers and sometimes also the exercises, meaning that many students missed out on this. And the other way around I typically wanted to refer to something said during the lecture when supervising, something that then wasn't always possible. There are some ways to deal with this, one being to make lectures mandatory, another to base the course on what is mandatory, namely the exercises. However this would probably require changing the exercises so that they are more strongly linked to a text.

## LITERATURE

In Aol2 there were three literature sessions, which were in effect collections of four texts. Each text had two questions associated to it, but the students needed only answer one question per text. They were also divided into study groups, and should within the groups divide the questions so that each group answered all questions, and then shared answers with each other.

A full list of texts and questions can be found in the Appendix-section, but in short it was texts from Lim et al (2007)<sup>13</sup>, Löwgren and Stolterman (2004) and Landin (2009) highlighting different aspects of interaction, Lundgren and Hultberg (2009) on temporality, Janlert and Stolterman (1997) on character as means for coherency, Jordan (2000) on designing for emotions (pleasure), Djajadiningrat et al (2004) on tangibility, Schiphorst (2009) on somaesthetics, Dunne (1999) on critical design, Lundgren et al (2003) on ambiguity and intriguing challenge, Krippendorff (2006) on the functionalist view in Ulm, and lastly either Lundgren et al (2009) on Playfulness or Gaver et al (2003) on ambiguity as a resource for design.

The literature questions were written with great care, formulating them in such a way that the students would have to read the entire article in order to answer. Some questions were design tasks, i.e. designing something applying the authors' ideas, and some questions let students apply the texts onto a recent design exercise. This aimed to point out the connections between the theory and the students' own work.

Originally I had not intended to give written feedback on the literature hand-ins but then I did anyway. Since everyone answered the same questions, it was fairly easy to reuse comments and questions; giving written to a student took thus only ca 15 minutes, including reading their answers. In total some 15 hours were spent on this throughout course. These hours were well spent since students appreciated the feedback (and the fact that their answers were actually read!), but also because the answers to the two last sessions were handed in prior to the lectures on those topics which meant that I could comment upon the student's answers during the lecture and/or let students share them themselves.

Again, due to the dense schedules students had, the joint activity – reading papers and comparing answers together – was probably not carried out in groups as I had wished, which I think was sad.

According to the course questionnaires (see Appendices) students actually claimed they learnt more from the literature than from the lectures. Then again not all students came to all lectures. Having literature deadlines throughout the course seemed to have helped students spread out their reading and assured that they were up to date with the theory. Albeit this approach is by no means new, it seemed to be new to some students. In the evaluation on student wrote:

*"The literature sessions were done during the course not after – we had the knowledge with us as we designed."*



## EXERCISES AND CRITS

In line with the conclusions from Aol1, the notion of portfolio exercises was taken out of the course, but some of these exercises reoccurred as “ordinary” class exercises. Also, the order of the exercises was changed to fit the lecture content better, starting out with exercises related more to interaction in itself, moving over to exercises where different aesthetic ideals were applied. In total there were eight exercises. They will be described in detail in the Exercises-section (see pp. 140-197) but in short they were:

- *Ex 1: Design the Apple:* To take the interaction aesthetics of e.g. Google and transfer them to e.g. a bike. On analyzing and applying someone else’s aesthetics of interaction.
- *Ex 2: The Schizophrenic iPod:* To combine different notions from Landin (2009) and Löwgren (2002). On how various aspects of interaction can affect design.
- *Ex3: Informative Art:* To design informative art according to a given artistic style. On coherency and how temporal aspects affect expression.
- *Ex4: The New Office Assistant:* To make a coherent version of Microsoft Words helping agent, the Office assistant. On coherency.
- *Ex 5: Expressions of Interaction:* To design interaction that appears in a certain way. On how interactions express themselves, highlighting the difference between interacting in a certain way and experiencing something in a certain way.
- *Ex 6: Designing Emotions:* To design a ticket machine that either expresses or evokes angst. On form, material, interaction and designing for emotion.
- *Ex 7: Calculator on the Runway:* To create two different calculators based on two different aesthetic ideals. On aesthetic ideals and how an ideal skews a design in a certain direction.
- *Ex 8: Face...what?!?:* To combine two given ideals in a Facebook-like design. On designing for, and combining different ideals.

The exercises were all feedbacked one way or another. Exercises 1 and 2 via class discussion, Exercises 3 and 5 as exhibitions and the rest with regular peer to peer crit-sessions. Each student was responsible for giving another student written critique, and during the crit sessions each student presented their work, got their critique, agreed or sometimes defended their design, and then the class discussed the design. Since the Aol2-class consisted of 20 students they were divided into two crit groups. This time

around, crits did not work as well; partly because critique was given based only on the design in itself and the description on it, not on the rationale for design, partly because students were not trained in giving constructive feedback. This meant that they did not really benefit from the crit sessions. For a lengthy discussion on this, see pages 222-227 in Part V.

## EXCURSION

Aol2 featured only one excursion, partly due to lack of money, partly due to the fact that the temporary exhibition “My Animal Park” that I had visited with Aol1 was now closed. This excursion was Röhsska Muséet, visiting the same exhibition as the Aol1-class did, i.e. “*The Röhsska Museum Design History 1851 to the present day*”. Parts of the museum’s extensive

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**Below:** Tanja Lindblad excellently guided us through the exhibition “*The Röhsska Museum Design History 1851 to the present day*”. Here she is talking about the *Itera-bike* (an epic design disaster) in front of the 1980ies showcase.

Permission to use this photo kindly gi-ven by Röhsska Muséet.



collection of furniture, textiles, ceramics, glass etc. are shown in thirty-one different environments, covering the development of the art of design over the last 150 years. Unlike Aol1, we also got a bonus, a quick look at the exhibition “Finland’s queen of fashion – VUOKKO” showing the works of Vuokko Eskolin-Nurmesniemi; interesting because of her modernist approach to fashion.

This time the visit was not coupled to a lecture per se, instead we went after the last lecture, so that we could look at how different aesthetic ideals have manifested themselves in industrial design over the last 150 years. As a result, some students commented that they did not quite see the coupling to the course, and some thought that it was too much fashion design-talk. Then again others did see the connection and liked the clothes. Most comments were positive. Here are a few:

*“Interesting to see all the designs and how they have evolved during the years.”*

*“It felt like we didn’t deeply explore any topic or necessarily followed a given concept through time.”*

*“The aim of the visit wasn’t really clear to me, but it was fun to see some ‘important’ [design] examples.”*

*“Interesting to really see the changes as we walked around.”*

*“Interesting to see how different form and structure of an object can mean different things, not only for computers.”*

*“Some classic designs are provoking people, but people still like it.”*

## ORAL PRESENTATION

Again, the course ended with an oral presentation where I wanted students to share their design experiences and learn from each other. Unlike Aol1, where the students had spoken of entire design processes, the Aol2-students spoke of general learning insights, e.g. how much form and color actually matter in a design, or consistency as a basis of aesthetics, or introspective learning outcomes like having a tendency to end up focusing on usability. Albeit interesting for me as a teacher, it was not very interesting for the class as a whole. Only one student delivered a presentation

about a process he had struggled with, in a very fun and insightful way too. Consequently, the students did not quite see the point in watching everyone else's overviews and personal insights.

*"I don't see what the final presentation gives to the course. Seems like its just there for the sake of doing presentations."*

## PORTFOLIO

Just as in AoI1, the assessment was in form of a portfolio. Drawing from my experiences in AoI1, the "extension" of exercises was omitted; they should just be improved. Additionally, the portfolio should be functional. Instead, focus was on reflection and introspection; the portfolio should contain a narrative explaining what the students had learnt from each part in the portfolio. It should contain the following parts (quoted from the home page):

- "A *narrative/an essay* explaining the rest of the content; how it is related, how it displays what you have learned and how you learned that. Here, you should also describe your current view on aesthetics of interaction and describe your personal aesthetic ideal. Relate and refer to existing work, e.g. the papers from the literature sessions.
- 2-4 *exercises*, improved according to the feedback you got (that is, the feedback you agree with!).
- 2-4 *other things*, e.g.
  - *Answer(s)* to literature questions.
  - *Feedback* you've written.
  - *Lecture tasks* (e.g. concept maps or design tasks like for instance your word processor/search engine designs from the temporality lecture, or something else we've been doing in class).
  - Something else that you come up with that was created/experienced within the course.
- A *new design* demonstrating something you've learned."

In total, the portfolio should contain the essay plus 5-7 other items, and there were two explicit target groups, me (grading) and potential employers. An example of how an exercise portfolio item could look, was also distributed.

The Aol2-students applied the same tactics as the Aol1-students when it came to choosing exercises; most of them used the ones they were the most satisfied with, probably to both save time and ensure a high grade. In total, the 20 portfolios contained 68 more or less improved design exercises – only five of those were complete redesigns (two made by the same person) by students who wanted to “conquer” the exercise. The “other things” were almost solely literature answers (32) although a few concept maps (5), feedbacks (2), essays (5) and lecture tasks (1) were handed in too. In general, the literature answers were just handed in as they were without improvements or elaborations (again, students tended to choose things they had gotten good feedback on); here I had assumed that since one of the target groups was future employers, students would explain the context and flesh out the answers, but hardly anyone did.

The portfolios were well-designed in general, but I got the feeling that most portfolios were created just as another exercise, not to actually show to anyone except me – most of them require substantial redesign in order to be shown to possible employers, lacking context and explanations. Also, in most cases, the narrative/essay was quite poor. At least partly this was due to me attributing the students more ambition and time than they had, and to not giving explicit instructions. And, whereas the Aol1-students had been forced to write a draft of their essay, which they had gotten half an hour feedback on, the Aol2-students (being twice as many) did not get this, probably a mistake from my part.

The students themselves were quite satisfied with this examination form. It got comments like:

*“More fun than writing a long report.”*

*“Makes you rethink the experience, I’m making discoveries while I compose essays/reflections.”*

*“...It’s good to have something stand-alone that can be shown in the future [...] But on the other hand it did not make me learn more or read some extra literature.”*

*“We could have just an essay as well, but a standard written exam is right out.”*

*“A way to review whole exercises and things we did during the course.”*

*"You really get to show what you learned and if you understand what the course is about."*

*"Reflecting and redoing increases the learnability when you also have to improve your earlier designs you learn even more."*

## SUMMARIZING AOI1 AND AOI2

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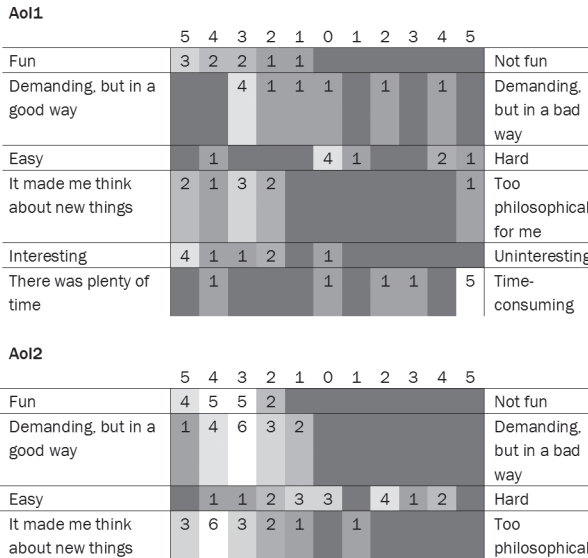
The first iteration of the course – Aol1 – was very useful. Firstly it revealed what worked and what could be improved, but it also raised many questions, like how can one focus even more on interaction in the exercises? How can one integrate literature in lectures? How could assessment be improved? As a result, the aesthetic ideals were introduced in Aol2, and so was a stronger focus on the design materials of interaction and temporality by introducing texts by Lim et al (2007), Landin (2009, pp. 35-68), Löwgren (2002), and Lundgren and Hultberg (2009). A stronger coupling between literature and the rest of the course was made, since the literature questions either were applied to exercise designs, and/or discussed or related to in class. This tighter coupling seemed to be appreciated according to the course questionnaire; seven out of seventeen Aol2 students ranked the literature as one of the things they had learnt the most from in the course. In comparison, the exercises got fifteen "votes" and the lectures only five (although this number may be skewed since not all students attended all lectures). It can also be compared with only two out of nine Aol1-students choosing lectures as something they learned the most from. These comparisons indicate that the new approach to integrate texts closer to the rest of the content was a good move; hardly surprising given the theories on constructive alignment (Biggs, 2003, Gronlund 2004) and interconnectivity (Biggs 2003, p 75-77).

But – the first version was also misleading in a sense. As has already been pointed out several times, the two classes were very different. In Aol1, there were only ten students; a small, very talented, ambitious and dedicated class. The Aol2-class was more normal, containing 20 students with a lower level of ambition, since some of them were taking more than one parallel course. Whereas three Aol1-students had an explicit design background, only one of the Aol2-students had this, as far as I know; instead most of them came from a computer science background. Another difference was that the Aol1-students had taken my course "Graphical Interfaces", whereas the Aol2-students had only met me during two weeks



of design exercises in a course. In retrospect I am wondering how much it mattered that the Aol1-students had had me as a teacher before?

I will not go into detail what came out of the course questionnaires because it is hard to draw extensive conclusions from the data in them (for a full record, see Appendix X). However one question asked the students were to assess the course, and the results are shown below. The numbers in the boxes indicate how many students chose that alternative (e.g. 3 Aol1-students gave the maximum 5 grade for “Fun”).



There are a few things worth pointing out in this diagram. Firstly, we can see that most answers are on the left end of the scale, towards the more positive judgments; even more so for Aol2, which indicates that the course in general has improved. Also, as a teacher one aims for the students to be in the middle of the Easy – Hard-scale; in Aol1, the level seemed to be exactly right for roughly half of the students, and too hard for a third, in Aol2, the opinions were more spread out with a slight bias towards “Hard”. This is rather good since it suggests that the course is on the right level. For Aol2, this seems to be in line with that the course is seen as demanding in a good way, but not too demanding. The biggest difference is the view on time; roughly half of the Aol1-students said it was very time consuming, marking the extreme value of 5. In Aol2 again the opinions are more biased, but much more close to the center. There are three obvious reasons for this; the Aol2-students were more ambitious, spending more time on exercises, they had nine exercises and their portfolio included the

improvement and extension of exercises. In AoI2, the students had only eight exercises, and did not have to extend their portfolio exercises.

If comparing the different elements further there are few lessons learnt. As for *lectures*, that it really helps to intertwine them with exercises and discussions. As for *literature*, that one must write questions with care, and that taking the time to give students short written feedback on literature hand-ins is fruitful, especially if you also relate to their answers and the texts in lectures. However I still lack a means to make students really discuss texts. As for *excursions*, they can be inspiring, providing variation and interconnectivity but one has to choose and prepare them carefully. Despite the AoI2-students objections against the *oral presentations* they can still be a valuable learning opportunity, but they need to be framed as designer stories, possibly by demanding that they shall have a clear fairytale structure; start, adventure and (happy?) end. As for *exercises*, that they need to be clearly coupled to content, and that the feedback on them must be constructive and rich. And, lastly, that the *portfolio assessment* must be designed in such a way that it provides a learning experience too, and that it nevertheless is not overwhelming to grade. These last three issues, exercises, feedback, and assessment will be discussed more in detail in the Exercises-section below as well as in Part V.

Knowing that I will teach the course at least once more, these are the most important changes I'll probably make;

- Ensure quality in peer-to-peer feedback and feedback sessions.
- Add another lecture on aesthetic ideals so that they can be (theoretically) covered more in depth.
- Create a couple of more lecture exercises that should be run in a more structured way so that students get to keep what they designed, other than just scribbling it on a paper that gets lost.
- Work harder to integrate literature.
- Improve the final portfolio demanding; 2-3 exercises (extended?), a new exercises plus an extensive essay, supervising the latter.
- Have exercises focusing on inscribing the aesthetic ideal from start, possibly by exploring and presenting ideal-specific design methods.

# DESIGN EXERCISES

In my opinion this is the most interesting part of the entire dissertation. As a consequence, the descriptions of each exercise, its outcome what worked well and what did not, which issues arose etc are quite lengthy. However – if I were a teacher, wanting to use any of these exercises, that would be what I wanted. Ergo: thorough descriptions. Then again, the different exercises are single learning objects, not related to each other, which means that the reader can choose only those he or she finds interesting.

My students have generously given me their permission to describe and in some cases show their designs, which is why positive examples are credited. Negative examples are however anonymous and more general in order not to embarrass anyone.

In order to make the iterative work with the exercises more clear, some exercises are described in several steps, describing the different occasions when it was carried out (typically in Aol1 and Aol2); sometimes the two iterations also differ in how the task was formulated. Full exercise descriptions can be downloaded from <http://www.ixdcth.se/teaching>, and an extensive discussion on how to use, redesign, give feedback upon and combine the exercises can be found in Part V.

## THE EXERCISE COLLECTION: AN OVERVIEW

In total ten exercises are described. Of these, two were never part of Aol – *Animal Expression Transfer* and *Character of Things* – since students in both classes had already tried them out. The exercises are as follows:

- *Animal Expression Transfer*: To create a hybrid object, combining and mapping expressions and behaviors from an animal to the expressions and functions of an everyday object. On expressions of interaction and coherency.
- *Calculator on the Runway*: To create two different calculators based on two different aesthetic ideals. On aesthetic ideals and how an ideal skews a design in a certain direction.
- *Character of Things*: To inscribe a character into an everyday thing, changing its behavior. On how to base coherency on a character.
- *Designing Emotions*: To design a ticket machine that either expresses or evokes angst. On form, material, interaction and designing for emotion.

- *Design the Apple*: To take the interaction aesthetics of e.g. Google and transfer them to e.g. a bike. On analyzing and applying someone else's aesthetics of interaction.
- *Expressions of Interaction*: To design interaction that appears in a certain way. On interaction in itself and the connections between form and interaction.
- *Face...what?!?*: To combine two given ideals in a Facebook-like design. On designing for, and combining different ideals.
- *Informative Art*: To design informative art according to a given artistic style. On coherency and how temporal aspects affect expression.
- *The New Office Assistant*: To make a coherent version of Microsoft Word's helping agent, the Office assistant. On coherency.
- *The Schizophrenic iPod*: To combine different notions on interaction, here from Landin (2009) and Löwgren (2002). On how various aspects of interaction can affect design.

Five of the exercises address design materials: *Animal Expression Transfer* (interaction), *Design the Apple* (interaction), *Expressions of Interaction* (interaction), *Informative Art* (temporality) and *The Schizophrenic iPod* (interaction). Four of them explicitly address the overarching ideal *Coherency*: *Animal Expression Transfer*, *Character of Things*, *Informative Art* and *The New Office Assistant*. Lastly, three address aesthetic ideals: *Calculator on the Runway* (any ideals), *Designing Emotions* (*Emotion*) and *Face...what?!?* (any ideals). The reason for the lack of exercises addressing aesthetic ideals is partly that the notion of aesthetic ideals is new, secondly that almost any design exercise can be skewed towards ideals; “design a playful lawn mower” or “design a critical pair of boots” etc.

Below the exercises are described as cases. The exercises in themselves (i.e. the instructions) can be downloaded from: Full exercise descriptions can be downloaded from <http://www.ixdcth.se/teaching>.

## ANIMAL EXPRESSION TRANSFER

**Task in short:** To create a hybrid object, combining and mapping expressions and behaviors from an animal to the expressions and functions of an everyday object. On expressions of interaction and coherency.

**Aim:** To explore how behaviors and interactions express themselves, sometimes only over time and in use. To get a better understanding of the interplay between expressions, interactions and functions. To design for coherency.

**Prerequisites:** None, but having read either Landin et al (2002) or pp. 56-78 in Lundgren (2006) can be helpful.

**Time + material:** At least three hours, preferably five, allowing for a second iteration, given that the deliverable is only a concept sketch.

**Organization:** Since the task is quite “odd” and relies much on coming up with a suitable combination, working in groups of 2-3 students is probably best.

This exercise was run in 2007 and 2008 in cooperation with Hanna Landin, as well as in a slightly altered version in 2009, in the “Chalmers Interaction Design Challenge” course, running in parallel with AoI2 with partly the same students. Thus the reason for not having it as a part of “Aesthetics of Interaction” was that most students had or would encounter it anyway. The outcome was evaluated using our own observations, the students’ designs and interviews the students made with each other after the exercise.

## The Origins of Animal Expression Transfer

In short, Animal Expression Transfer is a design tool where one maps behaviors and thus expressions and interactions onto an everyday object, creating a hybrid object. The process of combining suitable animal traits with those of the object requires careful mapping considering behaviors, interactions and expressions. Thus, focus is turned from functionality or usability – the functionality is already inherent in the object or in the animal, and although usability may be considered, it is outside the scope of the exercise. The result is an object with a behavior explained by its expressions, a behavior unfolding over time, in use and interaction.

Animal Expression Transfer was a tool developed during a design project carried out by myself, Hanna Landin, Johannes Prison and Magnus Johansson in 2002 (Landin et al 2002; Landin 2008; Lundgren 2006). The Iron Horse is a bike which sounds like a horse. Here, the initial inspiration came from the shared interaction of riding a horse and riding a bike (which is a consequence of the horse’s behavior and the bike’s function of moving from A to B). Consequently, expressions of riding a horse in different gaits were transferred to the bike, in our case as hoof sounds mapped to the speed, expressing the different gaits. We also transferred different horse behaviors to the bike, e.g. greeting its owner and other Iron Horses, which was expressed with different types of neighs. Each Iron Horse also had a unique personality – for instance it could be more or less friendly or lazy – which slowly unfolded over time, when interacting with it. Behaviors

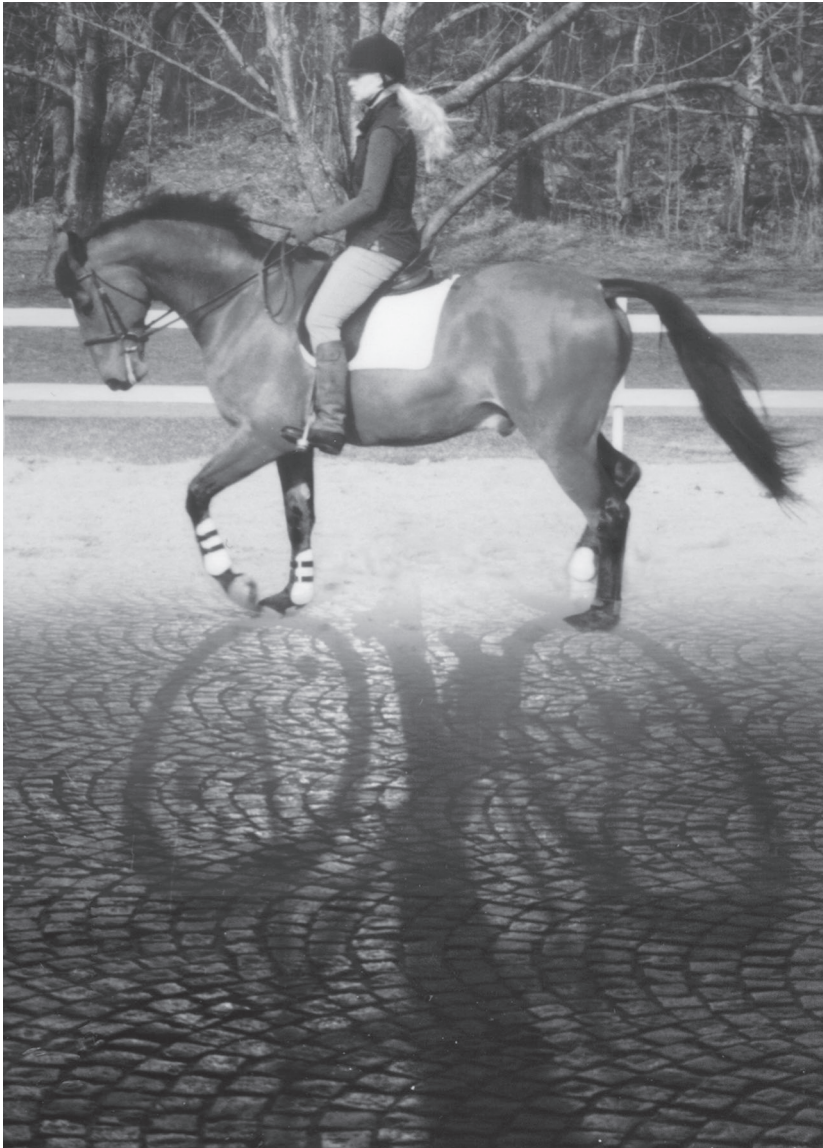
that were not transferred was everything that was related to the horse's digestion system – there were not enough similarities between the bike and the horse to allow this mapping.

Note the distinction between behaviors and expressions; behaviors are seen as a complex set of actions with an attached set of expressions (i.e. the *behavior* may be migration whereas the *expressions* of this are traveling over long distances, hardly resting, yearly repetition etc.). The

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***Below:*** *The Iron Horse-vision; getting the impression of riding a horse instead of one's bike.*

Horse photo by Johannes Prison, shadow photo by Sus Lundgren, montage by Sus Lundgren.





process of first carefully analyzing the expressions and behaviors/functionalities of both the object and the animal and secondly choosing the ones fit to transfer sets focus on the coupling between behaviors, functions and interactions and how they express themselves. This is the aim of the method, at least from a pedagogical point of view.

We also took the concept further, using the tool to come up with some other artifacts, e.g. a Puppy Printer, following its users around in the office space, and a Feline Car, roaming the neighbourhood (cf. Lundgren 2006 pp. 62-63).

## The Exercise

The task is to create a hybrid object using Animal Expression Transfer. In the first workshop half of the class started out from an animal and the other half with an object, but the latter approach turned out to be much harder; students struggled to find a suitable animal to transfer traits from. Hence, the second, refined, exercise states that students should start out with animals only.

Students choose an animal and find out more about it, analyzing and listing its expressions and behaviors respectively, using the lists as inspiration when choosing an object to transfer some of them to. Students should be encouraged to have a good rationale for transferring something; at least expressions and/or behavior/function and/or means of interaction should be apparent in both the animal and the object.

The exercise ends with a reflection-phase, dealing with issues like which expressions and behaviors were transferred and why, and how they contributed the most to the final design.

## Observations

Overall, eighteen hybrid objects were created; ca six of them very well designed, seven acceptable and five not so consistent and well-designed, in several cases due to a poor combination of animal and object, depending on the harder approach when they started with an object instead of with an animal.

We saw many examples of coupling animal's behaviors with the hybrid object's interaction. For example one group transferred the demanding task of milking a cow to the task of refueling a car, and another group transferred the obstinacy of a cat to a printer which tends to come and find you only when lacking papers or power, and which sometimes rips papers apart. These design decisions, and many others with them, have nothing

to do with the looks or physical forms of the hybrid objects, instead they concern different behaviors and interactions and the expressions thereof, just as the aim was. Among several groups there were detailed discussions and descriptions regarding the design of the hybrid objects, overall mainly concerning the interaction rather than visual appearance. E.g. one group combined a vacuum cleaner with ants. It consisted of small distributed units dragging dust and dirt to an ant-hill – a designated spot in the home. Here, the visual expressions were totally uninteresting, and so were the sounds; the key of the design was the mapping of the ants' behavior of collecting building material to the vacuum cleaner's function to clean. Another vacuum cleaner was created by combining it with a pig, this time mapping the expression of sucking and snuffling that the nozzle of the vacuum cleaner makes, to an eating pig. This group considered almost every possible interaction with a cleaner, and what the corresponding pig-like expression then should be. This for instance resulted in adding a new kind of expression; a high shriek when the bag was missing (a kind of warning not all cleaners have).

We also observed that the students thought of how a person's interaction with and relation to the object might change. For instance, the students commented that the cow-inspired petrol pump idea might attract environmentalists, but probably would be hated by all drivers if implemented correctly. One remark on an ant-inspired vacuum cleaner was that people could be released from the interaction with their cleaner, but if they wanted they could of course play with it, building race tracks of dust, instead of work with it. Another example was a combination of a cobra and a tazer gun, which was designed deliberately to scare off potential attackers, using the fact that most of us loathe snakes and see them as something unpleasant.

## Reflection: A keeper

To conclude we found the exercise very useful as a means of highlighting how behaviors and interactions express themselves, sometimes only over time and in use. In this, it serves as a way to practice consistency and thus aesthetics in design. As already mentioned it seems to be harder to start out with an artifact with an animal, and the current version of the exercise thus suggests starting with the animal. Since the key to this exercise is to find a suiting combination of animal and artifact, the exercise can be made easier, or shortened by giving combinations of animals and objects, e.g. horse + bike or pig + vacuum cleaner.

# CALCULATOR ON THE RUNWAY

**Task in short:** To create two different calculators based on two different aesthetic ideals. On aesthetic ideals and how an ideal skews a design in a certain direction.

**Aim:** To base design on a personality (Aol1) or an aesthetic ideal (Aol2), learning how the same artifact can turn out very different depending on the underlying rationale for design.

**Prerequisites:** None.

**Time:** Ca 6 hours if the deliverable is only a concept sketch.

**Organization:** Alone, or possibly in pairs.

This exercise was actually inspired by the reality television series “Project: Runway”. The show focuses on fashion design, and in typical talent show style, one contestant has to go home each episode. When only 3-4 designers are left, they all get to design a complete fashion collection of 12 garments, to be shown at a fashion show. This, to create a series of designs within one theme, was the starting point for this exercise, where the students design 2-3 calculators with different design goals; in Aol1 it was personalities/characters, in Aol2 ideals.

## The Exercise

The task is to design interactive prototypes of three calculators – each with a different approach. In Aol1, this “approach” was personalities, i.e. each calculator should be based on a person(ality). In Aol2, it was aesthetic ideals instead.

The calculators needn’t be complex; dealing with addition, subtraction, division, multiplication and square roots is enough. However any suitable functions can be added, as can any “behavior”, such as loathing the number 13, failing every 10th calculation, adding “6” to any result or whatever.

## Aol1: Personalities

In Aol1, the intended learning outcome of this task was to learn how to use the notion of “personality” in interaction design. Hence focus was on expressing the personality in the way the calculated looked, sounded and, most importantly, interacted with the user. Now, since this was a portfolio exercise, the students did not get any supervision in doing it, which was clear from the results. Firstly the task was not formulated in a good way,

and secondly, it seems that the whole “personality”-concept hadn’t been explained or taught (in class) well enough. As a result, most calculators expressed their “personality” via their exterior, via sounds and via spoken or written comments (e.g. several students who had TV-characters used sampled sentences), but not in code. E.g. one student made a Kurt Cobain<sup>14</sup> calculator, expressing his instable and depressed personality as a creased paper in a flickering light, with hand-written numbers. Whenever calculating, eerie sounds are heard, and every once in a while a shot is heard, and the paper is stained with blood. This calculator is very well designed in the respect that its visuals and sounds express angst and depression, but, at the same time the calculator works just like a normal calculator. Thus, the “personality” is not implemented fully; one could for instance imagine that a depressed drug-dependent calculator would not be very reliable. Another issue was that some students based their designs on rather obscure characters, assuming that I’d know them, without clearly mapping expressions back to the character they had chosen. Some students based their design on a rather vague character that they made up themselves; in a few of these cases it was not always clear whether the design was based on the character or vice versa. Adapting the character to an unstable design, and then use the character (unknown to the users) as a means to claim coherency is of course not what the exercise aims at.

If one wants to keep the focus on personalities anyhow, basing design on a very well-known and stereotypical character might help, since a distinct character helps guiding design and supports coherency. Additionally, one must clarify that interaction and function too, should be affected by the character.

## AoI2: Ideals

The second time around, this was an ordinary class exercise, and concept sketches were enough. Also, only two calculators were to be designed, based on two different aesthetic ideals. This time the designs were much better, probably partly because the students had a more thorough theoretical background to get inspiration from, partly because I during supervision kept pointing out that the way the calculators behaved mattered too. This aspect could still be enforced even further though. When supervising, it was clear that most of the students’ energy was spent on designing an input suiting the ideal – the output did not always fit as well; in very many cases it was just a screen. Also, most students seemed to spend most of their creative energy on the first design; the reason for making two was to

illustrate how changing ideals can change the design radically, but looking at the other's designs may prove this point just as effectively.

An interesting turn of events was that in this version of the exercise, students interpreted the concept of a “calculator” much wider, designing anything from bracelets to gymnasiums with calculator functions. Albeit this surprised me, and may not fit in other contexts or courses, I encouraged it, since it helped students pursue their chosen ideals. For instance a number of designs aiming for playfulness toyed with the idea of play, playing music and the coupling between numbers and notes and music being a sort of mathematical language. Among the designs we find the following, extra-interesting ones:

*The Scale Calculator:* HanHsiu Chiu wanted to criticize how we toy around with big numbers without really understanding their size, e.g. when writing budgets etc. Thus, his design consists of a scale with a set of different trays that indicate the mathematical operation to be done. In order to input numbers, objects with the corresponding weights must be put into the trays, hereby creating an awareness of the size of a number, as well as of the relative sizes of numbers. Of course the (tedious?) task of collecting enough heavy items in order to input a large number stresses this even further, meaning that the design states its point in three different ways; very nice.

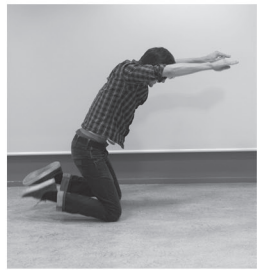
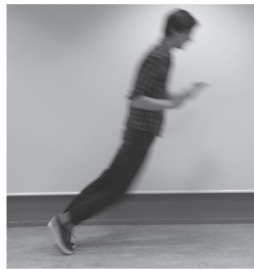
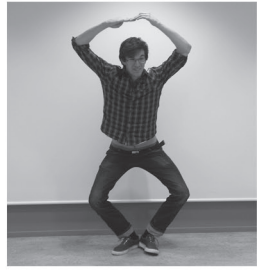
*The Informative Calculator:* Cristian Holth Österlund achieved a slightly different take in his design; his calculator works just as normal in all aspects, but it has a small add-on that greatly increases the pleasure of using it; it presents trivia about the numbers entered, e.g. “42 is the answer to the question ‘What’s the meaning of life’, at least according to the bestselling book ‘The Hitchhiker’s Guide to the Galaxy “ by Douglas Adams.”

*The Body Calculator:* Martin Hjulström wanted to design for sensing, and came up with the idea of using body posture as input, as show to the right The images (featuring Martin himself!) were taken in the open space where many of the students worked, and this may well have inspired the other students to a wider interpretation of what a calculator can be.

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*Right: Martin Hjulström’s Body Calculator. From top left to bottom right Martin (sometimes helped by Jonathan) is inputting the following: 1 2, 3, 4, 5, 6, 7, 8, 9, 0, +, x, /, square root, – and =.*

Photo by Andreas Magnusson





*The Guess Calculator:* Erik Johansson toyed with playfulness in one of his designs; the calculator does not give the answer right away; it waits a few seconds during which the user can try to guess the correct answer. A small gauge indicates whether the guess is close or not, and if it's above or below the correct answer. I like this design because it with a very easy change turns the calculator into not only a perfectly functional instrument, but also a toy. Two students commented that the design space was very big, and that some constraints could be needed.

*"Maybe have slightly stricter direction of the design. To have some special feature designed with different approaches [would] better show the difference in thought. "*

I neither agree nor disagree with that, it may be good or not depending on the teaching context, but in that particular context I wanted the space to be wide. More interestingly three students commented upon how some aesthetic ideals can be very alike in some contexts, and that a design often has elements of more than one ideal in it:

*"Difficult to design only for one aesthetic ideal. Always combine several ones. If you design for playfulness, it can be that it is more tangible in the end. Not easy to think about coherency at the same time."*

*"Some ideals seem similar. It is a little difficult to say [what] belongs to which."*

*"Some aesthetic ideals are quite relative. So the designs in some way [...] covered similar ideals. "*

This is absolutely the fact, ideals often intertwine or cooperate in a design. However this highlights the issue that some students tended to come up with the idea and the design first, and then, more or less afterwards, concluded which ideal(s) that could be "found" in the artifact as opposed to actively using the ideal as a basis for design decisions, inscribing it into the artifact. The result of this lack of focus often resulted in incoherent input and output.

Some students commented on their problems with making two designs:

*"[Hard:] To come up with two complete[ly] different designs. When the first one was designed it was hard to not referring to ideas I had to the first when designing the second one."*

Although much of my above comments may sound negative, I was rather satisfied with the outcome of this exercise. And, as the positive comments below suggest the exercise still served the purpose of demonstrating how different ideals can affect design:

*"Focusing on different aesthetic ideals really makes the result different."*

*"Good exercises since it was challenging to design two different calculators."*

*[Realized that] "a thing like a calculator, that one has a conception of, can turn out in many different ways."*

## Reflection: A Flexible Keeper

The interesting thing about this exercise is that it is very flexible; design x versions of an artifact, changing one aspect/dimension in each version. As such it can be applied in almost any course to highlight how the different aspects/dimensions affect design. Regardless of the aspects/dimensions chosen, one must ensure that the students have a rather thorough understanding of them.

If using it as an exercise on interaction in itself though, there should be a very strong emphasis on designing interaction rather than appearance; which functions does it have, how does it respond to interaction, how is input/output made? One mustn't stick to the average 15-button calculator featuring buttons for numbers, +, -, x, /, = and a screen showing input and output, but instead question these design choices.

Also, one could actively compare the different outcomes in a feedback discussion. Why is this calculator so different from that one? Which design choices differ the most? Then, it may not be necessary that each student designs several versions; they can instead compare the class' versions. If so, one may want to make sure that the different aspects/dimensions – or in this case ideals – are evenly spread out through the class.

# CHARACTER OF THINGS

**Task in short:** To inscribe a character into an everyday thing, changing its behavior.

**Aim:** To explore how to base coherency on a character.

**Prerequisites:** None. Possibly one can read Janlert and Stolterman's "The Character of Things" (1997) for inspiration and theoretical foundation.

**Time:** Ca 3-4 hours if the deliverables is only a concept sketch.

**Organization:** Alone or in pairs.

This exercise is reminiscent of *Animal Expression Transfer*, since the task now instead is to choose a character (as opposed to an animal) and then design an artifact lending traits and behaviors from this character. Although very similar to *Animal Expression Transfer* in its pedagogical perspective, it focuses more on character design than the latter. In this, it is inspired by Janlert and Stolterman's "The Character of Things" (1997).

The exercise was run in 2009 to the students later applying for the second version of "Aesthetics of Interaction" wherefore I did not want to repeat neither it nor *Animal Expression Transfer* in the course. The outcome was evaluated using my own observations, an analysis of the handed-in designs, and the students' own comments.

## The Exercise

The task is to inscribe a character into an everyday object. The students get to choose one out of four characters represented as pictures (in our case an old Chinese woman, a hard rock star, a golden retriever puppy and Queen Elisabeth I of England). They then discuss the following:

- What is your character's general attitude towards life (e.g. friendly, shy, cynic, aggressive, ignorant, accommodating...)?
- What is your character's general attitude towards other people?
- How do other people interact with your character?
- How does your character get others' attention?
- How does your character flirt?
- What does your character like to do together with others?
- What is your character's primary need (e.g. love, attention, piece & quiet, revenge)?

These questions aim to help the students pinpoint how the character interacts with others, and what drives it. Thereafter, material properties are investigated in a Chinese Portrait<sup>15</sup>, answering what the character would

be if she/he/it was a material, tool, color, sound, feeling or shape, respectively. Using this collected information/inspiration, they chose a printer, a car, a camera or a microwave oven to design their chosen character into. In doing this, the human dimension should be left behind; the objects can not talk or write things to express their personality. Apart from that, the boundaries are pretty open. First, the behaviors and functionality should be considered. When designing the students should also consider if the object has extra functions and/or misses functions. Only then, they can start designing the exterior, taking materials and shapes into account.

**Example:** *Imagine a toaster with the personality of a very aggressive and destructive person. It would probably always burn the bread, and would aggressively spit it out, high up in the air. This action comes with a very loud mechanical noise. Also, the cover would lead heat very well so that whoever tries to touch the toaster will burn themselves.*

*The aggressive toaster lacks a control for stating how much you want to toast your bread. It decides that by itself and is unpredictable. Most of the time the bread is burnt black, but sometimes it is instead spat out at once, not burned at all. Even more seldom the aggressive toaster delivers a perfect toast. It has an extra “functionality”; it is very hostile towards strangers. If a stranger appears in the kitchen it will turn on itself, become hot and repeatedly make the spit-out-the-bread-movement with the accompanying sound. This side-effect of its aggressiveness can be used as an alarm.*

*The aggressive toaster is made of pitch black metal with a matte finish, somewhat stained. The little handle that can be used to eject the bread with is made of shiny stainless steel whose shape is not rectangular as usual, but instead looks like an arrowhead. There are no soft edges; they are all very sharp. The shape is compact, almost a cube. It is very heavy.*

## Observations

In all, the students designed twenty different objects, since they were working in groups of two or three. My impression when supervising was that there were two major uncertainties in the task as described to them (which I've tried to counter in the current version of the exercise). Firstly, it was unclear how much they could change the object in itself; could a puppy microwave oven be equipped with legs, for instance? Secondly,

some of them had problems with not “gluing on” too much human/animal attributes, like eyes and a mouth despite the instruction to design “an object with character, not a personality dressed up as an object (as in many Disney movies).” E.g. one group redesigned the microwave oven so that it looked very much like a shark, claiming that this symbolized the rock star character. Additionally a few groups misunderstood (or ignored) the task and instead designed a product that seemed to have the character as a target user group instead, with the rationale that if a rock star was a car, he’d be a black limo, equipped with free drugs and booze. This is inconsequent with the character though. Arguably a rock star is an exhibitionist, which could be expressed in a very fancy car, but providing for the user’s every need is an expression of generosity and care, traits that we cannot per definition conclude that every rock star has.

Another thing that needs to be considered more carefully if the choice of characters. I do believe that students should get a few characters to choose from, more or less stereotypical, because otherwise they will probably spend much time on agreeing on, finding or inventing a character. However the characters presented – and I really liked presenting them as pictures rather than as written descriptions, since an image is much more vivid and inspiring – must be rather unambiguous. Consequently the dog and the painting of Elisabeth I worked very well, but the picture of rock star Nikki Sixx led to some students making up elaborate and rather weird stories about this person; I got a sense that the stories were made up to justify the design rather than inspire it, as a way to avoid “killing one’s darlings”. Similarly, one group first saw the old Chinese woman as an incredibly wise shaman which then would have let them design all sorts of functionality into their object explaining it with magic.

As for the objects used, the printer and camera seemed to work well; they are both objects which one can imagine equipping with sensors and code enabling a new behavior, whereas the car seemed harder to change. The microwave oven in turn, seemed to have too few functions to utilize. A better selection is probably a camera, a printer, and a music player of some kind.

Several of the designs were good, e.g. a dog-camera that utilized the fact that dogs’ eyesight is not as good as human eyesight; they are color-blind and are optimized for hunting, i.e. spotting movement. This was reflected in the photographs which had a different color spectrum than normal photographs. They were also more blurry with stronger contrasts. Similarly, a printer, having the character of the old woman, was slow but

very reliable. Every once in a while it adds some unnecessary information from another document (“gossip”) to the document it is currently printing. The most coherent design was probably Sixx Pixx by Patrik Björkman and Alexander Skogberg. This is a camera based on the rock star character, alias Nikki Sixx, which had been recognized by Alexander. Sixx is the infamous bass player of Mötley Crüe, a rock band known for an excessive consumption of drugs and alcohol, not to mention women. Sixx himself has taken at least two overdoses. (Strauss et al 2001). Sixx’ somewhat instable nature is expressed as the camera not always taking pictures on demand, but sometimes on its own initiative. Similarly the drug abuse is expressed as needing stronger and stronger batteries, and sometimes when changing batteries, its memory is completely wiped out. In addition the camera mimics a drug hazed world view by sometimes applying filters and/or distortion onto images. Alluding to Sixx’ strong drive to become and stay a rock star, the camera has a powerful objective, however with a limited field of view. And, lastly, his charisma is expressed in the camera’s very powerful flash; it will blind everyone nearby.

When it comes to what the students learned (or not) I got thirteen comments by email (some of them from whole groups). A few students stated right out that they did not learn anything, others that they did learn something but probably would not apply it in the future. Most of the comments were positive in terms that they had had a good time carrying out the exer-

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*Below: The rockstar-character camera Sixx Pixx as envisioned by Alexander Skogberg and Patrik Björkman.*





cises. Many commented on the task as being “very creative” and as a way to think out of the box.

*“It was a fun exercise even if I did not learn very much.”*

*“Other functions of the object were discovered, and one started to think outside the box.”*

*“Today’s exercise was the most entertaining one up until now. [...] It made us create a design we hadn’t really envisioned (thinking outside the box). The exercise helped develop our creativity.”*

Five of the comments explicitly mentioned the inscribing of the personality into the object as something interesting that they had learned something from. A typical comment sounded like this:

*“It was interesting to see how personality can be placed on an object, although sometimes it might be difficult. Other functions of the object were discovered, and one started to think out side the box.”*

*“[Both of us] have learned that balancing between designing a character-adapted object and still keep a realistic design is hard, and must be allowed to take some time.”*

*“Transferring a thought or idea to a design is harder than it sounds like. It must be well thought out and contain elements that resembles the original character.”*

## Reflection: Needs Some Fixing...

I think this task is easier to carry out than *Animal Expression Transfer*; it may be that it is easier for us to anticipate and design “human” behavior, than that of a not-so-known animal. A human personality is also richer, so it may be easier to find inspiration and things to inscribe. Thus this exercise can be seen as a “light” version of *Animal Expression Transfer*, because the latter demands more from the designer, especially when it comes to transferring expressions in a coherent way; here we can’t make some add-ons to a character in order to make the design work.

The current variant of the exercise has been reformulated, now stressing the design boundaries more. I also recommend a careful choice of characters and artifacts; as mentioned the former must be enough stereotype

and the latter should probably be digital products with a limited number of functions, although I am tempted to try out a cell phone next time!

## DESIGNING EMOTIONS

**Task in short:** *To design a ticket machine that either expresses or evokes angst.*

**Aim:** *To explore form, material, interaction and designing for emotion.*

**Prerequisites:** *None.*

**Time:** *Ca 6 hours if the deliverables is only a concept sketch.*

**Organization:** *Preferably the first step (The Chinese Portrait) is carried out in groups of 3-4 students, thereafter alone or in pairs.*

### The Exercise

In this task, students design a ticket vending machine that either expresses or evokes angst. In this, the task is very straightforward task and “only” requires students to be creative and work on combining form, material and interaction in an optimized way.

In an initial phase the students describe angst in a so-called Chinese Portrait<sup>15</sup>, by (individually) answering a couple of questions like “*If angst was an animal, which one would it be?*” or “*If angst was an activity, which one would it be?*” The answers then serve as inspiration for the design. After this first phase students can discuss their answers in groups, to get more inspiration and insight. Thereafter students split up to work alone or in pairs. Now they decide whether they want to evoke or express angst in their design. The exercise has previously been described in Lundgren (2009b).

### Aol1: Anthropomorphization in Abundance

In Aol1, some of the students tended to focus on form and on material, leaving the interaction-part behind to take care of itself, probably because they were a bit new to these aspects. Others first designed more classical machines where the interaction per se more or less standard. This was however dealt with in supervision, and students were encouraged to focus more on interaction.

As for the positive, this exercise helped students focus on designing emotions with all possible tools. They used visual expressions, but also sounds, tactile sensations and smell, and in addition they in their designs provoked and utilized emotions like fear, humiliation, disgust, pity, embar-

rassment and claustrophobia. In this, lots of uncommon types of interaction were designed:

- Punishing users who were too keen on getting their change back
- Filling in endless forms revealing lots of private information
- Interacting by screaming primal screams at a high pitch in echoing environments
- Patting an angst-ridden machine until it stops crying
- Force-feeding money into a an angst-ridden machine

Among the more interesting designs we find the following two, one expressing angst and one evoking:

*X-pose Spa Ticket Vending Machine* by Magnus Lorentzon evokes angst by building on shame and fear of exposure. It is a small, clinically white booth with cold lightening and walls which from the outside are somewhat transparent, but on the inside have a mirror surface. It cannot be locked. The potential ticket-buyer needs to undress and is being weighed, scanned, photographed and measured with the rationale that this is needed in order to customize the spa-trip according to that particular customer's needs.

This design is interesting because it utilizes many common fears all related to shame and one's view on one's body ; going to the doctor, being too fat, being ugly, being exposed, being naked in a more or less public environment and as such vulnerable.

*The Mental Patient Robot Ticket Vending Machine (MPRTVM)*: Inspired by a mental patient, Olof Göranson decided to express angst in his design, and the result was an old, rusty, humanoid robot residing in a multistory car park. The MPRTVM has only a few ways to interact or be interacted with. For instance it tends to go and stand in corners, rocking back and forth. This produces a squeaking sound coming from its rusty joints. It appears very afraid, since it moves away from everything that moves, e.g. people wanting to pay for their parking ticket, cars, or just autumn leaves blowing around. However it does not move fast enough to escape its users. When a user is nearby, it rocks even faster. One pays by feeding coins into the middle slot that appears to be its mouth, but it reacts on this by shaking its "head", and will also reject the coins until "force-fed". The ticket

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**Right:** *The Mental Patient Robot Ticket Vending Machine – hiding in a corner as always – by Olof Göranson.*

Illustration by Olof Göranson



will then emerge through one of the eye-like openings. The two arm-like shutters hide the control panel and the container for the money. Opening these shutters is very hard; if the MPRTVM is fully charged it takes several people to overcome it.

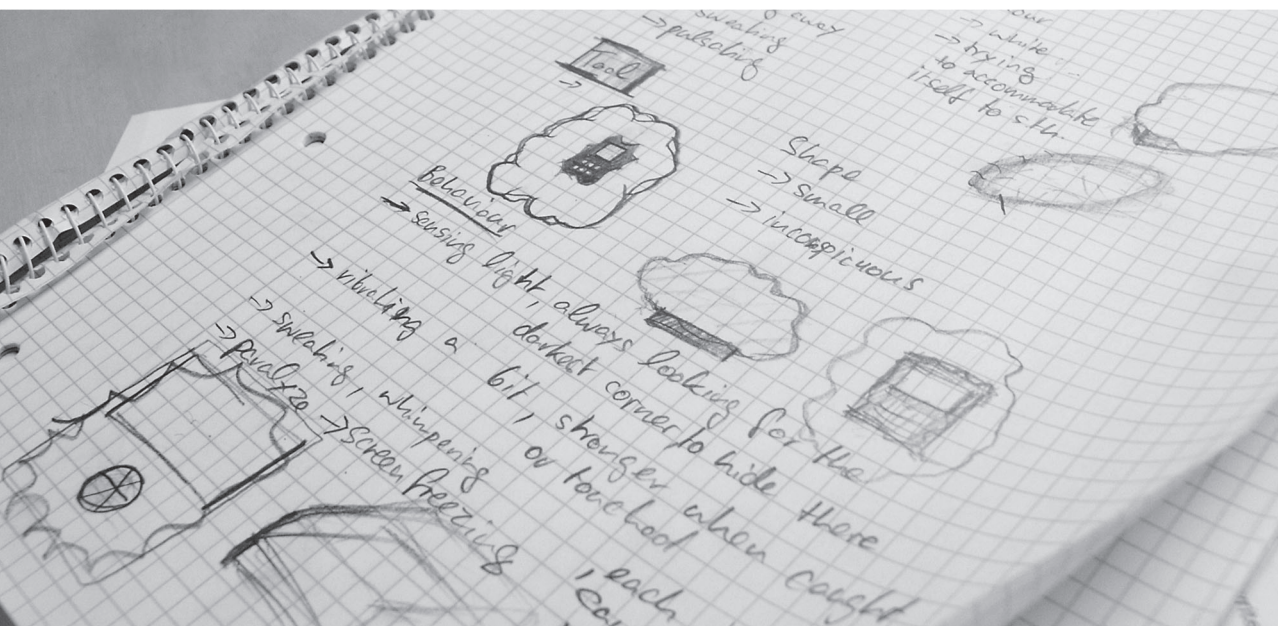
The interaction inscribed in this artifact is non-usual and definitely not user-friendly, but still consistent with the general design idea and the task. All of the behaviors and interactions, together with the general look& feel of the robot, cooperate very well in expressing angst.

When using anthropomorphization in design tasks such as this, it can be easy to move to close to human expressions, which somehow reduces the task, since it becomes an exercise in designing human expressions. Here, however, Olof's design utilized natural robot expressions, e.g. the squeaking sound from the joints, a machine's ability to spit out unwanted coins, and the common practice of hiding a machine's more delicate functions behind some sort of door or shutter that not every one can open.

In Aol1, anthropomorphization was used in three of five cases of expressing angst, e.g. Mathias Klein designed a delirious alcohol-junkie-like machine desperate for its next booze; the tickets were paid for with alcohol. Here, Mathias applied a very human and desperate behavior onto his machine, but by using a non-human shape, giving his machine a wobbly, blobby body of gelatinous material, he stayed away from coming too close to a human.

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*Below: Matthias Klein's initial sketches of Wobbly, the drunkard ticket vending machine. Note the list of behaviors.*



As for the other four vending machines – which instead evoked angst – two of them used a hint of anthropomorphization (e.g. letting the shape of the machine vaguely mimic a superior person towering over the user). Here instead, angst was created by creating/evoking secondary feelings like intimidation, fear and uncertainty. Regardless if they were evoking or expressing angst, students gave pretty much the same attention to form, material and expressions.

The exercise really made an impression on the students, partly because of the demand to adapt not only physical design but also interaction to the goal of evoking or expressing angst. Comments from students include the following:

*“I learned that [...] designing the environment (the context) can sometimes be even more important than the actual object/subject being designed.”*

*“I liked to approach the design by defining colors, natural phenomena, tools etc. which would be connected to “angst”. This strategy seems to be useful, if one wants to express specific emotions with a design object.”*

Several students also talked about it in the concluding oral presentation. One student in particular, spoke very vividly and intriguing about his struggle with this task. His original idea was inspired by “Big Brother” in Orwell’s novel “1984” and wanted to combine this with the Soviet of the 1970ies. It did not quite work out for him but he couldn’t let go and came up with idea after idea on this topic *“a painful struggling process, [...] didn’t feel right at any point.”* Finally, he designed a prying ticket machine that interrogated you and asked for all sorts of personal information before handing out a parking ticket. He was not at all satisfied with his design and a few days later he understood why: he had designed suspiciousness, not angst. He later redeemed himself by designing a truly angst-evoking machine as a completion in his portfolio. To him I think that the task – after all the struggle – highlighted how different emotions manifest themselves and thus also how different types of interaction can strengthen an emotion.

## AoI2: Ethical Issues and a Lot of Evoked Angst

In order to emphasize the focus on interaction, I decided to rephrase some of the questions in the Chinese portrait so that they dealt more with movement and sports rather than color and material.



In Aol2, this exercise turned out pretty much the same as in Aol1, with two exceptions. First of all, only five designs out of the twenty aimed to express angst; probably this aspect of the task is perceived as being harder. Secondly, at least two students had an issue with the task in itself; to them it felt very wrong, awkward even, to design something clearly dysfunctional. One student solved this by creating an elaborate background story, explaining why his machine acted as it did, whereas the other one stated “I tricked myself into seeing this as a psychological test of some sort”. In his portfolio, this student later wrote *“I found angst as a hard goal to have in a design, mainly because that it has absolutely nothing to do with usability, and it’s hard to design something that really in every aspect functions badly.”* This student also had other issues with the task; his first design was a little humanoid robot that communicated with natural spoken language. The student himself realized that his robot was “too human”, but handed it in anyway since the deadline was approaching. He then decided to put an improved version in his portfolio, but could not quite figure out how. In the oral presentations the last day he spoke vividly about his struggle with this design stating *“It has become my Mount Everest in this course!”*. He also presented an improved, less human design in his portfolio. Interestingly, despite all his troubles, he still liked the exercise, labeling it *“possibly my favorite exercise in the course.”*

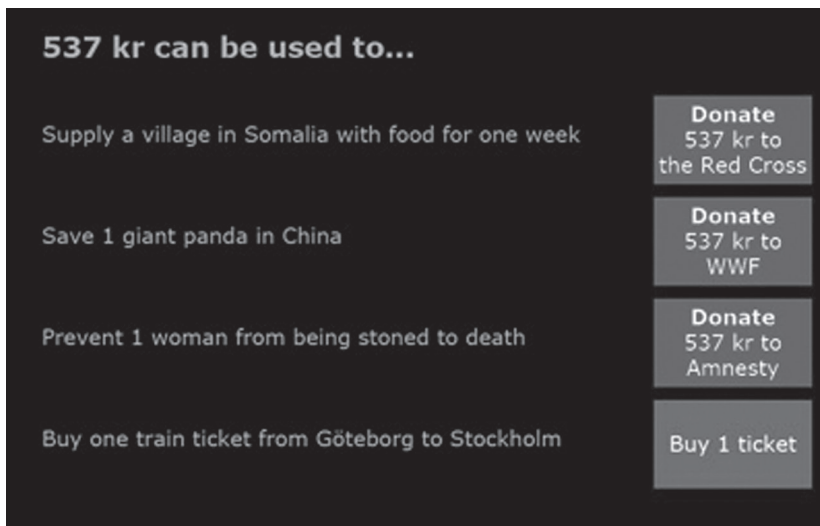
Another issue was related to anthropomorphization; several students had problems with incorporating this in their designs in a way that seemed coherent. E.g. one student designed an ordinary ticket machine, but with a screen showing emoticon-like facial expressions, whose only function was to express angst, i.e. it was “glued onto” the design, not incorporated in it. Additionally, some students, both in Aol1 and Aol2 utilized physical punishment and even mutilation, and although this is a very good way to create angst it borders on fear, will prevent users from using the machine at all and in general is just a bit over the top. Note that this in this context is not a moral or ethical issue, but just indicating that using more subtle means of evoking angst is a better design solution. As for interesting designs we find the following:

*The Room:* Fredric Svensson designed a machine in the form of a sound proof, closed room, lit by a dim, flashing reddish light. In order to use the machine, one has to allow being caught in a foot-iron, and in addition there’s a pulse-meter that the user has to hold; if the user is not calm enough the machine will cease to work for two minutes. In order to insert coins one has to pull the coins along a long slit and if the coin touches

its walls, the user gets an electrical shock (actually, there's a small probability that the user may get that anyway). If the user then drops the coin it will most likely disappear, since the floor is actually a grating. There's no feedback as to how much money one has entered or for how long one may park, not even on the ticket. The foot-iron only lets go if one manages to buy a ticket, so one runs the risk to get stuck until someone comes along with extra coins or some other sort of help – and the room jams cell phones, so one can't call for help! In addition the whole process is getting filmed, and posted on YouTube.

As crazy and distorted as this design is, it is good in the way it utilizes a lot of different sub-feelings in order to create angst. The room in itself can create claustrophobia and fear, as being stuck in the foot-iron. The punishment of electrical shock if failing to insert money creates fear, fear of failure, pain, and stress. Stress is also created by the pulse meter. The lack of feedback creates confusion and uncertainty. Uncertainty and stress is also created by the fact that one isn't sure if one will ever get out, possibly also regret (why did I even get into this mess in the first place). Lastly being filmed and posted on YouTube whilst getting electroshocks, and possibly having to be saved by someone else, also may result in embarrassment.

*The Guilt Machine:* A rather opposite design is that of Erik Johansson, who designed almost purely for guilt in his train ticket machine. Although starting with a few choices evoking uncertainty and a little fear, his final screen looked like this:



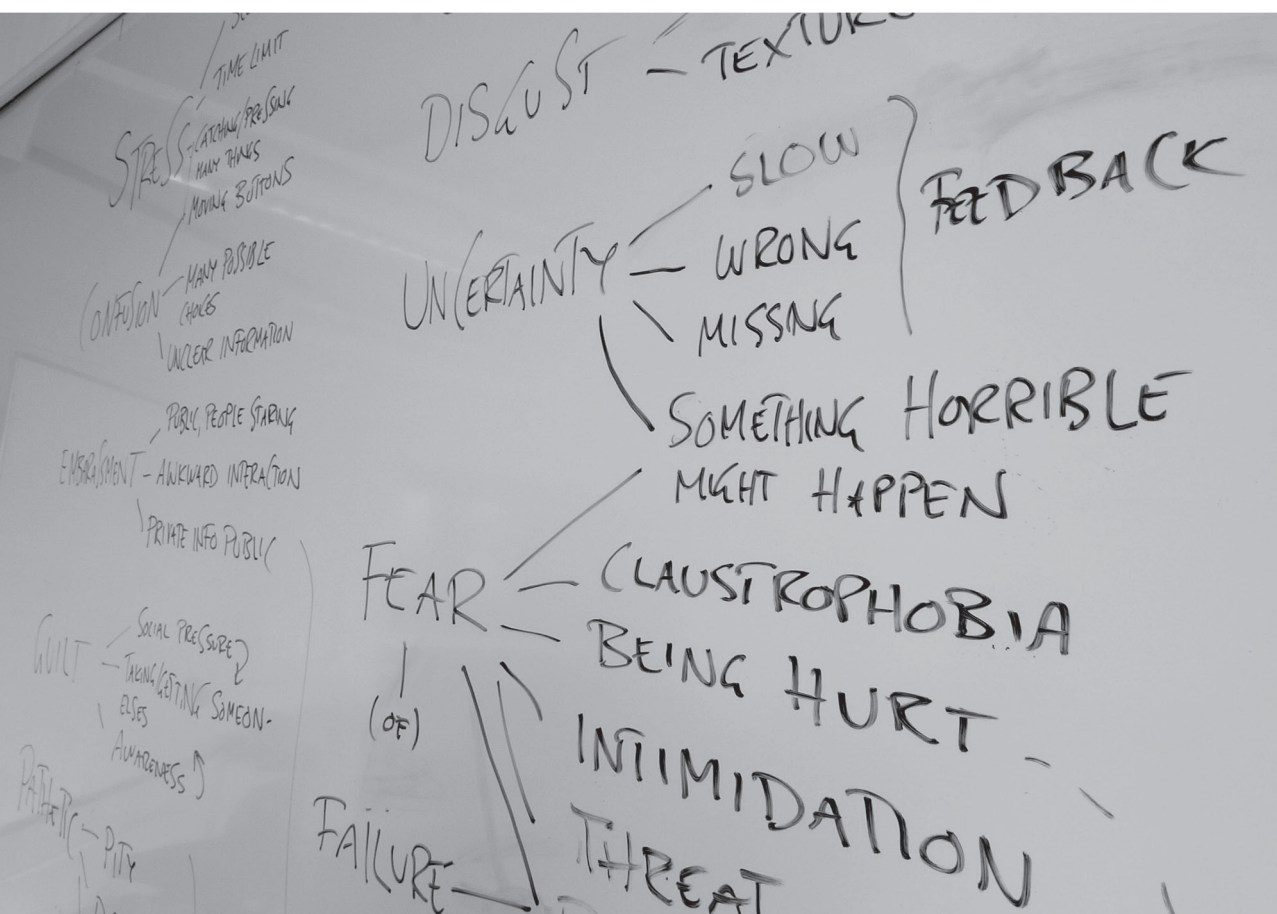
As such it hits a very strong spot of guilt in the users. Other students toyed with this idea too, but did not manage to manifest it so well; e.g. one student

created a scenario of the user being very thirsty, and the vending machine pointing out that if he buys a bottle of water, that water will be taken from a family in the midst of Africa's worst drought. Although similar to Erik's solution this design raises a lot of unnecessary questions like how the water is actually taken from the family, how the family is being selected etc. It simply does not make very much sense.

The feedback sessions of this exercise were rather interesting since we looked into how different sub-emotions can be utilized to create angst. Two MUD-cards commented on this:

*"[Insight:] That one might need to consider other emotions to design a specific emotion."*

**Below:** One thing that also became very clear in the feedback sessions was how many different sub-feelings that can be utilized in order to evoke angst; stress, confusion, embarrassment, guilt, being pathetic, suspicion, disgust, uncertainty, fear, fear of failure, regret...



As with Aol1 I observed how the students realized that all aspects of a design – look, feel, interaction, behavior, functions – need to be taken into account when designing. A few MUD-cards commented on this:

*“The look&feel as well as interaction, function and usability can evoke some feeling and strengthen it.”*

*“[Insight in] How we feel [that] materials [of] things have/express emotion.”*

As for the 13 MUD-cards handed in after the exercise, five dealt with angst itself, that the feeling was hard to define since it can mean many things to many people.

*“It was hard to design angst as it can be close[ly] related to so many things. And what makes one person feel angst doesn’t mean it will make another one feel the same.”*

Two comments also dealt with the lack of background, i.e. that some students had designed very far-out things (e.g. Fredric’s closed room) whereas others had designed something that was more realistic (e.g. Erik’s guilt-machine).

## Reflection: A Keeper

In my opinion, this task meets its aim to explore form, material, interaction and designing for emotion quite well. It is also targeted towards coherency since all different parts must cooperate in evoking or expressing angst. Again, if supervising this, make sure that the students consider interaction firstly; what interactions make us feel angst, or do express angst?

Note that angst is a carefully chosen emotion; I’ve run this exercise several years in various versions and courses, and have found that angst works well, probably because it is a complex feeling with elements of fear, humiliation, anxiety etc. Albeit negative these feelings can be very inspiring – very much more so than a hackneyed feeling like love.

# DESIGN THE APPLE

**Task in short:** To take the interaction aesthetics of e.g. Google and transfer them to e.g. a bike.

**Aim:** To analyze and apply someone else's aesthetics of interaction

**Prerequisites:** The exercise requires some insight in the difference between interaction, function and expression.

**Time:** Ca 3-4 hours if the deliverables is only a concept sketch.

**Organization:** Alone or in pairs, or in pairs or groups during the analysis phase and then alone.

## The Exercise

Here, the task is to analyze an existing software in terms of interaction – both how the user can interact with it and how it responds and how it itself interacts and initiates interaction. This “soul” of the program, as well as the look&feel is then transferred to an everyday object like a bike.

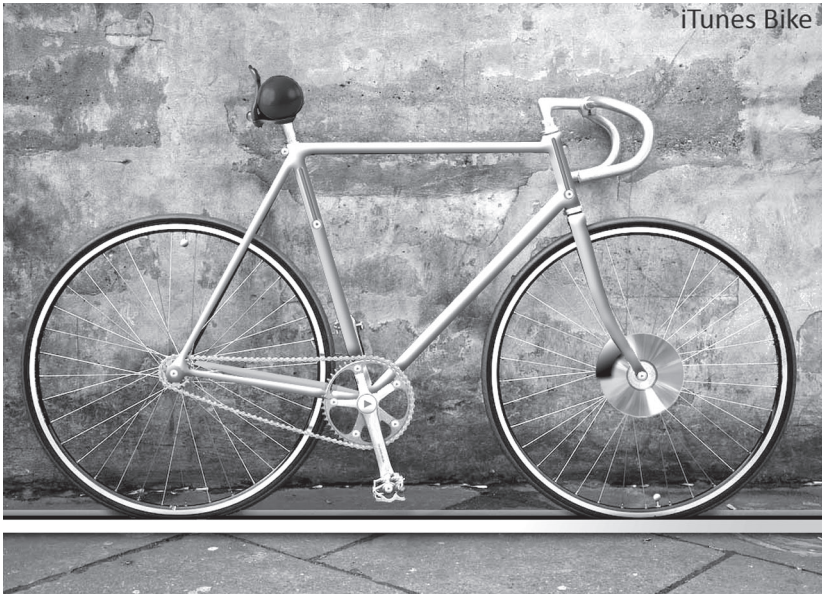
## Aol1: A Well Working Exercise...

In Aol1, the softwares that the students could choose from were Adobe Photoshop, Microsoft Word, iTunes, LinkedIn or Google, and they could choose to transfer the “souls” of these softwares to either a bike or a coffee machine.

This task seemed to inspire the students, probably because some of them used it to express their frustration with Word! Since the program's “soul” is transferred to an object rather than to another program, the means of interaction cannot be copied directly. This motivates a thorough analysis of how a program expresses itself, in turn illustrating this somewhat elusive trait of any interactive object and how it affects expression and impression. In the Word-case it resulted in several bikes with training wheels, whereas several Google-designs displayed very fast responses to actions. Here are a few examples of what students can accomplish in this task:

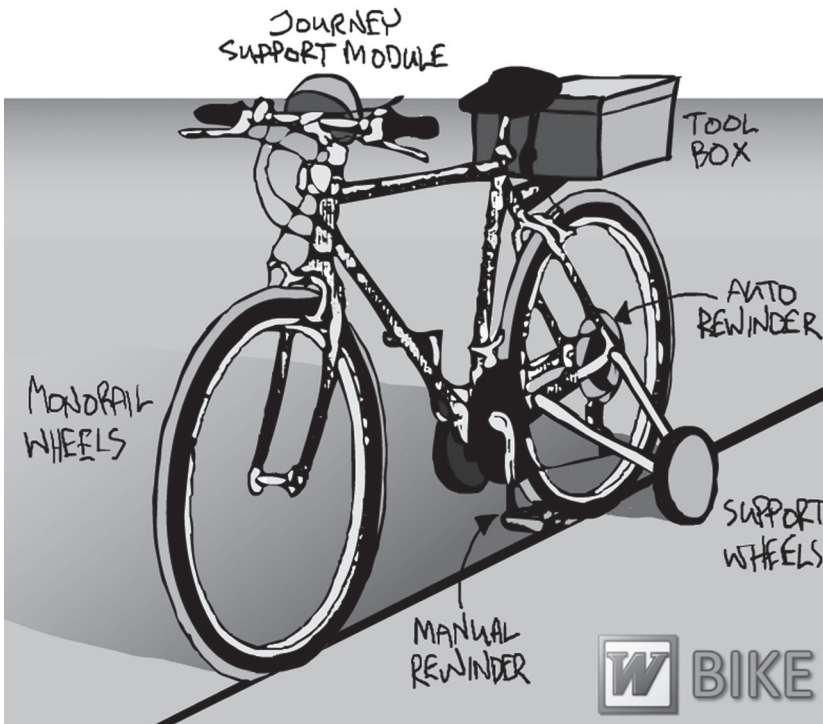
Erik Fagerholt designed the *iBike*, i.e. a bike with the soul of iTunes. Among its many features are for instance the slick design and the possibility to ride forwards, backwards and stop. The iBike runs on rails, and very smoothly so, but then again the rails will only take you through the central parts of town. This illustrates the (somewhat annoying) relation between iTunes and the iTunes store; only if you buy your music from the store, things





*Above:* Erik Fagerholt's slick iBike. Note the CD attached to the front wheel as a decorative element. Illustration: Erik Fagerholt

*Below:* Magnus Lorentzon's W-BIKE. Note the attached tool box and, of course, the support wheels, expressing much of Word's character. Illustration: Magnus Lorentzon





works smoothly – but you can't always buy what you want... Also, riding the rails costs so-so much per kilometer (symbolizing payment for music). The bike is free (just as the iTunes software is), but you need to buy a set of very expensive cranks (the iPhone or iPod) in order to ride it.

Magnus Lorentzon instead used Word as inspiration for his bike, creating the *W-BIKE*. It too, runs on rails, this time to protect the user from leaving the standard tracks, and it has support wheels as well to prevent the user from falling. This is similar to how it is easy to use Word for standard types of documents, whereas it can be very hard to design more advanced typography with it. In case of a crash, the auto-rewinder rewinds back to the last safe spot on the track (i.e. auto-recovers a crashed file) and it is of course also possible to rewind manually back to an earlier point, say if one wants to change one's path, mimicking the undo- functions. The *W-BIKE* also comes with an extensive tool box so that the owner can customize it if he or she wants to, just like Word allows customization. When parking however, the *W-BIKE* wants to park in a default spot; so if one wants to park elsewhere one has to jump of the bike and manually wriggle it into the right position – this mimics how complicated it can be to save a file in a non-predefined folder. Then again, just as Word gives lots of modeless feedback, the *W-BIKE* has a journey support module giving real time information about the ride, and upcoming decisions.

The Aol1-students really liked this exercise, and they created many nice designs, but for them it was the seventh exercise which meant that they had had time to adapt the ideas on interaction in itself etc. In Aol1, one of the most important outcomes of the exercise was how these programs, all aiming for efficiency, could turn out as such different products; the Work-products were anxious to please abut also a bit clumsy and annoying, the Google products were suggesting and adapting to the user albeit sometimes disturbing with ads, etc. In this, this task clearly shows how the same aesthetic ideal can come out very differently depending on how it is implemented. The task is also very suitable in that it trains analytic skills.

## Aol2: Confusing Conditions

In Aol2, there were a few changes; the softwares they could choose from were Adobe Photoshop, Microsoft Word, Facebook or Google, turning them into bikes or the typical 1980ies phone. The reason for changing the coffee machine against the phone was firstly just to try another product, but

also because a coffee machine was used in the Informative Art-exercise. As mentioned this exercise had worked so well in Aol1, illustrating the point of a programs “soul” in how it presents itself, and for that reason it was placed as the very first exercise in Aol2. Whether it was this change or something else is unclear, but in Aol2, the students really struggled with the task. Part of the issues were related to the Google-choice; many chose it as their software, and when combining this with the product, they got stuck in applying searching and search functions to the product, i.e. the functions of Google, rather than the behavior of Google. This was partly my fault, I did not quite manage to make the distinction when supervising.

Additionally, the Aol2-students were very keen on adding lots of new functionality to their objects in order to achieve certain functions, e.g. several students wanted to equip their Google-bikes with color screens showing maps, and several also had problems keeping the phones as classical phones, adding lots of non-phone-ish output to them. Here, it is really important to supervise students so that they stay on the right side of the line, using added on technology to support only behavior, not functions. Another thing one can do is to encourage students to keep the original interaction of the artifact, e.g. only use voice and button input to the phone, and only sound output.

To aggravate the situation, the feedback-session was in the form of posters and with post-it feedback (see pages 225-227) and despite my instructions, recommendations and exhortations, not all posters featured good explanations, so the feedback they got was rather weak.

Consequently, the Aol2-students did not like this exercise at all, and I got the feeling that they did not really “get” it. I got 13 MUD-cards, and several of them discussed issues related to the posters. Some addressed the transfer of “soul” as being either the hard part, or one of the insights (i.e. that an aesthetic ideal can be applied onto something else and then may change that item significantly).

*“Difficult to connect the software I chose with the product”*

*“Hard to transfer certain traits from software to hardware. A fun exercise that makes one see this from another angle.”*

Two pointed out the weakness in the exercise:

*“A bit hard to know whether we should start out from the program’s functions or the program’s personality.”*

*“A little bit confused with what we should give to the object. First I thought the object should communicate with users [giving] the same feeling as Google. But finally it looks like [an] object with some Google-functions.”*

## Reflection: Needs a Clear Focus

Despite the Aol2-students' not-so-positive reaction, I still think this is a good exercise, since it practices analysis of how software interacts and appears, rather than the functions of it, and in addition lets students apply this onto something else, exploring it even further. However the task needs to be refined in that it is really the behavior – or personality as on student put it – that is to be transferred, not the functions. To help in this, one must avoid software whose functions are easy to transfer to the given objects, i.e. the searching of Google can be applied to both bikes (Where do you want to go?) and phones (Whom do you want to call?). Word, Facebook and iTunes work better together with e.g. bikes and coffee machines in this respect, probably cameras too. Another issue in this task is to allow students to modify the objects... but not too much. I.e. it's very tempting to add a color screen or a keypad to one's phone, thus turning it into something far closer to the computer than to the phone. Also, it may have been a mistake running the exercise early on in the course; after all it requires a certain awareness of interaction. Possibly it could be combined with either Lim et al or Löwgren; analyzing it in either one's terms and then applying this in the redesign.

## EXPRESSIONS OF INTERACTION

**Task in short:** *To design interaction that appears in a certain way.*

**Aim:** *To explore how interactions express themselves, highlighting the difference between interacting in a certain way and experiencing something in a certain way.*

**Prerequisites:** *None.*

**Time:** *Ca 6 hours since the deliverable is a physical item. As a consequence students should be given access to different materials (typically what's already in a design studio) or extra time to look for materials outside school.*

**Organization:** *Since the task requires a certain insight it's best to let students work alone, lest they can just rely on their partner.*

## The Exercise

In this exercise, the task is to design a certain type of interaction, e.g. aggressive interaction, or happy interaction etc. So, if someone looks at the person interacting they should conclude; “Oh this person seems to be really aggressive/happy/whatever”. Hence the focus is not on designing a thing and adapting interaction to it, but rather the other way around.

**Example:** *If someone is hitting a punching ball the interaction is very aggressive, even if the person is not angry. Similarly people who play games often look more concentrated than amused.*

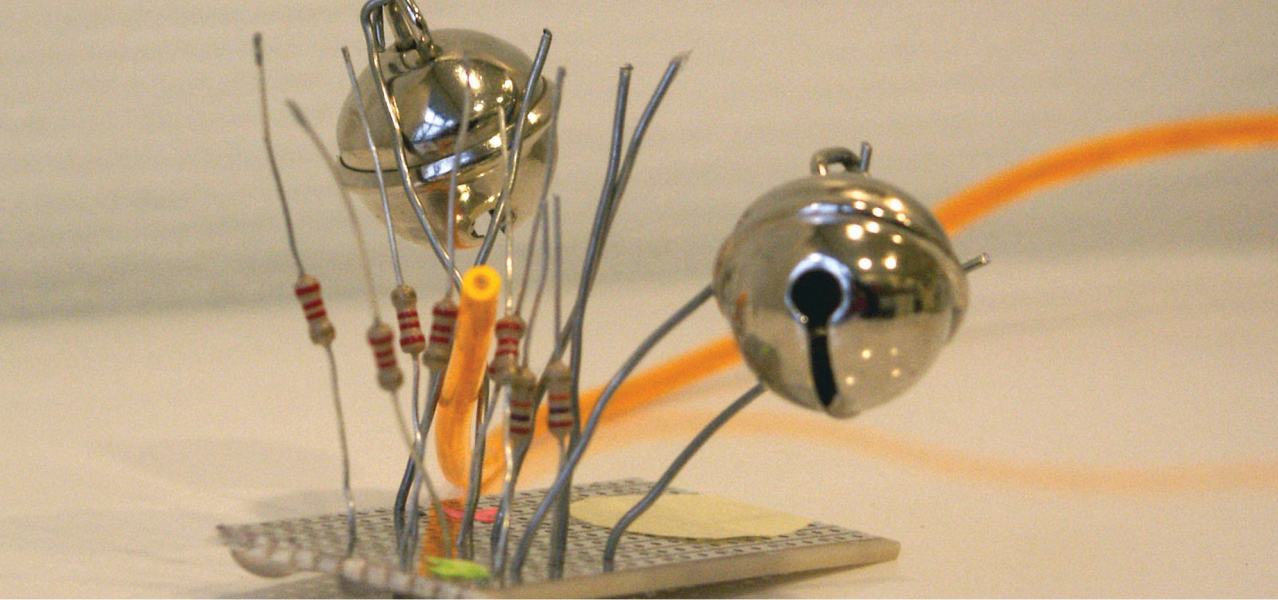
Each student gets a different word/emotion, and in order to get an interesting feedback session, the words/emotions are secret.

### AoI1: Healthy Confusion

This task requires a very unusual perspective, focusing on the expressions of the interaction rather than the interaction in itself, and even less the functionality of the object. “How does the wanted interaction appear?” is the key question in this exercise, and the answer is by no means obvious. For some of the students this was very frustrating; they were very stuck in the function-oriented way of designing. Arguably, part of some students’ frustration came from the fact that some emotions were harder than others to work with. The emotions used were *annoyed*, *energetic*, *careful* (all too easy), *sad*, *playful* (too hard?), *jealous*, *loving*, *shy*, *hysteric*, *content* (alright). The student working with playful commented something like: “*I can easily design something that can be played with, or that is playful in itself, but what does playfulness look like?*”

After some initial confusion, where students did not think about the expressions of the interaction, but tried to design for the emotion, they took one of two possible approaches. Either they did as in *Designing Emotions* (see pages 157-165), and designed an object that would evoke the emotion (like a cute furry toy bird evoking love), hoping it would affect interaction, or, they challenged themselves and tried to focus on the expressions of the interaction per se, and then designed an artifact which invited this type of interaction, e.g. designing a hand to be placed in suitable height for making a high-five slap, inviting happiness/contentedness. Then again this latter, more rewarding approach, is probably harder with certain emotions; the student designing loving interaction commented that it was very hard to design something that afforded this without that artifact being somehow cute. Consequently his design was a cute toy bird – but then





again he may have been stuck in some train of thought. Some interesting design examples are the following (see image on next page):

MinJuan Wang designed *careful interaction*, The orange tube must be guided through the labyrinth of wires without touching the bells, causing them to ring.

Carla Saraiva designed *energetic interaction* by filling a jar with a bottleneck, a few bells and a lot of red jelly, The task is to move the bells through the bottleneck, which results in a lot of (energetic?!) shaking. She also tried to bring associations to energy with the choice of the red color and the golden lid.

Karl Landin designed *sad interaction*. Pondering much over this, he decided to evoke the emotion sadness by presenting a miserable, wet, burnt, mutilated plush dog saved from a fire, that should bring user's thoughts to the toy's (presumably dead) little owner.

It is worth noting that this exercise was feedbacked via a guessing contest; the students got all words and had to match them with the correct artifact. This way of feedbacking made students actively explore and analyze interaction and they would also suggest other possible emotions that a certain interaction expressed. For example one student suggested that the careful interaction designed by MinJuan Wang (see figure on the previous page) rather invoked *concentrated* interaction; someone else pointed out that Carla Saraiva's *energetic* interaction ((see figure on the previous page) could also seem *frustrated*, especially since it was hard to succeed in transporting the bells from one end to the other as she had intended.

Out of all ten exercises in AoI1, I believe this one worked the best, and the students seem to agree. Comments I got about the exercise include the following:

*"...really liked the exercise because it made me think from another perspective. At the same time I must say that it was a very hard exercise [...] The exercise clarified how hard it can be to design a specific way of interacting, but it also made me think of how important it is that a interaction designer think of the consequences a design will have for the way we will interact with it."*

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**Left:** Careful interaction by MinJuan Wang, energetic interaction by Carla Saraiva and sad interaction by Karl Landin.



*"I learned to think about expressions of interactions themselves."*

*"I have problems designing an interaction that expresses a feeling.  
The more I think of it, the more I get confused."*

## Aol2: Healthy Confusion, Still

The words used in Aol2 were: *urgent, boring, shy, playful, hysteric, jealous, pitiful, satisfied, happy, nervous* and *loving*. Since the Aol2 class consisted of 20 students divided into two feedback groups, each group had a full set of word, more or less. This also meant that all words were designed by two people; afterwards they could compare their design with someone who had faced the exact same problems.

The exercise panned out pretty much the same in Aol2 as in Aol1; students started out confusing the emotions of the user with the expression of interaction, then slowly realized what the task was about and started toying with ideas. E.g. one student, who feared the dentist and had gotten the emotion *hysteric* first made a small dentist's chair, i.e. trying to evoke the emotion – but not the interaction. After some clarification on this, she started over. Again and again one must give the example with the punching ball and the game.

A few standard solutions can possibly be discerned; e.g. one of the students designing *playfulness* again used a ball and a rope, as had a Aol1-student done. Both *energetic* and *hysteric* interaction were related to shaking things it seemed, whereas *jealous* interaction in all instances meant looking at the "forbidden" e.g. skimming through someone's pockets. Again, some words seemed harder than others (e.g. *boring* and *satisfied*), but again it is unclear if that really was related to the words, or just the students lacking inspiration.

Again, we ended with guessing contest, one in each feedback group. And again this resulted in some pretty interesting discussions, asking people why they had associated a certain word to a certain object. However some objects could have used a small instruction; that should be kept in mind. Also, that it is the interaction that should be guessed upon, not the object in itself. E.g. one student, Silvia Pfoser had designed *jealous* interaction by letting people go through the things in the pockets of a coat (a very well designed interaction) but the objects on the pockets were not so well chosen; for instance they did not belong together very well which resulted

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**Right:** Eelke demonstrating Weronica Tancredi's *hysteric* interaction, and Fredric Svensson demonstrating his own *urgent* interaction.



in a lot of speculating on what the owner of the coat was like. Similarly, she had put a toy cell phone into one of the pockets, which made people wonder whether it was just a toy or if it was to symbolize a real phone. Here, Silvia's well-designed interaction (going through pockets) was muddled by the unintended interaction of guessing and second-guessing the meaning of the objects. Other good designs in this course were two totally different designs of *urgency*; Fredric Johansson interpreted it as the interaction of acting quick but nervous, and designed a spiked ball that was very unpleasant to hold wherefore users tended to move it from hand to hand rather fast, whereas Patrik Björkman thought more of time-pressure and a high pulse, and created a complicated design that resulted in an egg falling down, the user having to reach very fast to catch it. Here again, some design details mattered. Patrik used a plastic egg in the demonstration, and later concluded that he should have used a real egg instead. Another good design example was for instance Kadri-Ann Valgeväli's design of *nervous* interaction; a mask onto which one should put lips and "cheeks", mimicking how some people touch their face when being nervous. Yet another good example is Weronika Tancredi's design of *hysterical* interaction; a woolen hat and gloves with sewn in, hidden, bells; in order for them to make some noise one had to shake one's hands and head vigorously. This design for instance mimics the interaction of a hysteric teen seeing her idol, or someone very afraid of bees trying to get rid of one.

A hard thing in supervising this task is to realize how far one can go in the instructions and intentions of the interaction. E.g. one could imagine designing a device that only works when the user laughs – happy interaction. But this is somehow too easy although it may sometimes be hard to explain why.

Nineteen MUD-cards were collected after this exercise, and there were a few general themes. Four comments were related to what Silvia's design (the coat with pockets filled with strange things) showed; that the teeniest detail affects how people perceive an object.

*"Very interesting exercises. [E]Specially the unintended results of a certain design."*

Overall the comments were positive, and they touched upon several aspects of the task.

*"[Insight:] The difference between 'expression of interaction' and 'expression of an object'."*

*“Difficult task, very challenging, and now I know better the difference between the interaction on one side, and the feelings it elicits on the other side.”*

*“Interesting exercise to think about what makes other people interact in a certain way. Gave me another point of view. Liked the exercise very much. Also to guess the others ‘feelings’.”*

## Reflection: *The Keeper*

This task forces students to think the other way around, starting with how the interaction in itself is and appears, and then adapting the object to it, i.e. *“function follows interaction”* rather than the other way around. This take is very unusual in interaction design (or any kind of use-oriented design); normally there is a product or a service with certain functions that are somehow thought-up first and then the interaction is designed in interplay with the design of the software or artifact.

Out of all the exercises described in this dissertation, I believe that this one is the best, and the students agree; in both course questionnaires this exercise was ranked the one they had learnt the most from. The aim “To explore how interactions express themselves, highlighting the difference between interacting in a certain way and experiencing something in a certain way.” is definitively met. I truly believe that this new angle – looking at interaction before function – makes a real impact, and I intend to keep the exercise with only minor changes, such as replacing some emotions.

An important distinction in this task is that emotions and interaction are not necessarily coupled. E.g. a person being deeply immersed in a good book may interact in a very distant and dismissive way whereas their inner emotion is joy, interest or intrigue. This is also what separates this task from *Designing for Emotion* (see pages 157 - 165); in that exercise the focus is to design interactions that make users feel – but not necessarily express – angst, whereas in this exercise focus is explicitly on how interactions express themselves as opposed to what users feel.

One may argue that this type of task is irrelevant because such a situation will never appear in real life, but firstly that is not an argument as to why students should not become aware of how interaction appears, and secondly my colleagues and I were recently asked to participate in the design of an Exploratorium, and in such cases you may well want to design such an interaction that make the users appear as if they are having fun. I told the students this example, which was important; in one of the portfolios a student wrote as follows.



*“Originally, I was quite unsure as to the purpose of the assignment. I understood what the goal of the assignment was; however, I did not understand why it was something worth attempting. [...but...] After having completed the exercise I was then enlightened as to why this is useful. Sometimes one does care how the experience seems to bystanders. [...] I now find this goal of designing for an expression of interaction incredibly intriguing.”*

## FACE...WHAT?!?

**Task in short:** To combine two given ideals in a Facebook-like design.

**Aim:** To explore designing for, and combining different ideals.

**Prerequisites:** Knowledge of what Facebook is and how it works.

**Time:** Between 8 and 16 hours, depending on how detailed the deliverables should be, and how much interaction there should be between the students.

**Organization:** This is a hand-over exercise, so students work alone, but as part of a chain

### The Exercise

This is a handover exercise. The task is to redesign Facebook – a social network where one can post comments about almost anything (typically ones ongoing life, e.g. “Still working on my dissertation...” or “It snows!”), read one’s friend’s comments and in turn comment upon them.

The first person comes up with a new vision, related to some aesthetic ideal, and suggests new or redesigned functions. The second person then expands the design by combining it with another aesthetic ideal, rewriting the vision, and suggesting new functions or redesigning existing functions accordingly. The added things must not contradict the first set of suggestions, but should build on them. Preferably the new suggestions incorporate both ideals. Then, it is the third person’s task, to merge the different ideals and wishes into one coherent design. Throughout the three phases, the designs are handed forward along a chain: A giving his stuff to B who gives hers to C who gives hers to D and so on, the last person giving his to A.

### Aol2: Combine... what?!?

This exercise was introduced in Aol2, and, being the first handover exercise any of us had experienced, some confusion arose. I had assigned half an







hour each for the first two phases, and this turned out to be too little. Also, students misunderstood the second phase. Instead of combining the first ideal with the second one suggested by themselves, trying to come up with functionalities that fit both or were at least not contradictory, several of them just added a new ideal and a new set of requirements without taking the first ones into account. This of course led to that some combinations were very hard to design, e.g. combining playfulness with criticism, commenting on people spending too much time on Facebook. Also, in the third phase, some students “stopped thinking” and just implemented the functions suggested without trying to come up with new ones (especially such ones that combined both ideals) that would make the design more coherent. After the exercise some of them spoke of this as a relief; they felt that they did not have to stand up for or motivate the design, just implement it, as they had been told. This approach may actually be the result of fatigue, since *Face...what?!?* was the last exercise in the course, but it is even so unwished.

Nevertheless, some interesting designs emerged. Patrik Björkman, for instance, combined Xu Tian’s wish for a happy Facebook with Kadri-Ann

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*Left: Patrik Björkman’s version of Facebook, slowly changing from happy to boring and hard to use as time runs by.*

Illustration by Patrik Björkman.

Valgeväli's wanted critique of people spending a lot of time on Facebook (see image to the left). Part of Patrik's solution was to start out with an extremely happy look& feel that slowly decayed into something that was gray, hard to read and hard to use. Meanwhile, Alexander Skogberg combined two critical ideals; Silvia Pfoer wanted him to highlight how and that users can see one's information, and Andreas Ropel added gender issues to this. Alexander adapted to this provocative theme. *"In general for my design I decided to be as stereotypical, judgmental and politically incorrect as possible"*. The result were two themes, one manly and one girlie (based upon the genders of the user's friends), i.e. a woman with a majority of male friends would get the manly theme. The girlie design featured a pink color scale, flowers, soft corners, a script-like font etc, whereas the manly theme featured black color, sharp edges and phrasing like *"What's on your mind dude?"* (instead of Facebook's *"What's on your mind?"*) and the relationship status "in a relationship" was phrased "screwing someone". Ads and applications too, followed these stereotypical themes. It'd be interesting to see how users would react to this; would one for instance try to get more male or female friends to get one of the themes? Another part of Alexander's design was to adapt to Silvia's wishes by smudging posts that had been read many times, and by leaving lipstick marks (female) or fingerprints (male) on photos when viewed.

Another take on privacy issues was Eelke Boezemann's, being inspired by Kadri-Ann Valgeväli and Patrik Björkman. Both had ideas on tracking. If choosing to track someone, their mouse movements are shown as lines on the page, and if they click to see a friend's page, one gets to see that as well. And, the other way around, if someone chooses to track you, their profile picture will be attached to your mouse marker. The only way to get rid of one's trackers is to log out.

Undoubtedly *criticism* was a popular ideal in this design. Another popular ideal was playfulness, implemented more or less well, either as lots of more games, or the possibility to challenge friends, but several students also incorporated drawing in their designs, e.g. that you could draw upon pictures, or that they had to draw/write their comments by hand, as suggested by Nancy Li.

The seventeen MUD-cards handed in were quite positive despite the initial flaws.

*"Fun and hard! Good exercise!"*

Seven of them commented on that it was hard to combine two ideals, both as something being hard and as an insight.

*"[Hard:] To really combine the two ideals in one and not implement 2 separate functions representing one each"*

*"It was hard to combine two suggestions from different people and satisfy them both."*

However six students also liked the change to design something specified by someone else, designing "for" them. During the feedback sessions we also discussed how this was more like real life that you often get contradictory wishes that you must either combine or else you must convince the client to give some of them up. Several students said that they liked this real-life aspect very much.

*"This is more like reality, which is good."*

*[Insight] How to combine different ideals. Take different wishes into account "*

Returning to the MUDs, several other comments dealt with possible improvements of the task; to prolong the time, to have extra mid-feedback sessions with the two persons specifying one's design, and to have only two steps, so that the person merging the ideals has a stronger incitement to combine the two ideals well. I do not really favor this last suggestion since it takes out part of the tension since one is no longer merging two other people's ideas and wishes.

## Reflection: Has Lots of Potential!

I believe this task has lots of potential, for several reasons. Firstly, it has an important aim, "To explore designing for, and combining different ideals." which is met very well. Secondly, it has these real-life aspects, using other students as clients. Thirdly, having to negotiate a design with others is something every designer must be able to do and as a side effect this task has elements of this.

However, it can be improved in several ways. To begin with it needs to be clear that the second step is really about at least partly building onto the already given ideal and ideas, not just adding another ideal that does not contradict it. Additionally the exercise needs more time than the six hours I assigned to it, possibly two days. The start-up time can also be shortened

somewhat by turning the first phase into homework. Adding more design time also means that the students can focus on creating a really coherent design in that they can spend time on a coherent look&feel as well.

In order to increase the quality of the design specs given, it can be clearly stated that the students need to come up with at least seven (?) suggested new or redesigned functions in the first phase. Also, students can get more time in the second phase, with the instruction that at least half of the given suggestions must incorporate both ideals. Consequently, the first part of the third part must be about selecting functions that will make it to the final design – not just take everything on without questioning it – as well as come up with functions, graphic design and interaction design that fit both ideals.

To increase student interaction and design negotiation, the first day should end with the designers meeting with their “clients”, negotiating their design with them. If the designs have been handed around in the entire class (A to B, B to C, C to D... X to A) this can be hard to arrange, in which case one may want to arrange smaller circles (A to B, B to C, C to A and, respectively, D to E, E to F, F to D and so on). In the latter case the three students in each circle can just meet and discuss all designs they have a say in.

Possibly, if one wants to make sure that the combinations of ideals work out, or if one wants to ensure that all ideals will be present in at least some of the final designs, one may want to force some ideals onto the students, either in the second phase (easy enough if the first phase is home work; then one knows the outcome of the first phase already) or in both the first and second phase; alas this makes the task more boring and forced, probably taking some of the creativity and fun out of the task.

## INFORMATIVE ART

**Task in short:** To design informative art according to a given artistic style.

**Aim:** To explore coherency and how temporal aspects affect expression.

**Prerequisites:** A couple of works from example artists, e.g. Mark Rothko, Frank Stella, Theo van Doesburg, Josef Albers (Hommage to the Square), Kenneth Noland, Barnett Newman. One can also read Redström et al” *Informative Art: Using Amplified Artworks as Information Displays*” (2000)

**Time:** Ca 4 hours with an animated prototype as deliverable.

**Organization:** Alone or – if not all students are skilled in prototyping (e.g. Flash) – in pairs.

This exercise is based upon a design experiment by Redström et al (2000), called Informative Art where common artist's styles are paraphrased as interactive paintings. I.e. data/information is affecting the appearance of a digital artwork. One example is a Klein clock (after the artist Yves Klein who painted a series of monochrome works), where information about time is mapped to color codes – the artwork thus has a different color at any given second, slowly changing its color as the day passes. The task has been a standard inventory in the Interaction Design Project course, and was also tried out in both Aol1 and Aol2.

## The Exercise

The task is to create an informative artwork and inscribe information into it – it can be the time table for the local buses, the work load of the building's printer or an advanced coffee machine (serving not only coffee, but also cappuccino, chocolate, tea, café latte etc.), or a weather forecast. The basis is some kind of abstract artwork whose parts and/or colors are carrying information, and when this information changes, the painting does. The change is of course dependent on temporal aspects (e.g. the paper in a printer runs out rather slow whereas what was “the latest cup of coffee” changes very abruptly. Note that the Informative artwork mustn't be easy to understand, but for those who know the rationale for design, it should be easy to decipher information. It should however, at any given time, look like a painting made by the original artist.

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*Below: Informative Art handouts.*



## AoI1: A Too Extended Version

The AoI1-students had done the easier version of this exercise in another course, and as a result they tried out an extended version where they instead of looking at another artist started out with creating their own abstract art style, and applying it to a weather forecast, the time table of the local bus stop, the coffee consumption at the ITU, or a printer's workload. Unfortunately, this led to the students spending lots of energy on creating their art style, rather than focusing on the "real" issues in the task; how to depict the information, how to update it, how the manner of updating affected the expression of the image etc.

They had to deliver a working prototype – of course not coupled to real data, but showing a realistic scenario. Unfortunately, some of the students dodged this issue by saying "Oh, I update every full hour and then I just re-render the image", which of course meant that they did not really consider what would happen if they allowed for some other kind of updating that would probably fit the data better. Luckily most students did not take this easy way out; good since the whole idea behind demanding prototypes is to make them consider temporality. When does "new" information come? Is it a continuous flow (weather) or discrete events (getting a cup of cappuccino)? Should one try to show a forecast (like which buses are supposed to arrive in the next ten minutes)? Which time span should be shown – the last hour, the last day, yesterday today and tomorrow? How should the update be carried out? Jerky? Smooth? As a transition over several minutes? All of these issues are highly interesting since they highlight the relation between temporality and expression. In this they help students to reach the intended learning outcome.

Students only half-heartedly engaged in this exercise, probably because the act of coming up with one's own art style ironically removes a lot of creative aspects from the exercises; it seems as if having to use an existing style is a creative constraint. Another drawback is that it can be hard to come up with a style abstract enough. E.g. one student created a beautiful type of "machine art" featuring spinning propellers, moving bolts etc. Unfortunately it was a bit too life-like; not every kind of information could be mapped onto it, as with a truly abstract artwork – it worked excellently well for wind speeds but not as well for coffee types for example. Thus it is better to force students to utilize abstract art already created by someone else.

A good example of how this task can turn out was Magnus Lorentzon's informative art showing printer workload, depicting how many and what



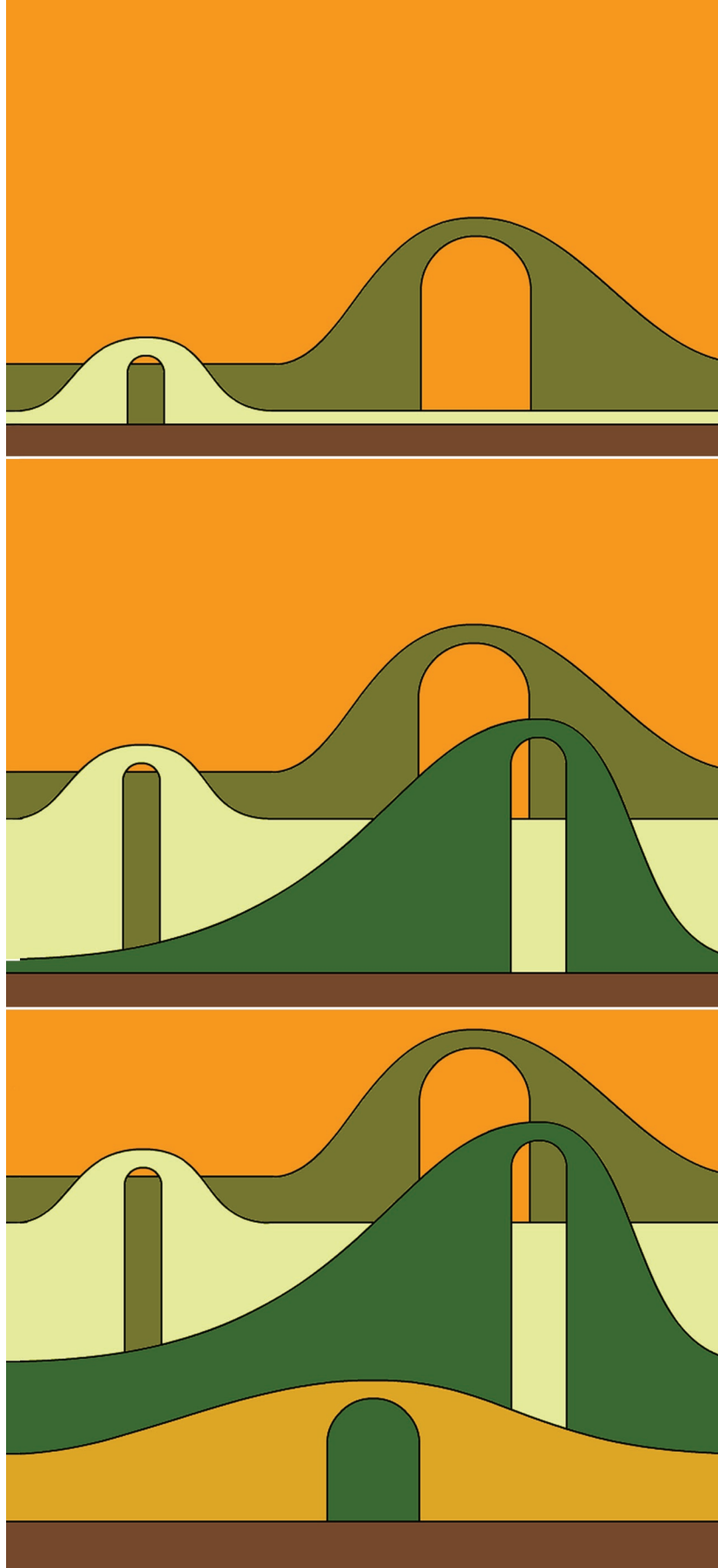
*Left: Magnus Lorentzon's own abstract art, showing a printer's workload.*

1) The ground symbolizes the printer queue. Each bridge represents a document already printed. The height of the bridge (as counted from its baseline) symbolizes the number of pages. The width of the inner arch symbolizes file size.

2) Now yet another document has been printed, apparently a text file taking up many pages but few kilobytes. By looking at the base levels of the bridges we can see that the first two documents were printed within a shorter time span than the second and third document.

3) Some more time has passed and a fourth document has been printed, this time a fairly big file with few pages – maybe a photo? Note that new documents grow up from the ground at the same pace as they are being printed whereas the already printed documents' bridge's move upwards at a certain rate.

Illustrations by Magnus Lorentzon, however – sorry Magnus! – the colors have been altered somewhat to work better in print.



kinds of documents have been printed in the last four hours (see description to the left).

## Aol2: Back on Track!

In Aol2, I went back to the original version of the task, and handed out four example artworks each from either Theo van Doesburg, Josef Albers, Frank Stella, Barnett Newman, Mark Rothko or Kenneth Noland to the students. Again, the students could choose to inscribe data from a weather forecast, the time table of the local bus stop, the coffee consumption at the university, or a printer's workload. They had to visualize at least four different parameters, changing over time, and a strict directive was that the painting at any time should look like a painting by "their" artist, i.e. not even in extreme cases could they deviate from the given form. This gave an additional focus of consistency to the exercise.

Now, the energy was spent on analyzing the painting, discussing which parameters they had at their disposal and how they could be changed and of course which information they could display. Of course it is hard to make natural mappings, but it is possible in some cases, e.g. bus lines are color coded in some cities, and a color printer does have ink colors as a possible parameter.

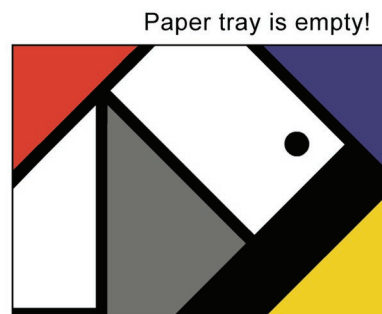
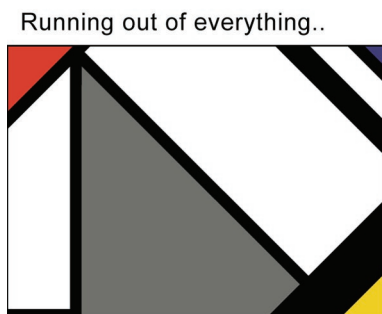
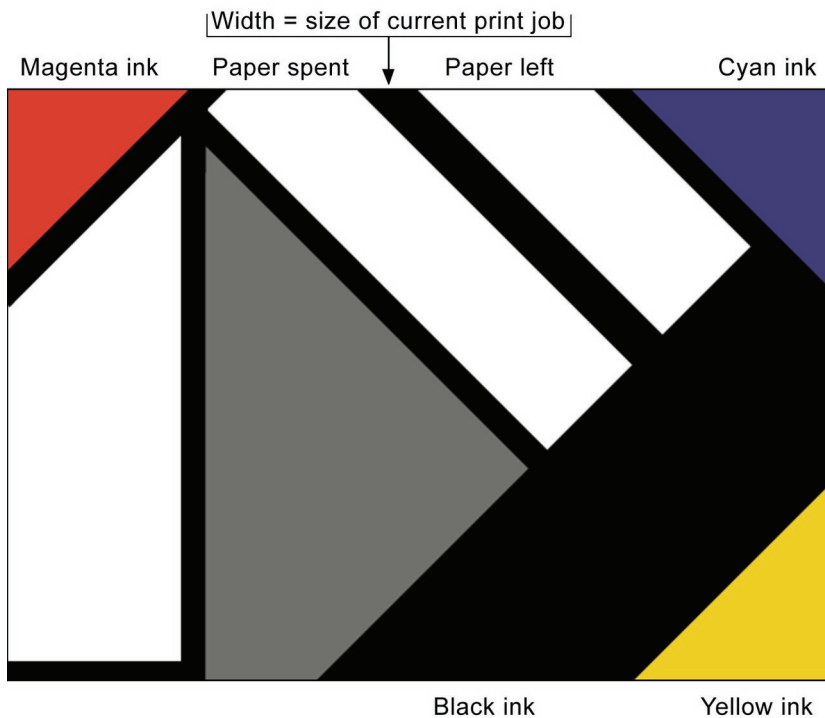
One example of the latter, and a very good design too, is Guy Lima's redesign of his Alexander Skogberg's and Patrik Björkman's original work. Utilizing the sparse coloring, triangles, occasional dots and tilted rectangles of Theo van Doesburg this informative artwork showed a printer load (see next side).

Again, supervision was very much about pointing out that the artist's style was to be mimicked – talking some students out of the use of an animated spinning globe on top of a Rothko painting! – and how the updates should look.

It seemed that the students' insights were more related to coherency than temporality. Of the eleven collected MUD-cards collected, only one mentioned time and temporality, but just as a comment that it was unclear whether the focus was on "time or artistic style". Instead several comments dealt with the issue of mapping as many as four parameters, and how to convey information with only colors and lines.

*"It was quite hard to represent all 4 parameters in a painting that is so abstract."*

*"[Hard] to create information using only different types of lines."*



Above: Guy Lima Jr's informative artwork showing the workload of a printer, too. Here, printer colors are mapped to colors on the painting, and the paper tray is mapped to a white area, divided by a black line that, moving towards the upper right corner shows how much paper is left and, via its width, the size of the current print job. The painting is carefully assembled in such a way that the different parts can slide in and out without affecting each other.

*"Fun to try to inscribe information into something that is really just supposed to look good."*

## Reflections: Needs a Tighter Focus

The good thing about this exercise is that it combines the need for coherency with design for temporality. However, the temporal part must be strengthened even further. Making a prototype definitely helps, but in order to really highlight the effects of temporality, the students should probably make more than one, focusing on different time spans. There's a huge difference in showing the coffee consumption over the last ten minutes as opposed to over the last year or week; first of all the temporal changes come across very differently, but secondly, one may want to show different things as well. If trying this out, one might have to consider the data sources. The ones I've used (a coffee machine, bus time tables, printer workload and users on a network) I've carefully tested over the years (the exercise has been part of at least two Interaction Design Project-courses) and they are chosen since they have rather rich data, that changes very often, and also because they do not require a lot of domain knowledge.

## THE NEW OFFICE ASSISTANT

**Task in short:** *To make a coherent version of Microsoft Words helping agent, the Office assistant.*

**Aim:** *To explore coherency.*

**Prerequisites:** *None.*

**Time:** *Ca 3 hours if the deliverables is only a concept sketch.*

**Organization:** *Alone or in pairs.*

## The Exercise

Here, the task is to create a better version of the assistant-personalities that show up in some software, Microsoft Word being the most common example (see next page). These assistants are not often very consistent or "logical", e.g. a real dog would never sit by a desk and take notes. Thus the task is to improve one of the existing Word assistants or design a new one and consider their behavior when the user carries out actions like *New, Save, Print, Find and Replace* etc. In addition, one must consider how this can be reflected in code, just not in animation. E.g. if the assistant is a UFO it would perhaps abduct files sometimes, which from a coding perspective

would mean that the files are transferred to somewhere else outside the computer, i.e. via Internet to some server far away.

## Aol1: A Need for Supervision

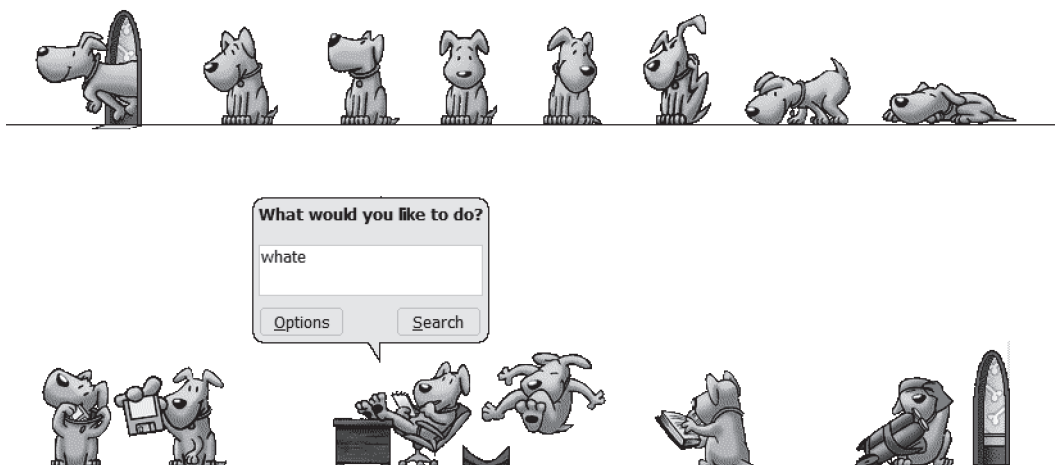
In Aol1, this was a portfolio task – unfortunately since the last demand – adapting code – was very hard for students to understand and since there was no supervision I could not explain it properly although I answered some questions per email. Nevertheless the task worked quite well, but all students displayed a lack of consistency in their designs. One of the main issues in this task – as it turned out – is to find suiting metaphors for the document and the text in it and no one quite succeeded in doing this.

At the oral presentations concluding Aol1, several students mentioned working with this design, which at least indicates that the design process was intriguing for some of them.

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*Below: The dog-version of the Office Assistant. The upper row shows some normal dog behaviour, like appearing from the doghouse, looking in different directions depending on where the cursor is, occasionally scratching himself, or falling asleep.*

*The second row however shows a lot of non-dog behavior. E.g. it produces a diskette from under its collar to illustrate the Save-action. When invoking Search, it first takes a note on what you need to find out, and then collapses the desk in a very odd way in order to (seemingly) run and find the answer to the question. It also sometimes skims a book. Lastly, and for unknown reasons it every once in a while produces a fusing burner with which it incinerates its doghouse.*



## Aol2: Finding and Replacing

In Aol2, this exercise took place after the lecture on consistency, and consequently had a much stronger focus on coherency, than on personal-ity. The students chose their animals rather quickly, set out to come up with behaviors for the different actions, came to *Find and Replace* and... crashed! To some I had to point it out, but to several it was obvious that they could not design this in line with their earlier suggestions, so they started over, trying out new animals. Most (all?) realized that in order to achieve consistency, they had to decide what the document was; it could either be the animal in itself, or something associated with the animal, e.g. a bird's egg, or a nut collected by a squirrel. Regardless, the *Find and Replace*-issues remain, since only a part of the document is being replaced. A couple of students approached this in a crude analytical way, stating: *"Okay, the rough part is the Find and Replace, we need to find an animal that replaces parts of itself or something"*. Unlike everyone else, who designed one animal (sometimes with an item) these students ended up with designing several animals; a pride of lions, a pair of cheetahs, and a gang of gorillas. Here, the group symbolized the document, and for *Find and Replace*, typically a new member was found, expelling another. For different strategies on how to depict the different functions, see the table on the next page.

Having *Find and Replace* as one of the functions was a deliberate choice since it really pinpoints the entire coherency issue. First of all, it's really hard to find an animal and metaphors that work, illustrating this point. Secondly, it raises another issue: how far should coherency be pursued? Is it better to be entirely consistent (sometimes according to a rather unknown animal behavior, e.g. turtles losing parts of their shell, so called molting) or to break consistency slightly in order to make the animation easier to understand? We of course discussed this at length in the feedback session. Another interesting issue was the different interpretations of *Print* and which one may be closer to the user's mental model; creating a copy of the document (offspring or a shed skin), having the object or animal representing the document seemingly leave the screen for a while, going off to the printer, or to use word play and let the animal make foot prints?

Apart from using a group as metaphor for the document, there was one other solution – rather unusual and creative – that differed from the general solutions mentioned above; Andreas Ropel used ants as the assistant, ants whose anthill was made out of letters. Consequently, *Save* is to drag



<b>Action</b>	<b>Animal represents document</b>	<b>Item represents document</b>
<i>New</i>	The animal appears on screen, sometimes as new born (e.g. chick coming out of egg.	The animal lacks the item representing a document, and finds one, e.g. a dog finding a bone.
<i>Save</i>	The animal falls asleep or hides (e.g. a turtle retracting into its shell)	The item is somehow saved or hidden, e.g. a hen carefully placing eggs in the nest, or a dog burying a bone.
<i>Open</i>	The animal wakes up or comes out; typically the inversion of save.	The item is retracted, e.g. the dog digging up the bone. Here, many bird-assistants “opened” the egg, which gets inconsistent; how can the chick then be saved?
<i>Print</i>	The animal makes foot-prints, moves “away” from the screen (metaphorically moving “away” to the printer), leaves part of itself behind as time-stamp (e.g. a snake shedding its skin).	The item is carried off screen (metaphorically moving it “away” to the printer). Offspring is created, e.g. cheetahs mating or eggs hatching, and the pup/chick leaves the screen.
<i>Find and Replace</i>	The animal finds and/or replaces parts of itself, e.g. a snake shedding its skin, a bird plucking a feather. Or, the animal finds and replaces something else, e.g. finds a new nest. Slightly inconsistent.	Typically the entire item is being replaced, e.g. a squirrel finding a new nut. Slightly inconsistent.

*Above: Strategies for depicting different Office Assistant actions.*

all letters in the document to the anthill, *Open* is to drag them out from the anthill onto their places, *Print* is to drag them to the printer symbol, *Find and Replace* is the entire colony swarms over the document, looking for the searched word, dragging all of them away and replacing them with words from the anthill. By placing his animal in the digital environment of the document Andreas solved the *Find and Replace*-issue, but instead got problems with *Print*.

In conclusion, the exercise worked well, except for a lack of focus on coherency in coded behavior; not all students took this into account, even if some did. E.g. there was a turtle search algorithm that was very slow but thorough, and a very fast cheetah-search algorithm. Nevertheless he Aol2-students seemingly enjoyed the struggle with this exercise, and out of the sixteen MUD-cards almost all discussed some aspect of coherency, especially the issues with *Find and Replace*.

*"[Hard:] To find an animal that suits every action. And to find a solution for Find and replace."*

*"The hard thing is to be able to think [about] something with its normal behavior and apply it on software behavior."*

*"Hard to know how consistent we/design should be. Is there some rule how to decide trade-off between how clear the design should be and how consistent it should be?"*

## Reflection: Needs Added Focus on Code Behavior

I find that this task is excellent for practicing design for coherency, especially since it also questions the need of clinging to consistency in absurdum. The intended learning outcome "To explore coherency." is however only halfway met; in order to keep the part related to programming behavior one must put more emphasis on this. Personally I'd prefer that since that provides a very strong link to the interaction designers' special design material; the code. It is possible that this aspect might work better as a class exercise so that the whole code-issue could be thoroughly explained and discussed.

In order to make the task more focused, descriptions of the behaviors should be sufficient, unless one wants to turn this into a larger task, in which case detailed animations (practicing consistency in appearance and movement) have their place.

It is also worth noting that whereas the Aol2-students got a fixed list of actions – which was good for the sake of comparison – the students in Aol1 got a semi-fixed list of actions; *Save*, *Print*, *Ask a question*, *Find* and *Replace* plus two other actions of their own choice. Offering some free actions makes the task easier, since one can choose an action that fits the animal. Then again, one does not want to have students desperately looking through all the actions of Word in order to find something that fits their animal. A possible solution to this is of course to ask for, say, the actions *New*, *Print*, *Find* and *Replace* and two more from the following list: *Open*, *Save*, *Save As*, *Close*, *Search* etc. Regardless if a fixed or semi-fixed list of actions is used, *Find* and *Replace* should be a requirement.

One student suggested that the exercise could be done like a class discussion in a shorter time, because he or she found that most of the learning took place in the feedback session, but I am unsure as to whether the lesson will really be learnt without spending an hour on finding the perfect *Find* and *Replace* animation.

And, as a final side note, there is at least *one* animal that can be used to symbolize the document in itself in a consistent way; the hermit crab.

- New: newborn, crawls into an empty shell
- Save: hides in shell
- Open: comes out of shell
- Print: any one of the following three metaphors
  - propagates (females usually lay their eggs shortly after copulating, but they can also store sperm for many months); the spawns swim off – however this is quite close to “new”
  - makes foot prints across screen (word play with “print”)
  - leaves screen and comes back; close to some user’s mental model, that the document “leaves” to go to the printer.
- Find and Replace: searches for a new shell to live in, finds one and changes shells.

# THE SCHIZOPHRENIC IPOD

**Task in short:** To combine different notions on interaction, here from Landin (2009) and Löwgren (2002).

**Aim:** To explore how various aspects of interaction can affect design.

**Prerequisites:** Being familiar with Landin's (2009) and Löwgren's (2002) views on interaction.

**Time:** Ca 3 hours if the deliverables is only a written description.

**Organization:** In groups of four or five.

## The Exercise

This exercise deals with combining some of Landin's interaction forms (Landin 2009) with some of Löwgren's use qualities (Löwgren 2002, Löwgren and Stolterman 2004), using them as inspiration for redesign. The object to be redesigned is an mp3-player, e.g. an iPod. Students work in groups of four or five, and each student gets an interaction form (we used fragile and magical) or use quality (we used playability, personal connectedness and in case of a fifth student in the group pliability) that they need to bring to the design. The groups split up in two parts, design one iPod each and then regroup as follows:

### First design session

- Fragile interaction form + playability (and possibly pliability too)
- Magical interaction form + personal connectedness

### Second design session

- Fragile interaction form + personal connectedness (and possibly pliability too)
- Magical interaction form + playability

## Aol2: A Design Method?

Since Landin's and Löwgren's concepts were added in Aol2, this exercise was only used in Aol2. The exercise followed after the lecture covering Landin, Löwgren and Lim et al (2007), and the concepts hadn't had time to sink in yet; this was also before the literature session with questions on these texts. Thus, there was some confusion in the beginning when everyone tried to get a grip on their assigned form/quality. This, together with the fact that it only covers a few interaction forms and qualities is a weakness of the exercise.

One interaction form that did not work that well in the exercise was fragile form, i.e. when an interaction does not result in the expected function. In most cases it was just implemented as sudden crashes or different types of malfunctions. *"Yeah so we had to make it fragile, so we decided that it crashes whenever x happens..."*. The best fragile design was probably that of a singstar-ish iPod, where a song is being deleted lest the user sings along (well enough) for awhile; this may turn fragility into thrill. Adding playability seemed to be inspiring, resulting on lots of more or less intriguing games related to music (singing along, guessing songs, and answering trivia questions about songs). Personal connectedness too, affected design strongly, making it possible to push music to others, get music from others or – with a twist – you need to stalk a person in order to listen to his or her music.

Although the students seemed to like the exercise when doing it, they saw it more as a design method than a means to get acquainted with Landin's and Löwgren's notions. Some MUD card comments were as follows:

*"Fun way to create features!"*

*"Interesting and fun to discuss and combine such different aspects."*

*"Great exercise for coming up with cool and new ideas."*

## Reflection: Needs a Tighter Coupling to Literature

This exercise may work better in clarifying how different aspects or design choices affect the final design, rather than explain Landin's and Löwgrens notions. However letting the students read and reflect upon the texts before the exercise will most likely strengthen his part of the exercise.

As already mentioned when discussing Design the Apple, (see pages 166-170) that exercise may be improved by letting students analyze software in terms of Lim's (2007) gestalt attributes and then transfer these gestalt attributes to a bike or phone. Then, in order to teach Landin's and Löwgren's notions as well, the iPod-exercise could be changed in such a way that one analyzes the iPod in Löwgren's terms, and then designs four variants where one toys with these qualities, making them stronger or weaker, seeing how this affects the interaction form and the expressions of interaction as described by Landin. This improved version does require that the students are quite familiar with the concepts, e.g. via lectures and/or literature sessions of some sort. Another version would be to as-

sign all groups different combinations of use qualities and/or gestalt attributes and/or interaction forms and then compare and discuss results more thoroughly.

## Footnotes

- 1 Bruce Tognazzini's First Principles of Interaction Design:  
<http://www.asktog.com/basics/firstPrinciples.html>
- 2 Project descriptions of Dunne and Raby's envisioned future robots at Dunne & Raby's website: <http://www.dunneandraby.co.uk/content/projects/10/0>
- 3 Jakob Nielsen's Alertbox can be found at:  
<http://www.useit.com/alertbox/>
- 4 Lev Manovich's page on Infosthetics can be found at: <http://www.manovich.net/1A/>
- 5 Project descriptions of Dunne and Raby's *Do you want to replace the existing normal?* at Dunne & Raby's website: <http://www.dunneandraby.co.uk/content/projects/75/0>
- 6 Stelarcs website: <http://www.stelarc.va.com.au/arcx.html>
- 7 Stelarcs project The Third Hand: <http://www.stelarc.va.com.au/third/third.html>
- 8 John Dewey, who suggested pragmatist aesthetics, was also a very influential educator, coining the expression – and philosophy – “Learning by Doing”.
- 9 J.P. Djajadiningrat is sometimes credited as T. Djajadiningrat.
- 10 More about Droog design can be found at the company website:  
<http://www.droog.com/>
- 11 Using MUD-cards (Most Unclear Discussion) means that at the end of class, students get three minutes to comment on one or two questions like “What I learnt today” or “What I would like to learn next time” or “What I did not understand today” (cf. Biggs 2003, p. 195). The latter are sometimes called MUD-cards.  
(Cf. [http://www.cdio.org/tools/ikit/ikit\\_tandl/reports/mudcards.pdf](http://www.cdio.org/tools/ikit/ikit_tandl/reports/mudcards.pdf))
- 12 Bembo's Zoo is a playful site where animals are built using letters in the animal's name. <http://www.bemboszoo.com/>
- 13 Lim et al (2007) were already a part of Aol1.
- 14 Kurt Cobain was the singer of the grunge band Nirvana, selling some fifty million records worldwide. During the last years of his life Cobain struggled with depression, illness and a drug addiction, and at the age of 27 he committed suicide by shooting himself in the head.
- 15 A Chinese portrait is, I believe, a French game, it's simply to ask “What if ‘x’ was a ‘y’...” and it can be used in interviews, personality tests or, as in this case, as a means to get inspiration for design. As far as know it is not known under any more well-known name.



# TEACHING AND LEARNING AESTHETICS OF INTERACTION

*Here, I present my findings, discussing the benefits of teaching interaction, temporality and aesthetic ideals. I also discuss how the exercises can be reused by others. Lastly I suggest a possible syllabus for teaching aesthetics of interaction.*

## PART V



Again, I wish to point out that my research is not a comparative study, but rather an exploration. The aim has not been to find a teaching approach that is superior to another in every respect, but rather to examine alternatives. It is however, an action research project and as such it is a systematic attempt to improve my own teaching practice. One of the main outcomes of this problem-solving exploration was the alternative approach to teach aesthetics of interaction in the form of aesthetic ideals. This approach was later implemented in the second version of the course and evaluated by using a triangulation of empirical data (observations, handed in material like exercises and literature answers, MUD-cards and a questionnaire). Based on the positive evaluation, I will in this section discuss its benefits and drawbacks in detail, ending by suggesting a possible syllabus for teaching aesthetics of interaction.

One might question whether the various elements of the course have been explored to such an extent that it is relevant to share the findings. The course is by no means perfect – it never will be – despite the high grades it got from the students (see the course evaluation in the Appendices), and I will probably fine-tune the exercises and the exercise collection for several years. I am guessing that 2-3 more iterations are needed until the various parts have been fine-tuned – for my context. For another context however, this additional fine-tuning may not help. Hence, it may be better to start out with the various suggestions to improvements/changes that I suggest here and skew the various parts towards one's own needs and one's own students.

We can also look back at the theoretical justifications for the general layout of the course; constructive alignment and common praxis as described in *How Designers Teach* (Baumann 2004) as summarized on pages 57-73. Several of the common design teaching methods have been used, e.g. practical work in the form of exercises, giving and getting feedback in different ways, theory in the form of lectures, readings and discussions. The course was also constructively aligned as described on pages 53-55 and 85-87. This in itself guarantees that the suggested syllabus presented later in this part is based on solid research.

Looking back at my work over the last few years, in which I've learnt a lot about aesthetics, interaction and the practicalities of teaching it, there are four conclusions, or rather contributions I think I can make, which are all related to my research questions why, what and how.

- Firstly, that we – and our students – need a solid understanding of our design materials. Here, a good start is to acquire a vocabulary for discussing different aspects of interaction and temporality.
- Secondly, that the concept of aesthetic (design) ideals is a neutral and helpful way to discuss aesthetics and aim for a certain aesthetics
- Thirdly, that students need to be aware, not only of the aesthetic aspects of design in general, but also of how different aesthetic ideas or ideals open up new design spaces, enriching design.
- Finally, that the design exercises I suggest can be used as tools to highlight diverse aspects of design materials or to practice design for certain aesthetic ideals.

The first and third point address why it is interesting for students to learn more about aesthetics of interaction. The first and second points address what could be part of such a course; materials and ideals. The last, and to some extent the second point suggest how to teach aesthetics of interaction. In this final chapter I will discuss these findings, ending with a suggested possible syllabus.

## KNOWING THE MATERIALS

I have argued that interaction design above all is about “shaping” the two materials interaction and time into reaction, interaction, behavior (see pages 30-34). Normally, we learn about materials by using them, seeing them in action and describing them when talking about them. Unfortunately most of us lack a common vocabulary when it comes to interaction per se and temporal aspects. This may not be important when designing, but whenever discussing, analyzing and to some extent also reflecting on design, a conceptual framework is needed.

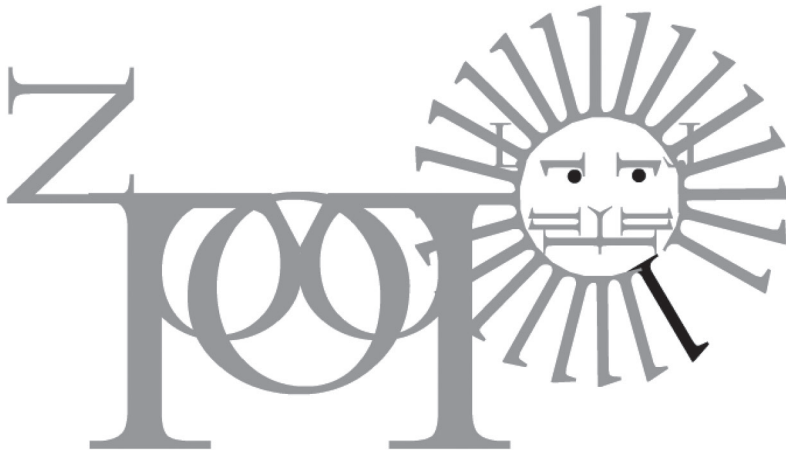
Acknowledging this need for a shared vocabulary on interaction I gave my Aol2-students texts by Landin (2009) discussing forms of interaction and expressions of interaction, Löwgren (2002, 2007a, 2007b) and Löwgren and Stolterman’s (2004) suggested use qualities and Lim et al’s (2007) interaction gestalt attributes (cf. pages 35-40 for a more thorough explanation of these three approaches). Once we had gained this shared terminology we could use it to describe and analyze design; in class we analyzed Google and Bembo’s Zoo<sup>1</sup>, in relation to literature questions students applied Landin’s concepts to their own Design the Apple-design and looked for applications displaying Lim et al’s attributes. Also, students

were encouraged to question the attributes – are all necessary, are some missing? Further, some of Löwgren’s use qualities were combined with some of Landin’s forms in different configurations in the exercise *The Schizophrenic iPod*, resulting in a series of designs where the influence of these could be compared. In this way, the terms were not only theoretical constructions, but something that could be applied, used, questioned and elaborated.

Arguably, there are other texts that one may want to use, e.g. Rullo’s (2007, 2008) soft qualities of interaction if interested in aesthetics of ambient computing, or Lim et al’s (2009) reduced list of gestalt attributes coupled to emotions, or one may want to apply Hallnäs’ and Redström’s (2006, pp. 77-99) idea of acts being what defines intended use. My rationale for the selection of texts was how well they complement each other, offering different perspectives that sometimes overlap. E.g. Lim et al’s gestalt attributes differ from the others since they are instrumental to their nature; each attribute is described as a dimension with two extreme end-points, e.g. Resolution being somewhere on the scale from scarce to dense. Some of Löwgren’s qualities are similar to Lim’s in that respect, e.g. *Control/Autonomy*. Having such a scale can simplify design decisions, given that the properties are rather easy to assess, as are most of Lim et al’s attributes. Here, we can quite clearly see how a certain design decision affects the interaction, e.g. changing *Pace* from slow to fast.

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*Below: Bembo’s Zoo<sup>1</sup> is a site where animal’s names (in this case “Lion”) are turned into the animal in itself in a rather intriguing way, using the letters as building blocks. The site can be used to illustrate Löwgren’s concepts Playability and Surprise, or Landin’s concept Magical form.*



Löwgren's collection, albeit covering many aspects of interaction and use, is rather sprawling, ranging from emotion-related qualities like *Playfulness* and *Seductivity*, to value statements like *Elegance* and *Relevance*, to interaction-related qualities like *Control/Autonomy*, *Pliability*, *Transparency* and *Fluency* (hardly surprising the latter qualities are the ones most alike Lim et al's) and with a couple of things in between. This is at the same time both a strength and a weakness; Löwgren's terms are easy to understand and cover a wide area, and are thus very useful for discussing and describing interaction, or the experience of it; the renaming from "use qualities" to "experiential qualities" also suggest this. On the other hand, this makes them harder to use as design tools, and if they are to be seen as design tools (which is not the intention) a whole lot of tools are missing. Landin in turn, leaves the design tool even further behind in her wish to help us acknowledge more unintended aspects of interaction. As Landin's concepts are tools for analysis, reflection and questioning of a design during the design process, they may indicate the need to steer a design towards a more wished expression or form without explicitly explaining how to do this. Then again, neither do Löwgren nor Lim et al.

If comparing all three texts, they can be grouped in several ways. For instance Landin acknowledges how the design of the artifact, and the qualities of the artifact affect interaction, whereas Löwgren's base point is how the user experiences the artifact (hence the name use qualities or experiential qualities). Lim et al discuss interaction gestalt as something that arises when the user interacts with the artifact, but still propose changing artifact attributes in order to change interaction, being closer to Landin in this respect. In another aspect Löwgren is serving as a bridge between Lim et al and Landin; it has already been mentioned that some of his qualities could have fit (or do fit) in Lim's collection whereas others may just as well be described as different expressions of interaction, e.g. *Seductivity* and *Playability*.

As for temporality, it was only addressed in one text, Lundgren and Hultberg (2009), since most other texts on temporality either discuss it in terms of dealing with consequences of timely issues or discuss time as a means to achieve a certain effect or just acknowledge time and temporality as being inherent in interaction design (see pages 41-48). In contrast, Lundgren and Hultberg set out asking what happens if using time a basis for design, introducing the notions *Live Time*, *Real Time*, *Unbroken Time*, *Sequential Time*, *Fragmented Time* and *Juxtaposed Time*. These concepts were explored in a lecture with an additional class design exercise, as well

as in two literature questions. Also, the exercise *Informative Art* is related to temporal issues. Again, the concepts were used to point out these different aspects of time, analyzing them, applying them, exploring them and questioning them. E.g. a couple of students suggested *Looped Time* as a possible new concept.

The point is that – regardless of the choice of texts – the means of giving students a palpable, useful, understanding of these frameworks is related to letting them acquire them, conquer them, by applying and questioning them. The important part is actually not to teach students the frameworks per se, but to use them as a means to show that interaction and temporality in themselves can be discussed, analyzed, modeled, looked upon from different angles. It is simply a matter of making the students aware of their design materials.

## UTILIZING AESTHETIC IDEALS IN DESIGN

When it comes to the current views on aesthetics of interaction, as presented on pages 20-30, we can draw the same conclusion as Pye (1978) did some thirty years ago:

*“It need not surprise us, either, that people do not unanimously agree about what is beautiful and what is not, for they do not unanimously agree about anything whatever.”*

– David Pye in *“The Nature and Aesthetics of Design”* (1978, p. 101)

Pye however also states that although we all may have different ideas on beauty and aesthetics, we can still discuss them, having a fruitful exchange of ideas (Pye 1978, p.99). This is one of the reasons for suggesting the aesthetic ideals; to serve as support for discussion, pointing out that there is more than one view on aesthetics in the world.

Consequently, I have discerned and presented six aesthetic ideals; *Criticism*, *Efficiency*, *Sensing*, *Emotions* and *Playfulness*, and the overarching ideal of *Coherency* (see pages 101-125). I wish to stress that it is important to see these ideals as aims for design; they are what the designer hopes to achieve, serving as a basis for coherency and as such



a guide through the numerous design decisions in a project. My taxonomy therefore takes a different approach than that of Udsen and Jørgensen (2005), whose taxonomy instead builds on the theoretical background for an aesthetic approach. Albeit useful in some aspects, it is not very helpful if one wants to aim for a certain outcome; it may not be obvious in which of the approaches ideas or design methods can be found. The latter is also a reason as to why examples from other disciplines have been included in the description of the different ideals. As such they serve two purposes. Firstly they validate that a certain ideal is strong enough to appear and reappear in different disciplines and contexts, which thus makes it more interesting to explore. Secondly they can also add design examples, ideas and design methods that can be applied onto interaction design as well. E.g. Jordan's (2000) work on designing for pleasure is aimed at industrial design, but there are no reasons whatsoever that his ideas cannot be re-used in other disciplines; after all they deal more with general analysis and attitude rather than specific design solutions.

Notably, Bardzell (2009), who sees aesthetics as a philosophical discipline above else, criticizes how in interaction design very often "a single concept or idea is borrowed from aesthetics or critical theory and applied in the context of interaction design." (Bardzell 2009, p 2358). Bardzell points out that this can be a good approach for the particular design cases described, but also can be very limiting if adapted to any design case; much of the aesthetics-related work in interaction design is just a pragmatic way to solve particular problems, according to Bardzell. Then again, Bardzell also notes, the few experts on aesthetics that discuss computer theory often focus on new media, not engaging in interaction design specifically (again proving the point that this dissertation might be useful). Arguably, Bardzell has a point in that a certain design solution, or aesthetic ideal for that matter, cannot work in all projects. However that is not the point with the ideals; it's not like a designer must commit to one ideal always; ideals change from project to project. As a matter of fact labeling the ideals as just that, aesthetic ideals, rather than just aesthetics, was a deliberate choice in that it indicates that there is not just one ideal, one aesthetics (which some papers on the topic actually suggest), but rather a diverse variety.

When it comes to teaching especially, the ideals-view can be helpful as a means to de-mystify the whole aesthetics-issue. For instance some people – who believe they lack artistic skills since they cannot draw – also believe that they are not able to discuss aesthetics. *"I don't know anything about*

art.” they say, or “*I can’t draw.*” The aesthetic ideals help clarifying that aesthetics is not about visuals only and that it is not about art, but rather about coherency and having a clear goal for one’s design decisions. Interestingly, the aesthetic ideals to some sense serve the same purpose as the conceptual frameworks on materials do: they give students awareness about different aims of design and how to attain them.

Secondly, seeing ideals as aims of design gives them a practical value, since they can be helpful in the design process. Actually, they can be seen as an initial part of it. Jones (1992) lists the stating of objectives as one of the divergent design methods; by identifying the situation of use, the sponsor’s expectations, available and the essential objectives, one sets the design space (Jones 1992, pp. 194-200). This also suggests or implies a suitable aesthetic ideal. E.g. if designing a game *Playfulness* is most likely an implied ideal whereas if designing a wheelchair for small children the design space can suggest designing for *Efficiency* as well as positive *Emotions* and/or *Sensing*. Since Jones points out that the objectives mustn’t be contradictory it is important to rank the ideals if there are several. In the wheel-chair example *Efficiency* is probably the primary ideal whereas *Emotion* or *Sensing* is a secondary; as a matter of fact *Sensing* can in some designs be a means to attain *Efficiency*.

The fact, that a design can be subject of more than one ideal needs to be discussed further. Partly, this issue is related to the fact that the ideals, as described, are rather over-arching. Of course more granular distinctions could have been made, e.g. separating pragmatism and somaesthetics from the aim to design for richer physical interaction. However, these aims may still have many things in common, e.g. designing rich physical interaction will most likely support a somaesthetic experience, which in a sense makes them inseparable. The latter shows that the ideals cannot – anyhow – be separated from each other entirely; they must be allowed to interplay. To some extent the ideals can be seen as flavors that one aims for in design, and as such, they can be combined for a better result. As already mentioned, *Coherency* can be seen as an over-arching ideal, an ideal that is attained by coherently designing for another ideal, which in turn is strengthened by *Coherency*.

To shed some light on this, exemplifying, the following conceptual map has been drawn, including designs and designers, taken from the descriptions of the ideals. Arguably it is somewhat strange to list designs, of which we do not have the slightest ideas of the designer’s actual aim, e.g. all the examples from art history. What do we know about the intended playful-

Hallnäs & Redström (2002, 2006)  
Janlert & Stolterman (1997)

## COHERENCY

*Aiming to create a coherent whole.*

*Consistency as a basis  
for usability/efficiency*

## EFFICIENCY

*Aiming towards an  
efficiently  
functioning artifact.*

Cooper et al (2007)  
Nielsen (1994, 2000)  
Preece et al (1994)  
Shneiderman (2004)

STATIC!

## CRITICAL DESIGN

*Aiming to highlight,  
question or criticize.*

Backlund et al (2006)  
Dunne (1999)  
Dunne & Raby (2001)  
Hallnäs & Redström (2006)

## EMOTION.

*Aiming to evoke emotional responses.*

Jordan (2000)  
Norman (2002, 2003)  
Overbeeke et al (2002)

## SENSING

*Aiming for rich physical  
interaction, often  
coupled to  
a mental experience*

Fiore et al (2005)  
Petersen et al (2004)  
Shusterman (2000)  
Schiphorst (2009)

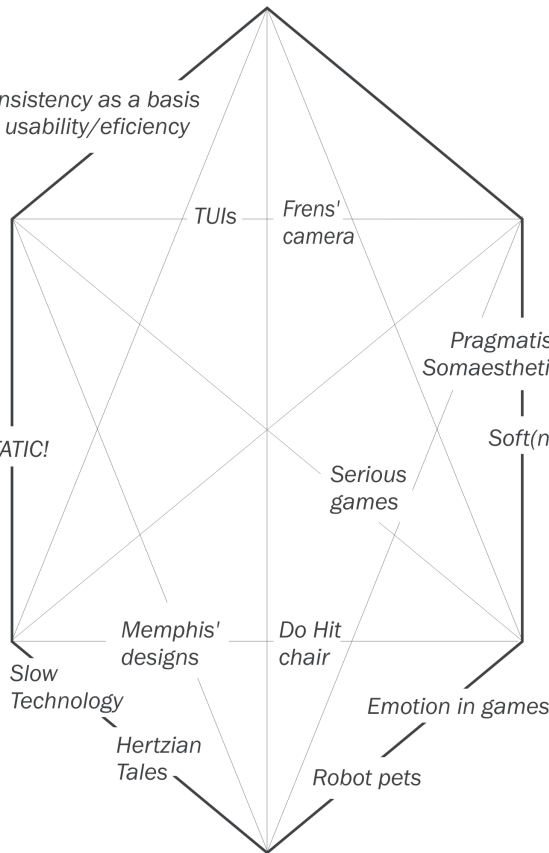
Frens (2006)  
Djajadiningrat et al (2000,  
2004, 2007)

## PLAYFULNESS

*Aiming towards, play,  
intrigue and tempting  
challenges*

Lundgren et al (2009)  
Lundgren (2006)  
Järvinen (2008)  
LeBlanc (2006)

Petersen et al (2004).



*Above: The six described aesthetic ideals and their relations.*

ness in the *Do Hit* chair? However, these designs can still serve as examples of a successful *Playful* artifact, and when designing for Playfulness we can draw from them.

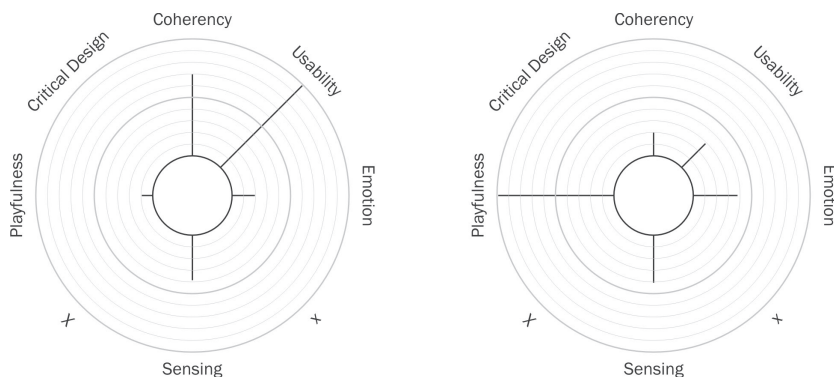
In addition, one must remember that these are not by any means the only ideals, just some of the prominent ones. Of course there are others, e.g. designing for sustainability, security or the fast-rising ideal of designing for social interaction. Albeit valid aesthetic ideals for any interaction designer these have not been included in this text for several reasons: firstly that they do not have a body of researchers discussing them in terms of aesthetics, secondly that researching backgrounds, giving design examples from other disciplines (far from art and industrial design, which happen to be part of my personal knowledge-base) simply became a too overwhelming task for this dissertation.

Taking yet another step further back, exploring the relations between the ideals we can discern some even larger areas of design; design for **efficiency** (encompassing *Efficiency* but also usability) design for **exploration** (encompassing *Criticism* but also other types of explorations, e.g. the testing of new design methods or materials), and lastly design for **experience**, which encompasses *Emotion*, *Playfulness* and the different aspects of *Sensing* (pragmatism, somaesthetics and tangibility).

## FUTURE WORK

As has already been pointed out, it would be interesting to supplement each ideal with possible design methods and other tools, e.g. for analyzing the emotional response towards an artifact, or the playfulness of a game. For some ideals, e.g. *Efficiency* there are an abundance of such tools, whereas *Criticism* has hardly any, again quoting Dunne and Raby (2007). *“It is more of an attitude than anything else, a position rather than a method”*. This, together with identifying and describing other overarching ideals (e.g. social interaction) would be a promising research path.

Moreover, an idea on something called *“The aesthetic sun”* has emerged during this work (see figure on next page). It is a simple tool aimed for inculcating that aesthetics is an *aim*, rather than something added afterwards, and it also acknowledges that some designs incorporate more than one ideal. It is simply eight scales/rays joined in a sun (the six ideals plus a seventh and eighth of one’s own choice. In the initial design process one states the importance of each ideal on the scales, thus expressing one’s



*The aesthetic sun for The Interactive Quilt (cf. Lundgren 2006, pp. 35–52, Lundgren et al 2003). This was a combination of a quilt and a jukebox, its textile patches serving as buttons. Initially our idea was to create the perfect usable intuitive interface; the fabric should help the user intuit which genre of music it was coupled to. Thus we aimed for Efficiency, partly using Coherency (in the coupling fabric- music genre) as a means. Although we anticipated some Emotion, aiming for enjoyment and appreciation, it was not the main target, whereas Sensing – the enjoyment of looking at an touching the fabrics was indeed a goal. However, people’s conceptions of music, music genres and fabrics differ greatly, and our final artifact was a very ambiguous one which, as it so happened, amused the users, encouraging them to Play with it, exploring it, trying to find out “what it did”. It was only Usable and Coherent in the sense that yes, if you pressed a patch you heard a new song, and this in itself was easy to understand. Note how the different suns clearly show how the intentions very much differed from the final result.*

intentions, and finally, one analyzes the final design accordingly. As such, it serves as a tool for internal measurement and reflection, however assuming that the designer is honest enough to acknowledge his or her mis-designs. However the final assessment could also be made by someone else, as a tool for a crit discussion. This too, needs to be explored further.

## REUSING THE DESIGN EXERCISES

For many teachers, the backbone of a course consists of the lectures, supported by literature and in some cases by exercises and excursions, exemplifying what has been said in the lecture. For me, teaching aesthetics

of interaction, it's the other way around; the exercises are the backbone, the living, ever-changing core of the course. In my opinion, design is a practical matter; it cannot be trained in theory, it needs to be lived, experienced first-hand. Similarly, my lectures illustrate the points explored in exercises, rather than the other way around. Whether it's because of this standpoint affecting students, or because of the fact that the exercises were such a significant part of both Aol1 and Aol2, is unclear, but the fact remains that the exercises worked very well as instructive elements. When asked to state the parts of the course that they had learned the most from – being able to select more than one – eight out of nine Aol1-students, and fifteen out of seventeen Aol2-students selected the exercises. The two most instructive ones, according to both classes, seem to be Expressions of Interactions and Designing Emotions.

This rhymes well with one of the major goals, and thus outcomes, with the work presented in this dissertation; to create and test a set of exercises that can be used to explore interaction per se, temporality and aesthetics of interaction. The idea was to provide other teachers with a collection of exercises of which one, some or all could be used – not necessarily in a course on aesthetics of interaction but in any course where there is a need to relate to such things.. In this section, the exercises will be discussed in terms of learning objects, e.g. how they can be reused by others, and in addition the use of exercises in general will be discussed.

Full exercise descriptions can be downloaded from <http://www.ixdcth.se/teaching>.

## DESIGN EXERCISES AS LEARNING OBJECTS

Before discussing the exercises in terms of learning objects, some theoretical background is necessary. Arguably this background could have been placed in Part II, but since the discussion regarding learning objects is so closely intertwined with the exercises, and the exercises only, it has been placed here instead.

The concept of learning objects is based on object oriented programming; the idea is simply to have lots of small objects that can be combined in different ways to result in different programs, or – in the case of learning objects – courses (Wiley 2000, ch 1). If so, one can take the stance that *“teaching and learning can be a creative, constructive process in which learning objects [...] can play an important role. Teachers [...] become designers who adapt and customize learning objects to fit their local needs and context*



" (Recker et al 2005). "Learning objects" is however a slightly problematic term, since there is no clear definition on it. The widest definition has been made by IEEE's Learning Technology Standards Committee (LTSC): "*Learning Objects are defined here as any entity, digital or non-digital, which can be used, re-used or referenced during technology supported learning.*" (quote from LCTS website<sup>2</sup>). According to LTSC, learning objects can include almost anything; multimedia content; instructional content; intended learning outcomes; instructional software and software tools; or persons, organizations, or events referenced during technology supported learning. The latter allows for almost anything. An alternative, more restrained version is proposed by Wiley: "*Any digital resource that can be reused to support learning.*" (Wiley 2000, p. 7) with the motivation that the core idea of learning objects should be reusable and should thus not exist in the form of discrete objects, but as digital resources (and as such accessed directly not just referenced to) which then automatically also makes them reusable. Wiley's explanation runs as follows:

*This is the fundamental idea behind learning objects: instructional designers can build small (relative to the size of an entire course) instructional components that can be reused a number of times in different learning contexts. Additionally, learning objects are generally understood to be digital entities deliverable over the Internet, meaning that any number of people can access and use them simultaneously (as opposed to traditional instructional media, such as an overhead or video tape, which can only exist in one place at a time). Moreover, those who incorporate learning objects can collaborate on and benefit immediately from new versions.*

*– David Wiley in "Connecting learning objects to instructional design theory: A definition, a metaphor, and a taxonomy" (2000, p.3)*

Unfortunately, most repositories seem to have their own standard – and sometimes their own term – when it comes to what a learning object is, or none at all. The EU-initiative Ariadne<sup>3</sup> calls it learning objects, but lacks a clear description of what that could be, whereas the worldwide MERLOT<sup>4</sup> (Multimedia Educational Resources for Learning and Online Teaching) uses the term "learning material", and explicitly states "*MERLOT has never promoted any particular learning material development processes, but has often been asked for recommendations regarding methodologies and tools for instructors to use to create such learning materials*". When adding a learning material one has to provide description, a category and some other data,

however without any distinct descriptions on what to deliver. *“Provide as much detail about the material as you can, include keywords in your description to help others find it in MERLOT.”* Connexions<sup>5</sup> calls it “modules” and describes them as *“a relatively short, standalone learning resource - a chapter, a section within a chapter, a journal article, or a single lab experiment, to name a few examples.”*<sup>6</sup> Connexions also provides a template, but as it turns out this template is for formatting and marking up of the module, i.e. not describing what the content should be like. Taking another approach, Edna<sup>7</sup>, Australia’s free online network for educators asks contributors to suggest *“content that actively enhances education and training”*. Edna too suggests a content standard, but this time the guidelines are related to things like accessibility, authority, currency, ethics and legality, objectivity, reliability and uniqueness.

Similar qualities are mentioned by Wiley (2000), stating that learning objects are characterized by their potential for *“reusability, generativity, adaptability, and scalability”* (Wiley 2000, p. 2). The Center for International Education<sup>8</sup> (CIE, at the University of Wisconsin) makes a similar summary, stating that learning objects are small, taking 2-15 minutes to complete; self-contained; reusable in multiple contexts for multiple purposes; possible to combine with others; and tagged with metadata to enable search.

Looking at the design exercises described in this dissertation from these different angles, we can conclude that by being part of this dissertation they will be online (as a matter of fact they already are; the pure instructions to the students are online on the respective course websites), and they will also be submitted to various repositories. In this, they are a digital resource that can be reused, following both Wiley’s (2000) and IEEE’s LTSC’s definitions as well as those made by Connexions and Edna.

In addition they are enclosed entities, standalone objects that can be reused and adapted to other contexts, as will be described in detail below. In this they meet Wiley’s demands as well as Connexion’s, whereas they are slightly too large for CIE’s demand of the object taking 2-15 minutes. Then again, there are few exercises that take only fifteen minutes. Each of them are possible to combine with others, e.g. the other exercises in the collection but most likely also other learning objects, like for instance lectures on their related topics.

Having concluded that the exercises are learning objects, we must now look into which contexts they can be reused in, and in which courses they can be integrated.

## TARGET GROUP: DESIGN STUDENTS

Since all the exercises are design exercises in some aspect, demanding both analysis skills and creativity from the student, they are designed to work for design students. That does not mean that they need to be very trained designers, but that they need to see themselves as designers, i.e. they mustn't shun creative work, but rather enjoy creative challenges.

Of the 30 students in total taking Aol1 or Aol2, most had a background in some aspect of computer science, e.g. computing science or information technology. Only a few (ca four) had a previous industrial design education. All but one had studied interaction design for a year, however. Of these thirty, sixteen were Swedish, five were Chinese and the rest came from nine different countries, including Iran and USA. This is a very heterogeneous cohort in several aspects, which at least suggests that the material is suitable for a wide variety of students. As for students' varying design skills, it is simply so, that most of the tasks are not limiting, i.e. they can pose challenges for most designers, – but on different levels and in different ways. E.g. in *The New Office Assistant* (see pages 189-194) one can strive for a logical coherency in a few actions, but one might as well challenge oneself by adding actions, and/or by creating animations that coherent with the meaning of the action and the animal itself (i.e. from a look & feel aspect) and/or one could take the task forward in another direction by really focusing on how various aspects could be programmed/expressed in code differently for different assistant, or for one assistant in particular. Similarly, *Expressions of Interactions* can be more challenging if demanding high fidelity prototypes, and/or selecting “harder” emotions and/or demanding a higher degree of quality, i.e. that so-so many percent of the observers manage to pinpoint the emotion. And so on. I have found that this is often the case with design tasks; the talented/good/demanding designer often poses additional challenges, constraints or add-ons for him- or herself.

Of course, the exercises can also be explicitly adapted to a certain cohort of students by adding or removing constraints, or by skewing the exercises slightly towards a certain aim or goal.

## REUSING THE EXERCISES IN OTHER COURSES

Since the exercises are stand-alone learning objects, the exercise collection can be split up and reused in lots of different contexts. Here, every exercise will be described shortly, together with a motivation to why it can

be reused in other courses and how. For longer descriptions on how each exercise “works”, including design issues, pitfalls and outcomes, see section “Design Exercises” (pages 140-197). Full exercise descriptions can be downloaded from <http://www.ixdcth.se/teaching>.

To further facilitate a search or design exercises, the below table serves as a quick reference (however there may be several other topics where the exercises can be used):

Exercise	Design Analysis	Design Methods	Affective Design	GUI Design	Interaction Design Basics	Ubiquitous Computing, Physical Computing etc.	Persuasive Technology	Embodied Interaction, Tangible Interaction etc.
Animal Expression Transfer	X	X	X		X	X	X	
Calculator on the Runway			(X)	X	X	(X)		
Character of Things		X	(X)		X	(X)	X	
Designing Emotions			X		X			X
Design the Apple	X			X	X			
Expressions of Interaction	X				(X)	(X)		
Face...what?!?			(X)	X	X		(X)	
Informative Art				X	X			
The New Office Assistant				X	X			
The Schizophrenic iPod	X	X			X	(X)		

### Animal Expression Transfer

**Task in short:** To create a hybrid object, combining and mapping expressions and behaviors from an animal to the expressions and functions of an everyday object.

**Aim:** To explore expressions of interaction and coherency.

**Possible courses/contexts:** Design Analysis, Design Methods, Affective Design, GUI Design, Interaction Design Basics, Ubiquitous Computing or Physical Computing, Persuasive Technology

As is described in Lundgren (2006, pp. 55-78) Animal Expression Transfer can be used as a design method e.g. for designing for emotions and/or playfulness, but also as a means to explore interaction design aesthetics (Landin 2006, pp. 43-46). Moreover it can sometimes be used to change the use of an artifact by adding animal traits, e.g. taking more care of one's pig-like vacuum cleaner than of your average vacuum cleaner, and vacuuming more often. This means that the exercise works well in a design methods context, especially if designing for emotions or affections. If used to change behavior it could be a part of a course on persuasive technology. One could also choose to focus on the "material"-aspect of the task, i.e. the interplay and wished coherency between expressions, interactions and functions. As such it could be a part of a basic course, discussing interaction in itself, or a course on design theory. Also if any of the above issues should be explored in detail, the exercise could serve as a starting point or theme for a course in physical or ubiquitous computing, since actually prototyping the concept will give additional insights on coherency issues (cf. Landin 2009, p. 139), and additionally the prototypes could be explored or tested to see which kind of emotional response they evoke. Lastly one could also utilize the emotional response towards the animal, using the exercise in a course on affective computing.

## Calculator on the Runway

**Task in short:** *To create two different calculators based on two different aesthetic ideals.*

**Aim:** *To explore some aesthetic ideals and how an ideal skews a design in a certain direction.*

**Possible courses/contexts:** *Affective Design, GUI Design, Interaction Design Basics, Ubiquitous Computing or Physical Computing.*

If one wants to explore the ideals thoroughly one could either demand a physical prototype or a software prototype, placing them in the context of either a GUI design course or a course on ubiquitous computing or physical computing. As such the exercise can serve as a starting point for a larger project and will give the added benefit of exploring ideals together with applying one's skills in GUI design or physical computing. If one wants to explore how different ideal or approaches can affect the design and more importantly the interaction of and with an artifact, the exercise can be used in some kind of basic course. One could also utilize the ideal Emotion, letting students design for two different emotions, in which case the exercise could fit in a course on affective computing.

## Character of Things

**Task in short:** *To inscribe a character into an everyday thing, changing its behavior.*

**Aim:** *To explore using a character as a means for coherency.*

**Possible courses/contexts:** *Design Methods, Affective Design, GUI Design, Interaction Design Basics, Ubiquitous Computing or Physical Computing, Persuasive Technology.*

Just like *Animal Expression Transfer*, to which it is somewhat similar, Character of Things can be seen as an idea generation method or a method to propose new or changed use, thus fitting in a course on design methods or, in the latter case, persuasive technology. It can also be used as the starting point for a longer project in ubiquitous computing. Similarly, and if the “everyday thing” is instead a software, it could be a part of a course in GUI Design as well. If utilizing the emotional response to the inscribed character the exercise could possibly be used in a course on affective computing although in that case, *Animal Expression Transfer* is probably more suited.

## Designing Emotions

**Task in short:** *To design a ticket machine that either expresses or evokes angst.*

**Aim:** *To explore form, material, interaction and designing for emotion.*

**Possible courses/contexts:** *Affective Design, GUI Design, Interaction Design Basics, Ubiquitous Computing or Physical Computing, Embodied Interaction or Tangible Interaction.*

Given the first part of the aim, “to explore form, material and interaction” the exercise works well in some kind of basic course on interaction, since it, with its extreme goal of aiming for angst – opens up for a very thorough use of materials and form in that the environment too is often designed. Additionally it can open up students’ minds towards not-so-common means of interaction. The second part of the aim, “designing for emotion” of course makes it well suited for a course on affective computing or similar. Additionally the focus on new types of interaction in combination with exploration of form and physical interaction means that the exercise can also be used in courses on embodied interaction, tangible interaction and similar. Since the task is also about constructing a concept for a physical object, often evoking unusual ways of interaction, it can also be used in a course on ubiquitous computing or similar, where the aim is to explore not-so-common interaction.



## Design the Apple

**Task in short:** To take the interaction aesthetics of e.g. Google and transfer them to e.g. a bike.

**Aim:** To explore analyzing and applying someone else's aesthetics of interaction.

**Possible courses/contexts:** Design Analysis, GUI Design, Interaction Design Basics.

Since this exercise very much builds on analyzing an existing software and then transfer the "soul" of that software, it is well suited for any course discussing analysis of interaction and interaction per se. Additionally, if wanting to make the exercise more life-like it can be skewed into an exercise where a certain software is given, and it is the student's task to create a new module/feature/part/application for it, that fits the interaction "character" of the initial software, i.e. not only look but also feel. As such, the exercise is well suited for a course on GUI design.

## Expressions of Interaction

**Task in short:** To design interaction that appears in a certain way.

**Aim:** To explore how interactions express themselves, highlighting the difference between interacting in a certain way and experiencing something in a certain way.

**Possible courses/contexts:** Design Analysis, Interaction Design Basics, Embodied Interaction or Tangible Interaction.

In all its oddness, this is an exercise that tends to make a very strong impression on students when it comes to looking at interaction per se, here separating it from emotion, intention and everything else. As such, it works well when analyzing design or looking at interaction in theory and similarly it can be a part of a basic course in interaction design – but if so as one of the last parts. Since it explores bodily movement it could also be a part of a course on embodied interaction or similar.

## Face...what?!?

**Task in short:** To combine two given ideals in a Facebook-like design.

**Aim:** To explore designing for, and combining different ideals.

**Possible courses/contexts:** Affective Design, GUI Design, Interaction Design Basics, Persuasive Technology.

Combining different demands and constraints (in this case aesthetic ideals) into one design is an everyday design dilemma and as such the exercise is

well suited for a course in interaction design basics, with the added benefit of exploring ideals. It can also serve as a starting point for a longer GUI design project where student thoroughly explore what it is like to design for a combination of ideals as well as practice their GUI design skills. If the ideals are Criticism and Emotion, the exercise can be used in a course on affective computing as well, or possibly even persuasive technology.

## Informative Art

**Task in short:** *To design informative art according to a given artistic style.*

**Aim:** *To explore coherency and how temporal aspects affect expression.*

**Possible courses/contexts:** *GUI Design, Interaction Design Basics.*

Since the task demands the design of a software prototype it fits into any course on GUI Design, especially as a means to explore non-efficiency and temporal aspects. Due to the latter the exercise is also well suited for some kind of basic course in interaction design, especially if emphasizing the temporal aspects.

## The New Office Assistant

**Task in short:** *To make a coherent version of Microsoft Words helping agent, the Office assistant.*

**Aim:** *To explore coherency.*

**Possible courses/contexts:** *GUI Design, interaction Design Basics.*

This exercise explores coherency, and also raises issues like how far it should be pursued. This discussion fits well in a basic course on interaction design, but one can also choose to explore coherency further in a course on GUI design, asking for a more elaborate prototype with animated characters and different assistants affecting certain functions (e.g. search algorithms) differently.

## The Schizophrenic iPod

**Task in short:** *To combine different notions on interaction, here from Landin (2009) and Löwgren (2002).*

**Aim:** *To explore how various aspects of interaction can affect design.*

**Possible courses/contexts:** *Design Analysis, Design Methods, Interaction Design Basics, Ubiquitous Computing or Physical Computing.*

Many of the students perceived this exercise as a method for generating new ideas, which it (also) is, wherefore it can be used in a course on design methods. In the form of an idea generating method it can also serve

as a starting point for a longer project in ubiquitous computing or physical computing, exploring effects of design choices. However the general aim is to explore how changing aspects of interaction can affect design, and in that respect the exercise can also be used in a basic course on interaction or when practicing design analysis.

## USING EXERCISES IN TEACHING: ISSUES AND SUGGESTIONS

The rationale for using as many as eight or more exercises in an eight-week course was, and is, that current research shows the value of activity – e.g. applying theory in practice – encourages cognitive high-level activities which in turn result in deep learning (cf. Marton and Säljö, 1976a, 1976b) as favored by Biggs (2004), Ramsden (1992), Bowden and Marton (1998), Marton, Hounsell and Entwistle (1986) and many others. Moreover, the approach to use exercises as an important part of the syllabus is very common in design education, as concluded by Baumann (2004). However this raises several issues worth taking into account when planning a design course.

- The trade-off between having many small exercises versus a few larger exercises; this is also related to the issue of prototyping.
- How to keep the energy and interest up throughout the course.
- How to reason when determining the order of the exercises.
- Issues related to time and supervision.

One may well question the choice to have many short exercises rather than a few exercises, e.g. one could argue that really implementing one of the designs – e.g. *The New Office Assistant* or a *Schizophrenic iPod* would give deeper insights in the interplay between “materials” like code, interaction and time on one hand and the expressions they make and the use it results in on the other hand. Although I do agree with this it is questionable whether the rather extensive extra amount of work will result in that many new insights. In addition a prototyping demand requires that the students are skilled in programming, physical computing etc., and this may not always be the case. A possible solution to this would of course be to let students work in groups on larger projects, and arguably working in groups is valuable in many ways, e.g. students learning from each other, the possibility to have larger projects, possibility to have interdisciplinary projects – cf. my own work in Lundgren et al (2006). However the Aol-students

had already experienced plenty of group work in four previous courses, which was one reason for ruling out large group projects. Another was that I wanted the students work alone most of the time, hence forcing them to create their own understanding of, and relation to, the different ideals, as well as making their own design decisions without having anyone to lean against or negotiate with. Additionally the negative aspects of group work were also avoided; dysfunctional groups, grading problems, etc. Arguably, one could let the students work alone and still have larger exercises, however ones that do not demand prototyping. For instance one could let the students design a much more detailed version of *Face...what!?!?* in the form of a series of “screen shots”. However, this approach is not “better” in the sense that the exploration of the “materials” interaction and temporality is still the same, and when it comes to the aesthetic ideals, much of the insights/learning are related to coming up with the concept, rather than realizing it as an elaborate prototype. In this, the exercises point at a new way of thinking; a new approach to design, as well as a skill in making design decisions in relation to an ideal, and thus the exercises do not necessarily need to be taken further than to the initial concept-sketch stage. From that point of view it is better to have many exercises, which all highlight different aspects, especially since several of the exercises, or rather the design approach in the exercises, will, or at least can, become part of the design student’s tool box. E.g. several of the exercises contain strong elements of design analysis (*Animal Expression Transfer*, *Design the Apple*, *Expressions of Interaction*, *Informative Art*, *The New Office Assistant*, *The Schizophrenic iPod*). Additionally, several can be used for idea generation (*Animal Expression Transfer*, *Character of Things*, *The Schizophrenic iPod*) whereas those who are related to applying ideals (*Calculator on the Runway*, *Designing Emotions*, *Face...what!?!?*) will become part of the design student’s repertoire, i.e. ability to design for different ideals.

However, having many exercises often brings with it another problem; how to keep student’s energy and interest up; e.g. the MUDs and the course questionnaire pointed out that several Aol2-students were losing energy and creativity towards the very end of the course. One should however not underestimate that an important part of being a designer is the ability to be creative, and to come up with designs, ideas and concepts regardless if the topic is interesting or not. Nevertheless, the exhaustion after some five-or-more exercises cannot be neglected from a learning perspective. Fortunately, there are ways to mitigate this. The most important way is to provide variation, not only in what the exercises are about, but also in

ways of working. For instance, four of the exercises in the collection were carried out in groups or pairs (*Animal Expression Transfer*, *Character of Things*, *Informative Art* and *The Schizophrenic iPod*) whereas three demanded that students cooperated in some part of the exercise, e.g. in the initial phase (*Designing Emotions*, *Design the Apple* and *Face... what?!?*) whereas three were carried out individually from start to end. In all cases the groups or pairs were different, meaning that students communicated and cooperated with new people each time. Note also, that even if the exercises were carried out this way, working in pairs or alone is not inherent in the exercises per se, but a matter of choice; the only exception to this is *Face...what?!?* which in its current version is a handover exercise. As for topic, these vary as well; roughly half are related to “material” whereas the others deal with different aesthetic ideals.

Choosing the order of the exercises, coordinating it with lectures and numerous outer constraints, is by no means trivial. For instance one might want to start the course with interaction in itself and temporality, moving into and ending with different ideals, just like I did, but making *Expressions of Interaction* the first or second exercise could be hard since the exercise is quite demanding. One might want to start with exercises easier to grasp, such as *Informative Art*, or *The New Office Assistant*. It is impossible to suggest a designated order, especially since the favored order of content may depend on the students in themselves and their prerequisites. How well an exercise works out may (also) depend a lot on where it is placed. A poignant example of this was *Design the Apple*, which was the last exercise in Aol1; not only did the students learn from it and like it, they also created very good and interesting designs. Given this “success” and since the exercise is related to analysis of an existing design, it became the first exercise in Aol2 aiming to give the course a soft start. Unfortunately, this did not turn out well – at that point in time the students were still lacking both the words and the insights that enable such an analysis and a lot of supervision was needed to steer the students towards satisfactory insights and results. Consequently, one must place exercises in relation to the rest of the content, which of course is problematic if one wants to have exercises directly at the beginning of the course. An alternative is of course to go through the entire theory first, and then apply it, but with this approach the connection between theory and practice is weakened; students may have to wait several weeks until applying a concept by when they may have forgotten part of it anyway.

How long the exercises are, and how frequent they are, affects teaching too. To most of the exercises 5-6 hours were allocated, but in many cases (especially if there was no strict deadline, like the art exhibition in Informative Art) students did not finish their designs within the given time, but kicked in a few extra hours the following day. Partly this was an effect of taking other classes and not being able to attend the entire day, partly it was an effect of wanting to hand in something that one found to be “good” rather than just satisfactory. Some students complained about this, wanting to have a strict deadline. This is a sensitive issue. On one hand it sets equal conditions for all, and some students are very anxious when it comes to knowing how much work they need to put in. On the other hand the students are not equal; some are very skilled in sketching and drawing and can thus afford to spend more time on coming up with a good idea whereas others must allocate quite some time to just create the deliverables. Some are very creative and can come up with many ideas to choose from, others have to struggle to find ideas. On one hand, students should learn how to work under stress. On the other hand, one should however not underestimate the very human wish to hand in something that one is satisfied with, especially if the exercises will be discussed in a crit-session. It may feel awkward sitting there with a piece of work one is not satisfied with. Also, if the exercises are graded when handed in, these differences really matter, whereas their effects can be mitigated by allowing students to improve exercises for their portfolio.

Another approach to deal with time-issues is to split the exercise up into two sessions, e.g. days, given that one has the time and space to allocate two days in a row; one might have to adjust to other schedules. Getting a good night’s sleep to subconsciously address the design problems can be very helpful for some designers whereas others do not benefit from that at all, but do want to stay in the flow. It is probably good to allow some flexibility when it comes to this.

Also, the amount of work students put into the exercises is partly related to how the course is graded; if the idea is to put improved versions of the exercises in a portfolio, some students may choose to put in some extra hours the first time around, hoping that their design will be so good that they can put it in the portfolio with very little extra work, which can be an advantage in the stressful exam period.

Timing is also related to if, and in such case when, one wants to schedule crit-sessions; obviously the design must be finished by then. If the people that are to give critique should be given some time to prepare, this further adds to the time needed between the start to the exercise and the



crit session. In both Aol1 and Aol2, most exercises were carried out on Tuesdays, hand-in was at Thursday midnight (in order to give time for the students to prepare their critique) and the crit session itself took place on Tuesday, in most cases in the morning before starting the next exercise. In this way, students would get closure, and possibly learn something that they could apply when taking on the next exercise directly after the crit session.

When it comes to the teacher's time it should be pointed out that the exercises described are not meant to be just handed out to students and then assessed when finished, unless one has very adept students. In my experience much of the insights built into these exercises are achieved through discussion/supervision and redesign. In addition, several of the exercises seem to be uncomplicated, judging from the task description, but as a matter of fact have lots of inherent issues that are not obvious after the first glance, meaning that students making a shallow analysis of the task might miss them. Hence, more or less continuous supervision/feedback is recommended, which of course takes up a lot of teacher time.

## Giving Feedback: To Crit or Not To Crit?

As already stated in Part II (see pages 65-67 giving good feedback continuously is crucial for supporting the learning process (cf. Biggs, 2003, p. 229-231; Bowden & Marton 1998, p 135; Ramsden 1992, p. 99, 193; Orrell 2006). Baumann (2004) summarizes: *"It is coaching, tutoring and feedback which makes the difference between a simple training-on-the-job and a real education in a design school."* (p. 316).

In both Aol1 and Aol2, students got continuous feedback in several ways; written feedback on literature hand-ins, and three to five written pages with feedback on their portfolio. In addition they got spoken feedback during supervision, as well as written and spoken feedback from their peers and spoken feedback from me during the feedback sessions after each exercise. The Aol1-students also got a one-to-one meeting discussing the first draft of their paper. Although this sounds ideal, again, there are some issues to take into account when planning how and when to give feedback:

- Whether to let students give peer to peer feedback and how to prepare them for this.
- Alternatives to supervision and crit sessions

Note that I am assuming that students will get spoken feedback during supervision; as mentioned above the exercises are designed in such a way that they require reflection originating from discussion/supervision.

According to Biggs (2003, p. 229-231) peer-to-peer assessment works well, partly because students by grading someone else's work gain insight in what is important, but also because they step up when being graded by each other. I'm however unsure whether the latter argument holds in all contexts and cultures, e.g. Swedish students do in my experience not work harder if being assessed by peers, as a matter of fact some work less hard since they "only" are being assessed by their peers and not the teacher. But – from a design-point of view, the ability to analyze a design and point out it's strong and weak points is a significant design skill. In addition, crit-sessions (to go through the designs one by one in a group), is common practice in design educations (Baumann, 2004, pp. 72-79). In line with this, I used crit-sessions in both Aol1 and Aol2, with astonishingly different results. In both cases students got to write feedback to another student (different each time) and then presented the critique verbally in class, whereafter the other student could agree, disagree or motivate, followed by a short class discussion.

Looking at the course evaluation of Aol1, these feedback sessions were an appreciated part of the course:

*"I really like the feedback sessions, they help me improve my design in a good way"*

*"Feedback very giving."*

*"Feedback sessions, [it is] really useful to see and reflect on the work of others."*

In Aol2, the class was divided into two feedback groups, so that each group contained 10-11 students, i.e. they were of the same size as the Aol1 class. Drawing from my experience with Aol1, I was self-confident that the feedback sessions would work well too, and that students would learn a lot, but this was not really the case, judging from the course evaluation and a final class discussion. There, several students said that they had found the feedback sessions rather boring, and that they had come only because it was mandatory. In the course questionnaire the students were rather negative too:

*"Quality of feedback is low. You spend 6+ hours working on something to get 1 paragraph and a few spoken sentences of feedback."*

*"Feedback sessions were a bit boring"*

*"Feedback on exercises was gotten written from other students mostly. During the portfolio work its [it would be?] nice to have some written feedback from you. You are very good at writing feedback, use it to its fullest potential!"*

*"[suggesting improvements] That you give more feedback. It's way more interesting with feedback from you than fellow students. Plus that you are good at it!"*

*"[suggesting improvements] Intensive feedback"*

This expressed craving for supervision and feedback from me is probably partly related to the fact that roughly half of the students could not attend the entire exercise sessions due to other classes. I had thus added extra exercise sessions on Wednesdays 9-14, but typically no one came.

So – what did the two classes react so differently on the crit sessions? I have two possible answers. Firstly, the Aol1-students based their critique on the full set of deliverables, i.e. not only on the design in itself, but also on the rationale for it. Being allowed to read the rationale, gives a richer source for feedback, and it also results in a designer-to-designer feedback: *"You wrote that you chose red as a warning color, which I agree with, but then you said that the furry surface should denote a monster, but to me this looks like a cute little pet, so if you want it to look like a monster you should perhaps make a surface that looks like reptile skin or something?"* This resulted in rich and constructive feedback.

In Aol2, I wanted to expose students to a user's reactions, which meant that they only gave feedback on the design and never got to read the rationale. As a result they gave user-to-designer feedback. This type of feedback is instructional in that it points out misunderstandings and sometimes indicates unexpected use, but on the other hand it tends to be less constructive. *"I don't really get the point of this button. I thought that since it is large and green it would start the device but it doesn't."* As a result of this choice that I had made – designer-to-designer feedback, vs. user-to-designer feedback, the Aol2-students got less constructive feedback. To aggravate this, the Aol2-students were simply less trained in giving feedback whereas the Aol1-students had 3-4 very skilled designers in

the class, ensuring good discussions. My mistake here was first to assume that the students were good at writing feedback, and then to not check it by reading some feedback. Of course feedback must be valuable to the students; otherwise it is just a waste of time. And, note that the Aol2-students' complaints about feedback was not that they did not like feedback per se, but that they wanted more and better feedback. It can never be an option to just skip feedback; it goes against every instinct, as well as the pedagogical ideas of constructive alignment and interconnectivity: "Never assess without giving comments to students about how they might improve." (Ramsden 1992, p. 211).

Thus one must ensure that the quality of the feedback is good. One could of course give feedback on everything oneself, but this is very time-consuming. A better way is probably to train students in analyzing design and give constructive feedback, in case they do not already know this. Ways to do this could be to give feedback on feedback, grade feedback, let students write feedback to themselves too, force students to come with  $x$  positive comments and  $y$  constructive comments in their feedback (although this could easily become strained), let everyone write feedback on two designs so that everyone in turn gets feedback from two people, although this increases the burden on the students. Another idea is to create even smaller groups, say five students, to really force everyone to engage in the discussions, but this also means that they get to see fewer designs; sometimes a vast overview of many designs is better from a learning perspective. Also, one should perhaps alternate between designer-to-designer feedback and user-to-designer feedback since both have their strengths.

Although a good working crit session is an excellent means of giving feedback, variation can be useful for keeping up the interest. I've used a few alternatives. *Character of Things*, *Design the Apple* and *Informative Art* were concluded with a Post-It session (see image on the next page). In the two first cases, students created a poster describing their design, for *Informative Art* we had an interactive art exhibition where students just wrote a short explanation on how their design worked. Then, everyone got three green post-its (for positive critique), three yellow (for comments or questions) and two red (for negative critique) which they had to make a note on and put onto someone's poster.

If students put some effort in this, striving to write useful comments, this can be a very good way to feedback designs, especially since it works with very many students without taking very much time, 30-45 minutes is



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Safe

Point camera target and  
"Feteli" to take a picture  
Camera gives a back  
"Feteli" the picture.

The camera may take pictures  
by itself to satiate its curiosity  
(especially when in a new place).

The camera needs to be petted  
and Ad (charged) regularly.

When left alone and unattended  
for too long, the camera will start  
whining and vibrating.

When attracted to someone the camera  
will photograph that someone's crotch,  
alternatively repeatedly take picture  
of their leg.

Looks like some  
sort of inter-  
species parasite!

Looks  
very  
interesting +  
futuristic

Nice Picture

to watch  
into!

Looks like  
some  
sort of inter-  
species parasite!

Ad  
to watch  
into!

the camera  
the camera  
the camera



typically enough. If there are extremely many students one may want to limit the number of posters they need to look at and analyze. The students themselves seemed to appreciate the opportunity to see what the others had done, and to get their peer's comments although the quality of the comments was a bit so-so. Many of them were just value judgments like "awesome", "great", "uninteresting", i.e. not very substantial, but some were very good and insightful. So, in order to use this method, one really has to clarify what useful feedback can be like. And, one must assure that the students make posters that really explain the designs (rather than just presenting them); otherwise feedback tends to get more shallow.

For *Expressions of Interaction* I used a guessing contest as feedback-session, giving the student all words and letting them choose which word goes with which design. This type of feedback worked very well for that exercises since the exercise is about designing and analyzing how interaction appears and it was thus useful to actually try to interact with the things. It also resulted in interesting discussions, as is explained further on pp. x. Although suitable for this exercise, it is very much like a user test, and thus results in user-to-designer comments unless one allows for a substantial discussion on each design.

The teacher writing feedback is of course another way to go. In my experience –and from a pragmatic point of view – giving written feedback works best if the task is rather limited, e.g. if it cannot result in very different outcomes. E.g. I wrote feedback on everyone's answers to literature questions in Aol2; each student handed in 1,5-2 pages of text, but since they answered the same questions again and again I could pick up the speed, knowing what to ask about and comment upon after having looked at a few. I managed to cut down the general feedback time, i.e. reading and writing brief feedback (typically 1-5 sentences per question) to 15 minutes per student. Similarly, I have used grading sheets for designs in other courses (cf. Lundgren 2009a) which works well for a defined task. When it came to written feedback on the exercises, I saved that for the portfolio. Not using explicit grading sheets, but for each exercise listing some aspects and how important they were, I graded all exercises of the same kind in a row, sometimes reusing comments on common mistakes or misconceptions.



# TEACHING AESTHETICS OF INTERACTION

Now, after some 200 pages of background, exploration and discussion it all boils down to this: What should a course on aesthetics of interaction contain? In which context should it be taught? To whom, and when? How should teaching and assessment be modeled?

As for *content*, this has already been addressed in the previous sections, discussing interaction and temporality as design materials, aesthetic ideals, and the exercises as means of exploring this.

As for *context*, some may argue that the course I will propose, based on my explorations in Aol1 and Aol2, can only be taught in small classes, i.e. that it would be impossible to run the presented course or its exercises in a larger class. After all, Baumann (2004) showed that most of the design teachers in his study considered a studio-based environment with few students and much teacher time per student to be the best way to educate design. In addition, there seem to be plenty of proof that this is the case; there are a number of prestigious design schools with this approach, e.g. Cooper Union<sup>9</sup> (admitting less than 5% of the applicants and having a student/faculty ratio of 2,85), Yale School of Art<sup>10</sup> (admitting some 5%) or the Royal College of Art (RCA). According to RCA's own statistics<sup>11</sup>, 91% of its graduates gain a suiting employment after their education, and some fifty of their graduates were listed as being among the hundred most influential contemporary designers worldwide. Albeit all of this is pretty impressive, it shouldn't come as a surprise that if a school has the luxury of admitting only the best students, these chosen few are already talented when they start such an education, and thus they will stay talented and develop their talent throughout their education; no wonder they are "good" when they graduate.

As for teaching classes of 60 students instead of 12-15, having perhaps only a few really talented students I'd just like to raise the following question:

*As teachers, it is not our task to strive for improvement, growth, development of skills, regardless of the initial skill set and talent of the students – rather than just comparing end results not based on equal conditions?*

I think so. And I do not agree with those arguing that the teaching-methods conducted at high-profile art and design schools are impossible to transfer to larger classes. In my opinion and in my experience design may well be taught in classes of up to 60 students (Lundgren 2009a). Of the teaching methods the teachers in Baumann's study used (see pages 58-59), hardly any are explicitly tied to having a small class. For instance it is definitely an option to run a practical exam in a large class; this is by no means different from any other type of home assignment, and it does not take longer time to assess using proper grading templates (Lundgren 2009a). Crit sessions are of course hard to run in a large class since they take a certain amount of time per design; one alternative is to divide the class into smaller crit groups (resulting in more teaching time), another is to let students write crits for and to each other (which requires some training in how to write good feedback), a third is to use crits "light" in the form of Post-It feedback (see pages 225-227).

As for *whom* and *when*, I believe that a course or a course module on aesthetics should be one of the first parts of an interaction design education, possibly as the second course after a course on interaction design basics and a course on idea generation/design methods. There are several reasons for this. Firstly, students should get to know their design materials at an early stage, so that they can apply this knowledge in any further designs, and it also means that the class achieves a shared vocabulary on matters related to interaction and temporality. Additionally, coherency will be favored in any other design class, meaning that students will benefit from exploring coherency as an overarching aesthetic ideal. Furthermore, looking at different ideals at the beginning of the education opens up the students' mindset, making them aware of the many possible approaches to interaction design, not only the usability-approach that most of them have. As has already been argued in the previous section, most of the exercises adapt themselves, or can be adapted to the students' talent and skill-levels, wherefore they can be run quite early on in the education.

Another possible approach is to let the idea of aesthetic ideals permeate a whole education, so that each course explicitly addresses one or more ideals if possible, also explicitly discussing these in terms of aesthetics rather than something else, e.g. design approaches. However that requires that the entire staff of teachers is interested in doing this, and is willing to spend some time on the general idea of aesthetic ideals in interaction design. Nevertheless, the exercises presented here are free-standing and may well be taken out of their context here and be adapted

to another course that wishes to address whatever the chosen exercise highlights.

As for *how*, and as discussed in the section “How Designers Teach Today” (pages 52-73) the general designerly approach to teaching coincides very much with the current educational research findings as advocated by Biggs (2003), Ramsden (1992), Laurillard (1993), Bowden and Marton (1998), Marton et al (1986), i.e. aiming for self-governed work, creativity, critique, reflection, extensive (in comparison) teacher-student-interaction and iterative improvement. Further, this constructive alignment and deep learning approach is adapted in the Bologna system, uniting higher education in 46 countries, and recommended by the ENQA European Association for Quality Assurance in Higher Education (ENQA 2005). One thus favors applying concepts and ideals in design, exploring them firsthand. As a consequence I see any course on aesthetics of interaction as a highly practical endeavor, where lectures and literature only support the high-level goals of transforming the knowledge on materials and aesthetic ideals into design tools and design approaches. Again, I cannot refrain from quoting Baumann (2004): *“Different forms of practical exercise and feedback are central to design education”* (p. 78). This also means that one should strive for interconnectivity; revisiting concepts of interaction when discussing design for an aesthetic ideal for instance, or having exercises that cover more than one topic, or applying concepts explained in lectures directly, in the form of small design exercises taking place during the lecture. Arguably, giving high-quality feedback and supervision, is a teaching-approach that requires more teaching resources than the average course does, and in addition the teacher/supervisor must have substantial design skills. I am aware of this, but in the context of offering good learning environments it is nevertheless desirable.

As a consequence of the above, assessment cannot be purely theoretical. In Aol1 and Aol2 portfolios were used as a means for assessment, which has its own pros and cons. Grading becomes messier and more time-consuming than grading one large design task, for instance. Also, one must carefully consider what one wants to gain from it, and what the students should gain from it. For instance it is of course always nice if the assessment is a learning experience in itself, but how to facilitate this is not easy to sort out; can one for instance demand significant improvement of each part by extending them in such a way that there is some learning in this, rather than just tedious repetition? The alternative to the portfolio could be to have a larger design task. Giving a new fresh task puts everyone on the same baseline, requiring new design from everyone. And, one

can ask for a more elaborate prototype for once. On the other hand, the reflection on the course as a whole is lost, which is a severe drawback.

Another issue is supervision – exactly how and how much should one supervise that, which will then be assessed? On one hand, the smart designer checks with the client, on the other hand one wants students to show that they are independent of their teacher's advice.

At the end of the day, it all comes down to the question as to whether the intended learning outcomes are being assessed or not. From that point of view, the portfolio-format, where students reuse and improve exercises and revisit texts, is good, since it requires thorough analysis as well as a compilation of the course. Making the portfolio rather small decreases grading time at the same time as it forces students to choose carefully which items they put in their portfolio and how to expand or elaborate on them. If one wants to assess student's ability to design without feedback, one could of course also add a new design task to the portfolio.

## CONCLUSION: A SYLLABUS

Building on the exploration carried out in this work, and the argumentation already presented in this part, I offer a syllabus for teaching aesthetics of interaction. It is *one* possible solution to the design problem of creating such a course, and as with any design problem, it may not fill all contexts and all users; it may require some redesign to fit other contexts. Nevertheless I believe that my work in this dissertation has given a solid rationale for this syllabus, as well as extensive information as to why some design decisions were made, and how they can be altered. The syllabus I offer contains the following:

### Entry requirements

Any design student having basic knowledge in interaction design basics and basic design methodology.

### Aim

To open up the participants' views on interaction and interaction design in two ways. Firstly, by showing them different ways to relate to, analyze, discuss and apply the design materials interaction and temporality. Secondly, by pointing out the diverse views on aesthetics of interaction, and

exploring these in terms of different aesthetic ideals such as *Coherency*, *Efficiency*, *Criticism*, *Emotion*, *Sensing* and *Playfulness*.

## Contents

Theoretical views and conceptual frameworks regarding interaction and temporality as design materials. A brief overview of the history of aesthetics. Current views on aesthetics of interaction. Aesthetic ideals present in interaction as well as in other disciplines. Exploration of aesthetic ideals within interaction design.

## Intended Learning Outcomes

The learning outcomes are written in action-verb style as recommended by Bologna standards (cf. Kennedy, Hyland and Ryan 2006). Numbers are not ranks, but just a basis for reference.

1. Analyze a design and describe and discuss the interaction in itself, using terminology and concepts taught in the course.
2. Apply one's knowledge about interaction in itself, e.g. design interaction firsthand, or analyze and improve one's own design in respect to interaction in itself.
3. Analyze a design and describe and discuss the temporal aspects of it, using terminology and concepts taught in the course.
4. Apply one's knowledge about temporality, e.g. design temporality firsthand.
5. Describe the current views on aesthetics of interaction, in terms of aesthetic ideals.
6. Analyze a design and describe and discuss it in terms of aesthetic ideals. Design aiming for a certain aesthetic ideal.
7. Combine several aesthetic ideals and design for them.

## Organization

- Lectures, covering theoretical views and conceptual frameworks regarding interaction and temporality as design materials (setting the ground for learning outcomes 1-4).
- Lectures, covering the history of aesthetics, current views on aesthetics of interaction, and aesthetic ideals present in interaction as well as in other disciplines (setting the ground for learning outcomes 5-8).
- Literature and literature questions on interaction and temporality as design materials (enabling learning outcomes 1 and 3).

- Literature and literature questions on current views on aesthetics in interaction design (enabling learning outcomes 5 and 6).
- Exercises exploring interaction and temporality as design materials (enabling learning outcomes 2 and 4).
- Exercises exploring various different aesthetic ideals, as well as the combination of them (enabling learning outcomes 7 and 8).
- Feedback from teacher, either as supervision sessions or written (supporting learning outcomes 1-8).
- Crit sessions (supporting learning outcomes 1,3, 6, 7 and 8, especially if teacher-moderated peer-to-peer crits).

### Assessment

A combination of theoretical and practical tasks, e.g. a portfolio containing 3-5 items such as: one essay and/or one analysis of a design, 1-2 improved design exercises and one new design task.

## CONCLUDING REMARKS

To summarize and conclude the teaching of aesthetics, I must again quote Pye (1978):

*“I am tempted almost to say that in matters of beauty it is never worth preaching to anyone but the converted and never worth trying to make converts. I will not stand by that, because it sounds contemptuous of the ‘unconverted’ and I am far indeed from being so. But the fact remains that all one can do towards teaching the appreciation of beauty is to say to one’s friend, one’s pupil, ‘I should look at that. It seems to me beautiful. Perhaps you may see something in it too. And try looking at this too, and this, and this....’ That’s all. But once your friend has seen eye to eye with you, then you can start talking about ripples and dentils and the rest and perhaps be understood.”*

– David Pye in *“The Nature and Aesthetics of Design”* (p. 99)

I think this is the key. The general approach to teaching aesthetics – in any subject – ought to be the highlighting of possible views. When it comes to interaction design in specific, I’d like to paraphrase Gelernter (1988), who coined the expression “Deep Beauty” which refers to a successful combination of simplicity and power. However we, as interaction designers should strive for a *Deeper Beauty*, namely a coherent relation between the expressions, interactions, functions and behaviours of a computational



artefact. This means two things; we must teach our students to see interaction and temporality/change as design materials that we can shape in order to enable functions and shape behaviour. And, that we can use an aesthetic ideal (any suitable aesthetic ideal) as a means to create coherency in all aspects of design. We must realize – and our students must realize – that there is not one truth on aesthetics, not in any subject, not in interaction design (at least not until Bardzell (2009) gets his wanted overarching, philosophically grounded theory based on interaction per se!) We must keep this in mind, presenting the ideals as exactly such; ideals, possible choices, not absolute truths.

Over and out,



Sus Lundgren, May 2010



## Footnotes, Part V

- 1 Bembo's Zoo is a site that plays with words and letters, building animals out of thier letters. Check it out at <http://www.bemboszoo.com>
- 2 IEEE's site for its Learning Technology Standards Committee: <http://www.ieeeeltsc.org:8080/Plone/working-group/learning-object-metadata-working-group-12/learning-object-metadata-lom-working-group-12>
- 3 Ariadne website: <http://www.ariadne-eu.org/>
- 4 MERLOT (Multimedia Educational Resources for Learning and Online Teaching) website: [http://about.merlot.org/Programs\\_and\\_Projects/LMDI.html](http://about.merlot.org/Programs_and_Projects/LMDI.html)
- 5 Connexions website <http://cnx.org/>
- 6 Connexions instructions on modules: <http://cnx.org/help/authoring/createmodule>
- 7 Edna: <http://www.edna.edu.au/>
- 8 Center for International Education, CIE: <http://www4.uwm.edu/cie/>  
What are learning objects? [http://www4.uwm.edu/cie/learning\\_objects.cfm?gid=56](http://www4.uwm.edu/cie/learning_objects.cfm?gid=56)
- 9 The Cooper Union for the Advancement of Science and Art:  
[http://en.wikipedia.org/wiki/Cooper\\_Union#The\\_School\\_of\\_Art](http://en.wikipedia.org/wiki/Cooper_Union#The_School_of_Art)
- 10 Yale School of Art: [http://en.wikipedia.org/wiki/Yale\\_School\\_of\\_Art](http://en.wikipedia.org/wiki/Yale_School_of_Art)
- 11 The RCA Experience: Facts and Figures: <http://www.rca.ac.uk/Default.aspx?ContentID=160271&CategoryId=36283>

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# REFERENCES

Entries marked with a star (\*) are books or dissertations.

\* Alberti, L. B. (1435): **On Painting**. Accessed from <http://www.noteaccess.com/Texts/Alberti/> (Retrieved 2009-01-08)

\* Alexander, C., et al (1977) **A Pattern Language**, Oxford University Press, New York

\* Alexander, C. (1979) **Timeless Ways of Building**, Oxford University Press, New York

Backlund, S., Gustafsson, A., Gyllenswärd, M., Ilstedt-Hjelm, S., Mazé, R. Redström, J. (2006) **Static! The Aesthetics of Energy in Everyday Things**, In Friedman, K., Love, T. and Corte-Real, E. (Eds.) Proceedings of Design Research Society Wonderground International Conference 2006.

\* Baumann, K. (2004) **How Designers Teach – a Qualitative Research on Design Didactics**, Doctoral Thesis at the Design and Assessment of Technology Institute, Vienna University, Vienna, Austria.

Baumann, K. et al (2007) **EISH – Exercises in Studying HCI**, Proceedings of HCI Educators 2007, 29th – 30th of March 2007, Aveiro, Portugal

Baljkó, M. and Tenhaaf, N. (2008) **The aesthetics of emergence: Co-constructed interactions**, ACM Transactions on Computer-Human Interaction (TOCHI), Volume 15, Issue 3 (November 2008)

Bardzell, J. (2009) **Interaction Criticism and Aesthetics**, Proceedings of the 27th international conference on Human factors in computing systems (CHI '09), ACM Press.

Bassey, M. (1998) **Action Research for improving educational practice**, in Halsall, R. (ed.) *Teacher Research and School Improvement: Opening Doors from the Inside*, Open University Press, pp 98-108.

\* Beyer, H. and Holzblatt, K. (1998): **Contextual Design: Defining Customer Centered Needs**, Morgan Kaufman, San Francisco, CA

\* Biggs, J (2003) **Teaching for Quality Learning at University: What the Student Does**, 2nd Edition, Open University Press, Maidenhead, UK

- \* Björk, S., and Holopainen, J. (2005) ***Patterns in Game Design***, Charles River Media
- \* Blumer, H. (1986) ***Symbolic Interactionism: Perspective and Method***, University of California Press.
- \* Bolter, J. and Gromala, D. (2003) ***Windows and Mirrors: Interaction Design, Digital Art, and the Myth of Transparency***, MIT Press.
- \* Borchers, J. (2001) ***A pattern approach to interaction design***, John Wiley & Sons,
- Borgmann, A. (1995) ***The Depth of Design***, In Buchanan, R. and Margolin, V. (eds.) (1995) *Discovering Design*, The University of Chicago Press.
- \* Bowden, J. and Marton, F. (1998 ) ***The University of Learning: Beyond Quality and Competence in Higher Education***, Kogan Page, London
- \* Bourdon, D. (1989) ***Warhol***, Henry N. Abrams, Inc. Publishing,
- \* Burke, E. (1757) ***A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful***, 1998 edition, Oxford University Press, Oxford, England
- \* Carr, W. and Kemmis, S. (1986) ***Becoming Critical. Education, knowledge and action research***, Falmer Press Ltd.
- Cennini, C. (c 1400) ***Il libro dell'arte***, accessed from <http://www.noteaccess.com/Texts/Cennini/index.htm> (Retrieved 2009-03-26)
- Chang, A., Gouldstone, J., Zigelbaum, J., Ishii, H. (2007) ***Simplicity in interaction design***, Proceedings of the 1st international conference on Tangible and Embedded Interaction (TEI '07), 15-17 Feb 2007, Baton Rouge, LA, USA. ACM Press.
- \* Cooper, A. and Reimann, R. (2003) ***About Face 2.0: The Essentials of Interaction Design***, Wiley; 1st edition, 2003, ISBN: 0764526413
- \* Cooper, A., Reimann, R. and Cronin, D. (2007): ***About Face 3.0 The Essentials of Interaction Design***, Wiley Publishing, Inc.
- Cooper website*** (n.d.), interaction design exercise for employees in spe: [http://www.cooper.com/documents/interaction\\_design\\_test.pdf](http://www.cooper.com/documents/interaction_design_test.pdf) (Retrieved 2009-04-09)



- \* Costello, P. J. M, (2003) **Action Research**, Continuum Books, London, UK
- \* Crawford, C. (2003) **The Art of Interactive Design A euphonious and illuminating guide to building successful software**, No Starch Press Inc, San Francisco, CA
- Desmet, P. and Dijkhuis, E. (2003) **A Wheelchair can be Fun: A Case of Emotion-driven Design**, Proceedings of DPPI'03. ACM Press, pp. 22-27.
- \* Dewey, J. (2005) **Art as experience**, Perigee. Original work from 1935.
- Dewey, J. (1934): **The Aesthetic in Experience Excerpts from Art as Experience**, first published by G. Putnam's Sons in New York 1934. This summary consists of pages 13, 16-17 and 35-50 of the original version and was published in Feagin, S., and Maynard, P. (Eds.) *Aesthetics*, Oxford University Press 1997
- Dingus, Thomas A. (1989): **Now the First Class has Graduated: Some Thoughts on Beginning and Maintaining a Human Factors Program**, Proceedings of the Human Factors Society 33rd Annual Meeting 1989. pp. 493-496.
- Djajadiningrat, J.P.\*., Overbeeke, C. S. and Wensveen, S. A. G. (2000) **Augmenting fun and beauty: a pamphlet**, In Proceedings of DARE 2000 on Designing augmented reality environments. ACM Press.
- Djajadiningrat, T.\*, Overbeeke, K., and Wensveen, S. (2002) **But how, Donald, tell us how?: on the creation of meaning in interaction design through feedforward and inherent feedback**, Proceedings of the 4th conference on Designing interactive systems: processes, practices, methods, and techniques (DI S 2002). ACM Press.
- Djajadiningrat, J. P.\*, Gaver, W. W., & Frens, J. W. (2003) **Interaction relabelling and extreme characters: methods for exploring aesthetic interactions**, Proceedings of DIS2000. pp. 66-71. ACM Press
- Djajadiningrat, T.\* Wensveen, S., Frens, J., Overbeeke, K. (2004) **Tangible products: redressing the balance between appearance and action** In: Personal and Ubiquitous Computing, Volume 8, Issue 5 (September 2004), Pages: 294 - 309, ACM Press

---

\* = J.P. Djajadiningrat is sometimes credited as T. Djajadiningrat.

- Djajadiningrat, T.\*, Matthews, B., Stienstra, M. (2007) **Easy doesn't do it: skill and expression in tangible aesthetics**, Journal of Personal and Ubiquitous Computing, Volume 11, Number 8 / December, 2007, Pages 657-676, Springer London
- \* Dourish, P. (2004) **Where the Action Is: The Foundations of Embodied Interaction**, MIT Press.
- \* Droste, M. (2006) **Bauhaus 1919-1933**, Taschen GmbH, Germany
- \* Dunne, A. (1999) **Hertzian tales**, Royal College of Art Computer Related Design Research, London
- \* Dunne, A. and Raby, F. (2001) **Design Noir. The Secret Life of Electronic Products**, Birkhäuser Basel; 1 edition ( 2001)
- Dunne, A. and Raby, F. (2007) **Critical Design FAQ** Accessed from <http://www.dunneandraby.co.uk/content/bydandr/13/0> (Retrieved 2010-03-03)
- \* Eco, U. (2005) **Om Skönhet**, Brombergs bokförlag AB, Sweden. English version: **On Beauty**, Secker & Warburg 2004
- Ehn, P. (1998) **Manifesto for a digital Bauhaus**, Digital Creativity, 1462-6268, Volume 9, Issue 4, 1998, Pages 207 – 217
- Ehn, P. (2002) **Neither Bauhäusler nor nerd educating the interaction designer**, Proceedings of the 4th conference on Designing interactive systems: processes, practices, methods, and techniques, London, England. ACM Press.
- ELIA, European League of Institutes of the Arts (2008) **Designing Design Education Proceedings** (3 parts) Designtrain Congress Trailer II, Amsterdam, The Netherlands 5-7th of June 2008
- ENQA, European Association for Quality Assurance in Higher Education (2005) **Standards and Guidelines for Quality Assurance in the European Higher Education Area**, Helsinki, Finland 2005. Accessed from <http://www.ond.vlaanderen.be/hogeronderwijs/bologna/documents/Standards-and-Guidelines-for-QA.pdf> (Retrieved 2009-03-12)
- Eriksson, E., Ludvigsen, M., Lykke-Olesen, A., Nielsen, R. (2006) **Bthere or be Square: A Method for Extreme Contextualization of Design**, Proceedings of WonderGround - 2006 Design Research Society International Conference in Lisbon, 1-4 November 2006.

- Ernevi, A., Jacobs, M., Mazé, R., Müller, C., Redström, J., & Worbin, L. (2005). *The Energy Curtain: Energy Awareness*, In Redström, M., Redström, J. and Mazé, R. (Eds.) (2005) *IT+Textiles*, IT Press, Edita Publishing Oy.
- Ernevi, A., Palm, S. and Redström, J. (2007). *Erratic Appliances and Energy Awareness*. In Hummels, C., Koskinen, I. and Redström, J. (Eds.) *Knowledge, Technology & Policy*, Special Issue on Design Research, Vol. 20, No. 1, pp. 71-78. Springer.
- Fällman, D. (2008) *The Interaction Design Research Triangle of Design Practice, Design Studies, and Design Exploration*, Design Issues, Summer 2008, Vol. 24, No. 3, Pages 4-18, MIT Press
- Fiore, S., Wright, P. and Edwards, A. (2005) *A pragmatist aesthetics approach to the design of a technological artifact*, Proceedings of the 4th decennial conference on Critical computing: between sense and sensibility. Aarhus, Denmark
- Fishwick, P. A., Diehl, S., Prophet, J. and Löwgren, J. (2005) *Perspectives on aesthetic computing*, Leonardo: Art Science and Technology, 38 (2). MIT Press
- Fogarty, J, Forlizzi, J., and Hudson, S. E. (2001) *Aesthetic Information Collages: Generating Decorative Displays that Contain Information*, Proceedings of UIST'01. ACM Press, pp. 141-150
- \* Frens, J. (2006) *Designing for Rich Interaction: Integrating Form, Interaction and Function*, Doctoral dissertation, Eindhoven University of Technology
- Fricke, D. (1979): *Frippertronics*, Synapse Magazine, volume 3, number 2, May/June p. 24
- \* Fullerton, T. (2008) *Game Design Workshop: A Playcentric Approach to Creating Innovative Games*, Morgan Kaufmann
- \* Fullerton, T., Swain, C., & Hoffman, S. (2004) *Game Design Workshop: Designing, Prototyping, and Playtesting Games*, CMP Books, 2004.
- Gaver, W. W., Beaver, J. and Benford, S. (2003) *Ambiguity as a resource for design*, Proceedings CHI'2003. ACM Press, NY, pp. 233-240.

- \* Gamma, E., Helm, R., Johnson, R., Vlissides, J. (1994) ***Design Patterns Elements of Reusable Object-Oriented Software***, Addison-Wesley
- \* Gelernter, D. (1988): ***Machine Beauty: Elegance and the heart of Technology***, Basic Books, New York, 1988
- \* Gibson J.J. (1979). ***The ecological approach to visual perception***, Lawrence Erlbaum, Houghton Mifflin, Boston, Massachusetts.
- \* Goldberg, R. (1988) ***Performance Art: From Futurism to the Present***, Harry N Abrams
- \* Graham, I. (2003) ***A Pattern Language for Web Usability***, Pearson Education; 1st edition
- Glancey, J. (2001) ***Love it or loathe it?***, The Guardian, Thursday 6 September 2001. Accessed from <http://www.guardian.co.uk/culture/2001/sep/06/artsfeatures.arts> (Retrieved 2009-08-12)
- \* Gronlund, N. E. (2004) ***Writing Instructional Objectives for Teaching and Assessment***, Pearson Prentice Hall, Upper Saddle River, NJ, USA
- Hallnäs, L., and Redström, J. (2001) ***Slow Technology – Designing for Reflection***, Personal and Ubiquitous Computing January 2001, Volume 5 Issue 3.
- Hallnäs, L. and Redström, J. (2002a): ***Abstract information Appliances; Methodological Exercises in Conceptual Design of Computational Things***, Proceedings of DIS2002: Serious reflection on designing interactive systems, pp. 105-116. ACM Press
- Hallnäs, L. and Redström, J (2002b) ***From use to presence: on the expressions and aesthetics of everyday computational things***, ACM Transactions on Computer-Human Interaction (TOCHI) Volume 9, Issue 2, (June 2002), pp. 106-124
- \* Hallnäs, L. and Redström, J. (2006): ***Interaction Design: Foundations, Experiments***, Textile Research Centre, Swedish School of Textiles, University College of Borås and Interactive Institute, 2006
- Harrison, S., Back, M. and Tatar, D. (2006) ***“It’s Just a Method!”: a pedagogical experiment in interdisciplinary design***, Proceedings of the 6th conference on Designing Interactive systems (DIS 2006). ACM Press

- \* Herr, K. and Anderson, G. L., (2005) ***The Action Research Dissertation A Guide for Students and Faculty***, SAGE Publications Inc.
  
- Hewett, T. T., Baecker, R., Card, S., Carey, T., Gasen, J., Mantei, M., Perlman, G., Strong, G., and Verplank, W. (1992, 1996) ***ACM SIGCHI Curricula for Human-Computer Interaction***, ACM. Accessed from <http://old.sigchi.org/cdg/> (Retrieved 2010-03-10)
  
- Hodgson, V. (1984) ***Lectures and the Experience of Relevance***, In Marton, F., Hounsell, D. and Entwistle, N. (eds.) *The Experience of Learning* Edinburgh: Scottish Academic Press
  
- \* Hume, D. (1757) ***Of the Standard of Taste***, A part of the collection *Four Dissertations*. Accessed from: <http://www.mnstate.edu/gracyk/courses/phil%20of%20art/hume%20on%20taste.htm> (Retrieved 2009-02-06)
  
- \* Hutchinson, A. (1977) ***LABANOTATION, The System of Analyzing and Recording Movement***, Theatre Arts Books, New York.
  
- Janlert, L-E. and Stolterman, E. (1997), ***The character of things***, Design Studies. Vol.18, no.3, pages 297-317. Elsevier. 1997
  
- Janse, M., Markopoulos, P., and Vinken, P. (2005) ***Eindhoven's User-System-Interaction Design Program: an overview***, interactions XII.5, September/October 2005. ACM Press.
  
- \* Jaques, D. (2000) ***Learning in Groups. A handbook for improving group work***, 3rd edition, Kogan Page, London,
  
- John, B.E (2005) ***The Human Computer Interaction Institute at Carnegie Mellon University***, interactions XII.5, September/October 2005. ACM Press.
  
- \* Jones, J. C. (1992) ***Design Methods***, John Wiley & Sons Inc, 2nd edition.
  
- Jones, M. C., Floyd, I. R. and Twidale, M. B. (2008) ***Teaching Design with Personas***, Proceedings of the International Conference of Human Computer Interaction Educators 2008 (HCIEd 2008) in Rome, 2-4 April 2008.
  
- \* Jordan, P. (2000) ***Designing Pleasurable Products***, Taylor & Francis, London, UK

- \* Järvinen, A. (2008) **Games without Frontiers**, Ph.D. thesis, Department of Literature and the Arts, Tampere University
  
- Klemmer, S., Hartmann, B., and Takayama, L. (2006) **How Bodies Matter: Five Themes for Interaction Design**, Proceedings of Designing Interactive Systems (DIS 2006), June 26–28, 2006, University Park, Pennsylvania, USA.
  
- Kramer, W. (2001) **What Makes a Game Good?**, Accessed from: <http://www.thegamesjournal.com/articles/WhatMakesaGame.shtml> (retrieved 2009-06-18)
  
- Kahn, P. H., Jr., Friedman, B., & Hagman, J. (2002) **"I Care About Him as a Pal": Conceptions of Robotic Pets in Online AIBO Discussion Forums**, CHI 2002 Extended Abstracts of the Conference on Human Factors in Computing Systems (pp. 632-633). New York: ACM Press.
  
- Kahn, P., Friedman, B., Perez-Granados, P. R., Freier, N. G (2004) **Robotic Pets in the Lives of Preschool Children**, Proceedings of CHI 2004.
  
- \* Kant, I (1892) **The Critique of Judgement**, translated with Introduction and Notes by J.H. Bernard (2nd ed. revised) (London: Macmillan, 1914). Accessed from <http://oll.libertyfund.org/title/1217> (Retrieved 2009-03-06)
  
- Kennedy, D., Hyland, A., Ryan, N (2006) **Writing and Using Learning Outcomes: a Practical Guide** In Froment, E., Kohler, J., Purser, L., Wilson, L. (Eds) *EUA Bologna Handbook Making Bologna Work*, European University Association. Accessed from <http://www.bologna.msmt.cz/files/learning-outcomes.pdf> (Retrieved 2010-03-12)
  
- Krippendorff, K. and Butter, R. (Eds.) (1989) **Special issue devoted to Product Semantics**, Design Issues, Volume 5, Issue 2, MIT Press
  
- \* Krippendorff, K. (2006) **The semantic turn: a new foundation for design**, CRC Press, Boca Raton, USA
  
- Landin H., Lundgren S., Prison J (2002) **Aesthetic artefacts: The Iron Horse: a sound ride**, Proceedings of the second Nordic conference on Human-computer interaction October 2002, Aarhus, Denmark, October 19-23, ACM Press.



- Landin, H. (2009) **Anxiety and Trust and other expressions of interaction**, Doctoral thesis, Chalmers University of Technology, Gothenburg, Sweden.
- Landin, H. (2006) **Fragile and magical interaction forms: an approach to interaction design aesthetics**, Licentiate thesis, Chalmers University of Technology, Gothenburg, Sweden.
- \* Laurel, B. (1991) **Computers as Theatre**, Addison-Wesley Publishing Company, Reading, MA, USA
- Laurillard, D. (1984) **Styles and Approaches in Problem-Solving**, In Marton, F., Hounsell, D. and Entwistle, N. (eds.) *The Experience of Learning*, Edinburgh: Scottish Academic Press
- \* Laurillard, D. (1993) **Rethinking University Teaching: A Framework for the Effective Use of Educational Technology**, Routledge, London and New York
- LeBlanc, M. (2006). **Tools for Creating Dramatic Game Dynamics**, In Salen, K. & Zimmerman, E. (eds.) *The Game Design Reader: A Rules of Play Anthology*, pp. 438-459, MIT Press, 2006.
- \* Lindinger, H. (1991) **Ulm Design: The Morality of Objects**, The MIT Press, Cambridge, Massachusetts
- Lim, Y., Stolterman, E., Jung, H. and Donaldson, J. (2007) **Interaction gestalt and the design of aesthetic interactions**, Proceedings of the 2007 conference on Designing pleasurable products and interfaces , 22-25 August 2007, Helsinki, Finland, ACM Publishing
- Lim, Y., Lee, S. and Lee, K. (2009) **Interactivity attributes: a new way of thinking and describing interactivity**, Proceedings of ACM CHI 2009 Conference on Human Factors in Computing Systems 2009. pp. 105-108.
- Lundgren, S., Eriksson, E., Hallnäs, L., Ljungstrand, P., Torgersson, O. (2006) **Teaching Interaction Design: Matters, Materials and Means**, Proceedings of WonderGround - 2006 Design Research Society International Conference in Lisbon, 1-4 November 2006.
- Lundgren, S. (2006) **Facets of Fun: On the Design of Computer Augmented Entertainment Objects**, Licentiate thesis, Chalmers University of Technology, Gothenburg, Sweden.

- Lundgren, S. (2008a) ***Controlled Confusion: Teaching complex multi-disciplinary group work***, Proceedings of the International Conference of Human Computer Interaction Educators 2008 (HCIEd 2008) in Rome, 2-4 April 2008.
- Lundgren, S. (2008b) ***Designing Games: Why and How***, interactions, Volume 15, Issue 6 (November + December 2008), Pages 6-12. DOI: <http://doi.acm.org/10.1145/1409040.1409042>
- Lundgren, S. (2008c) ***Teaching Gameplay Design is teaching Interaction Design***, Proceedings of the International Conference of Human Computer Interaction Educators 2008 (HCIEd 2008) in Rome, 2-4 April 2008.
- Lundgren, S. (2008d) ***Treating and Teaching Aesthetics as Personality***, Proceedings of NordiCHI 2008: Using Bridges, 18-22 October, Lund, Sweden
- Lundgren, S., Bergström K., and Björk, S. (2009) ***Exploring Aesthetic Ideals of Gameplay***, Proceedings of DiGRA 2009 (Digital Games Research Association Conference 2009 Breaking New Ground: Innovation in Games, Play, Practice and Theory), Brunel University, West London, United Kingdom, 1st - 4th of September 2009.
- Lundgren, S. and Hultberg, T. (2009) ***Time, Temporality and Interaction***, interactions, Volume 16, Issue 4 (July+August 2009), Pages 34-37. ACM Press.
- Lundgren, S. (2009a) ***Case Study. Teaching Design in Large Heterogeneous Classes***, Interfaces No. 79, Summer 2009, pp. 12-15, Available from: Interfaces Archive
- Lundgren, S. (2009b) ***Exploring the Interplay between Emotions and Interaction***, Proceedings of the third Nordic Design Research Conference, NORDES'09: Engaging Artefacts, Oslo, Norway, 30th of August to 1st of September 2009.
- Lundgren, S. (2009c) ***Teaching Aesthetics in Interaction Design: Attempt One***, Proceedings of the International Conference of Human Computer Interaction Educators 2009 (HCIEd 2009) in Dundee, 22-24 April 2009.

- Löwgren (2002) *The use qualities of digital designs*, Accessed from <http://webzone.k3.mah.se/k3jolo/Material/uqDDv1.pdf> (Retrieved 2010-03-19)
- Löwgren, J. (2007a). *Fluency as an experiential quality in augmented spaces*, International Journal of Design 1(3):1–10.
- Löwgren, J. (2007b). *Pliability as an experiential quality: Exploring the aesthetics of interaction design*, Artifact 1(2):85–95.
- Löwgren, J. (2008) *Five things I believe about the aesthetics of interaction design*, Dagstuhl Seminar Proceedings, Schloss Dagstuhl - Leibniz-Zentrum für Informatik,
- Löwgren, J. (2009). *Towards an articulation of interaction aesthetics*, New Review of Hypermedia and Multimedia 15(2). Page references are to a pre-publication-version retrieved March 18th 2010 from [http://webzone.k3.mah.se/k3jolo/Material/THAM\\_preprint\\_2009.pdf](http://webzone.k3.mah.se/k3jolo/Material/THAM_preprint_2009.pdf)
- \* Löwgren, J. and Stolterman, E. (2004) *Thoughtful interaction design* MIT Press, Cambridge, MA.
- \* Manovich, L. (2002) *The Language of New Media*, The MIT Press
- Manovich, L. (2006) *Interaction as an aesthetic event*, In: Reciever # 17 (online magazine), Vodafone Group 2006
- Martin, F. G. and Roehr, K. E. (2010) *A General Education Course in Tangible Interaction Design*, Proceedings of the fourth international conference on Tangible, embedded, and embodied interaction (TEI 2010). ACM Press
- \* Marton, F., Hounsell, D., Entwistle, N. (1986) *Hur vi lär*, Prisma, Stockholm, Sweden. Original title: *The Experience of Learning*, published by Scottish Academic Press 1984.
- Marton, F., and Säljö, R. (1976a) *On Qualitative Differences in Learning – 1: Outcome and Process*, British Journal of Educational Psychology, 1976, Vol. 46, Pp. 4-11.
- Marton, F., and Säljö, R. (1976b) *On Qualitative Differences in Learning – 2: Outcome as a function of the learner's conception of the task*, British Journal of Educational Psychology, 1976, Vol. 46, Pp. 115-127.

- \* McGregor (1960) *The Human Side of Enterprise*, McGraw-Hill, New York – as described in Biggs (2003), pp. 64-73
  
- Melson, G. F., Kahn, P., Beck, A. M., Friedman, B., Roberts, T., and Garret, E. (2005) *Robots as Dogs? – Children's Interactions with the Robotic Dog AIBO and a Live Australian Shepherd*, Proceedings of CHI 2005.
  
- Miles, M. (Ed.) (2004), *New Practices, New Pedagogies: a Reader*, Swets & Zeitlinger / Taylor & Francis
  
- \* Monö, R (1997) *Design for Product Understanding*, Liber AB, Stockholm, Sweden
  
- \* Moggridge, B (2007) *Designing Interactions*, MIT Press, Cambridge Massachusetts, USA
  
- Moore, G.E. (1903): *Principia Ethica*, Cambridge University Press, Cambridge. Accessed from <http://fair-use.org/g-e-moore/principia-ethica/> (Retrieved 2009-06-24)
  
- \* Mumaw, S. and Oldfield, W. L. (2006), *Caffeine for the Creative Mind*, How Books, Cincinnati,
  
- \* Murray, J. (1997) *Hamlet on the Holodeck: The Future of Narrative in Cyberspace*, The Free Press, New York
  
- Nicholson, J. A. (2005). *Flash! Mobs in the Age of Mobile Connectivity*, Fibreculture Journal, Issue 6, Fibreculture Publications/Open Humanities Press. Accessed from [http://journal.fibreculture.org/issue6/issue6\\_nicholson.html](http://journal.fibreculture.org/issue6/issue6_nicholson.html). (Retrieved 2010-02-15)
  
- Nielsen, J (1995 –) *Alertbox: Current Issues in Web Usability*. Bi-weekly column published online at: <http://www.useit.com/alertbox/>
  
- \* Nielsen, J (2000) *Designing Web Usability: The Practice of Simplicity*, New Riders Publishing, Indianapolis, USA
  
- Nielsen, J. (1994). *Heuristic evaluation*, In Nielsen, J., and Mack, R.L. (Eds.), *Usability Inspection Methods*, John Wiley & Sons, New York, NY.
  
- \* Norman, D (1998) *The Design of Everyday Things*, The MIT Press, London, England

- Norman, D. A. (2002) *Emotion and Design. Attractive things work better*, interactions Volume 9 Issue 4, (July + August 2002), ACM Press, pp. 36-42.
- \* Norman, D (2003) *Emotional Design: Why We Love (or Hate) Everyday Things*, Basic Books, New York
- Obendorf, H., Finck, M., Schmolitzky, A. (2005) *Teaching balance and respect: HCI Group & Software Technology Group at the University of Hamburg*, interactions XII.5, September/October 2005. ACM Press.
- Orr, S., Blythman, M, & Blair, B. (n.d.) *Critiquing the Crit, Staff Guide*. The HigherEducation Academy, UK. Retrieved 2010-03-22, from <http://www.adm.heacademy.ac.uk/projects/adm-hea-projects/learning-and-teaching-projects/critiquing-the-crit>
- Orrell, J. (2006) *Feedback on learning achievement: rhetoric and reality*, Teaching in Higher Education, Volume 11, Number 4, October 2006, pp. 441-456, Routledge
- Overbeeke, C.J., Djajadiningrat, J.P., Hummels, C.C.M. and Wensveen, S.A.G. (2002) *Beauty in Usability: Forget about Ease of Use!*, In Green, W.S and Jordan, P.W. (Ed.), *Pleasure with products: Beyond usability*, pp. 9-18, London: Taylor & Francis
- \* Parlett, D. (1999) *The Oxford History of Board Games*, Oxford University Press.
- Petersen, M. G., Iversen, O. S., Krogh, P. G and Ludvigsen, M. (2004) *Aesthetic interaction: a pragmatist's aesthetics of interactive systems*, Proceedings of the 5th conference on Designing interactive systems: processes, practices, methods, and techniques, ACM Press, New York, pp. 269-276.
- \* Picard, R. W. (2000) *Affective computing*, MIT Press
- Picard, R. W. (2009) *Robots with emotional intelligence*, Proceedings of the 4th ACM/IEEE international conference on Human robot interaction, March 2009
- \* Pineiro, E. (2003) *The aesthetics of code: on excellence in instrumental action*, Arvinus Förlag, Sweden.
- Plato (ca 360 B.C.) *Timaeus*, translated by B. Jowett. Accessed from <http://classics.mit.edu/Plato/timaeus.html> (Retrieved 2009-02-04)

- \* Preece, J. et al. (1994) *Human Computer Interaction*, Addison Wesley
- \* Pye, D. (1978) *The Nature and Aesthetics of Design*, Cambium Press, Bethel, Connecticut, USA
- \* Ramsden P (1992) *Learning to Teach in Higher Education*, Routledge, London and New York
- \* Raskin, J. (2000) *The Humane Interface*, New Directions for Designing Interactive Systems Addison-Wesley / ACM Press.
- Recker, M., Dorward, J., Dawson, D., Mao, X., Liu, Y., Palmer, B., Halioris, S. and Park, J. (2005) *Teaching, Designing, and Sharing: A Context for Learning Objects*, Interdisciplinary Journal of Knowledge and Learning Objects Volume 1, 2005
- Redström J, Skog T and Hallnäs L. (2000) *Informative Art: Using Amplified Artworks as Information Displays*, Proceedings of DARE 2000 Elsinore, University of Aarhus, 2000
- Redström, J. (2001) *Designing Everyday Computational Things*, Doctoral thesis at Gothenburg Studies in Informatics, Report 20, May 2001, ISSN 1400-741X
- Redström, J. (2008) *Tangled interaction: On the expressiveness of tangible user interfaces*, ACM Transactions on Computer-Human Interaction (TOCHI), Volume 15, Issue 4 (November 2008)
- Redström J, Skog T, Hallnäs L. (2000) *Informative art: using amplified artworks as ambient displays*, In: Proceedings of DARE 2000. Elsinore, University of Aarhus, 2000
- \* Reeves, B and Nass, C.,(2002) *The media equation*, CSLI Publications, Center for the study of Language and Information, Leland Stanford Junior University, 2002
- Riseberg, J., Klein, J., Fernandez, P., Picard, R.W. (1998) *Frustrating the user on purpose: using biosignals in a pilot study to detect the user's emotional state*, Proceedings of CHI '98, ACM
- \* Robson, C. (2002) *Real World Research: A Resource for Social Scientists and Practitioner-Researchers*, Wiley-Blackwell, 2nd Edition



- Routarinne, S. and Redström, J. (2007). **Domestication as Design Intervention**, Proceedings of Design Inquiries, the Second Nordic Design Research Conference 2007. Web proceedings of Nordic Design Research: [www.nordes.org](http://www.nordes.org).
- \* Rullo, A. (2007) **Aesthetics of use: A methodological perspective on ambient computing**. Ph.D. thesis, University of Florence, Italy.
- Rullo, A. (2008) **The soft qualities of interaction**, ACM Transactions on Computer-Human Interaction (TOCHI), Volume 15, Issue 4 (November 2008)
- \* Salen, K. & Zimmerman, E. (2004) **Rules of Play: Game Design Fundamentals**, The MIT Press, 2004.
- Schiphorst, T. (2009) **Soft(n): Toward a Somaesthetics of Touch**, In: proceedings of CHI 2009, April 4-9, 2009 ~ Boston, MA, USA. ACM Press.
- \* Schön, Donald (1983) **The Reflective Practitioner: How Professionals Think in Action**, Basic Books Inc, Reprinted by Ashgate Publishing Ltd, Aldershot, England.
- \* Seow, S. C. (2008) **Designing and Engineering Time**, Addison Wesley
- \* Shusterman, R. (2000) **Pragmatist Aesthetics. Living Beauty, Rethinking Art**, Rowman & Littlefield Publishers, Inc., 2nd edition
- \* Spence, R. (2000) **Information Visualization**, ACM Press, Addison Wesley; 1st edition
- Stolterman, E. (1994) **Guidelines or aesthetics: design learning strategies**, Design Studies Vol 15 No 4 October 1994
- \* Strauss, N., Lee, T., Neil, V., Mars, M., Sixx, N. (2001), **The Dirt - Motley Crue: Confessions of the World's Most Notorious Rock Band**, Harper Collins
- Strommen, E. (1998) **When the Interface is a Talking Dinosaur**, ACM Press/Addison-Wesley Publishing Co. New York, NY, USA, pages: 288 - 295 Series-Proceeding- Article
- Sullivan, L. H. (1896) **The tall office building artistically considered**, Lippincott's Magazine, March 1896. Accessed from <http://academics.triton.edu/faculty/fheitzman/tallofficebuilding.html> (retrieved 2009-03-26)

- Thomassen, A. and Ozcan, O. (2010) **Standardizing interaction design education**, Computers & Education, Volume 54, Issue 4, May 2010, Pages 849-855
- \* Tidwell, J. (2005) **Designing Interfaces. Patterns for Effective Interaction Design**, O'Reilly Media
- \* Tiger, L. (1992) **The Pursuit of Pleasure**, Little, Brown & Company, Boston, USA
- Tscheligi, M., Bernhaupt, R. (2005) **HCI education at the ICT&S Human-Computer Interaction as a cornerstone between technology and society**, interactions XII.5, September/October 2005. ACM Press.
- Tractinsky, N., Katz, A. S., Ikar, D. (2000) **What is beautiful is usable**, Interacting with Computers 13 (2000) 127-145, Elsevier
- \* Tufte, E. R (2006) **Beautiful Evidence**, Graphics Press LLC, Cheshire, Connecticut
- \* Tufte, E. R (1990) **Envisioning Information**, Graphics Press LLC, Cheshire, Connecticut
- \* Tufte, E. R (1997) **Visual Explanations: Images and Quantities, Evidence and Narrative**, 4th printing with revisions edition Graphics Press LLC, Cheshire, Connecticut
- Tzara, T. (1918) **Dada manifesto**, Accessed from: <http://www.freemediaibrary.com/>
- Udsen, L-E. and Jørgensen, A. H. (2005) **The aesthetic turn. Unraveling recent aesthetic approaches to human-computer interaction**, Digital Creativity 2005, Vol 16, No 4, pp 205-216
- Vedel Jensen, M., Buur, J. and Djajadiningrat, T. (2005) **Designing the user actions in tangible interaction**, Proceedings of the 4th decennial conference on Critical computing: between sense and sensibility, Aarhus, Denmark. ACM Press.
- Vedel Jensen, M. and Stienstra, M. (2007) **Making sense: interactive sculptures as tangible design material**, Proceedings of the 2007 conference on Designing pleasurable products and interfaces. ACM Press
- Viégas, F. B., Wattenberg, M., Dave, K. (2004) **Studying Cooperation and Conflict between Authors with history flow Visualizations**, Proceedings of CHI 2004, ACM Press.

- \* Vihma, S. (2003) *Designhistoria*, Raster Förlag, Stockholm.
  
- Weiser, M. and Brown, J. S. (1996) *The Coming Age of Calm Technology*, Accessed from: <http://www.johnseelybrown.com/calmtech.pdf> (Retrieved 2009-05-06)
  
- \* Wick, R. (2000) *Teaching at the Bauhaus*, Hatje Cantz Verlag, Ostfildern-Ruit, Germany
  
- \* Wiley, D. A. (2000). *Connecting learning objects to instructional design theory: A definition, a metaphor, and a taxonomy*, In D. A. Wiley (Ed.), *The Instructional Use of Learning Objects: Online Version*. Accessed from: <http://reusability.org/read/chapters/wiley.doc> (retrieved 2010-02-22)
  
- Winograd, T. and Klemmer, S. (2005) *HCI at Stanford University*, interactions XII.5, September/October 2005. ACM Press.
  
- \* Woodham, J. M. (1997) *Twentieth Century Design*, Oxford University Press, UK
  
- Wright, P., Wallace, J., McCarthy, J. (2008) *Aesthetics and Experience-Centered Design*, ACM Transactions on Computer-Human Interaction (TOCHI), Volume 15, Issue 4 (November 2008)
  
- Zanko, F. (1999) *Looking for Atmosphere*, Éditions Dis Voir. Accessed from <http://www.jaspermorrison.com/html/3841160.html> (Retrieved 2009-05-04)
  
- Ziff, P. (1979) *Anything viewed*, reprinted in Feagin, S., and Maynard, P. (eds) (1997) *Aesthetics*, Oxford University Press

# APPENDICES

Intended Learning Outcomes for Aol1 and Aol2

Schedule for Aol1

Schedule for Aol2

Literature Questions, Aol1

Literature Questions, Aol2

Course evaluation, Aol1 and Aol2

# INTENDED LEARNING OUTCOMES, AOI1 AND AOI2

Writing the learning outcomes was one of the very first things I did, since these had to be entered into the database system long before the course was due. As a result, the learning outcomes for Aoi1 were written in a rather fuzzy way to allow for several approaches. For Aoi2, they were rephrased in a clearer way. The numbers are added only to help referencing in the text below):

## First version, Aoi1

1a. Have an overarching knowledge of the history of aesthetics in general.

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2a. Have an overarching knowledge of the history of aesthetics in relation to industrial design.

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3a. Have a good knowledge of the ongoing discussion on aesthetics in relation to interaction design, i.e. interaction aesthetics.

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4a. Be aware of the importance and aesthetical effect of all kinds of expressions, not only visual ones.

## Rephrased, Aoi2

1b. Be familiar with some aesthetic ideals and how they are applied in interaction design:

- Coherency
- Efficiency
- Criticism
- Sensing
- Emotions
- Playfulness

2b. Have a good knowledge of the qualities of interaction per se. e.g. interaction properties and different ways to view and denote interaction.

3b. Be aware of aspects of temporality and be able to consider and apply temporal aspects in a design.

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4b. Be aware of how the interplay of expressions, interactions, functions and behaviors cooperate to create the gestalt of an artifact.

First version, Aol1	Rephrased, Aol2
5a. Know how to analyze an interactive system or object from an aesthetical standpoint (own or others).	5b. Be able to analyze an interactive system or object and formulate its aesthetic characteristics, i.e. which aesthetic ideal that seems to be the basis for design.
6a. Be able to apply certain aesthetic values to a design.	6b. Be able to design an interactive system or object according to a certain aesthetic ideal.
7a. Be trained in discussing and motivating your design choices.	7b. Be trained in basing your design decisions on an underlying aesthetic ideal, hereby also being able to discuss and motivate them.
8a. Be trained in giving and receiving constructive feedback on design of interaction aesthetics.	8b. Be trained in giving and receiving constructive feedback on design of interaction aesthetics.
	9b. Be familiar with the idea of the Gesamtkunstwerk.
	10b. Have formulated and motivated a first draft of your own aesthetic ideal.
To summarize: After the course you should have a clear idea about what interaction aesthetics is and what to consider when designing the various aspects of it. Thus, you should be able to design an interactive object or system with a	To summarize: After the course you should have a clear idea of some aesthetic ideals and how to design according to them, giving a valid design rationale. You should also have formulated a first draft of your own aesthetic ideal.

The rephrasing of the intended learning outcomes describes a shift from teaching in a time-related manner (first talking about aesthetics in general, then about aesthetics in industrial design and lastly about interaction



design) towards a topic-related manner. Clearly describing a few aesthetic ideals will help in practice in particular 5b, but also 6b and 7b which all deal with analyzing and designing according to aesthetic ideals.

The added learning outcome 9b, about the *Gesamtkunstwerk*, is related to another conviction; that aesthetics actually is a matter of consistency, i.e. of being consistent to one's aesthetic ideal. This learning outcome is also closely related to 4b; that the combination of everything that an object is makes out its aesthetic impression.

The added learning outcome 10b, to formulate one's own aesthetic ideal, was inherent in 5a, but was and should be such an important part of the course that it deserves to have its own learning outcome. Explicitly letting students formulate their own ideals forces students to reflect upon and discuss already existing ideals and thus encourages deep learning.

# SCHEDULE FOR AOI1

The course took place between October 28 and December 11, 2008.

## TUESDAYS

09.00-10.00: Introduction  
10.15 - 12.00: Lecture: History of aesthetics. Basic issues.  
13.00-16.00: Ex1: Super Hero Gadgets

09.00-10.00: Feedback Ex1  
10.00 - 16.00: Ex2: Cartoon

09.00-10.00: Feedback Ex2  
10.00 - 16.00 Ex3: Designing Emotions

09.00-10.00: Feedback Ex3  
10.00 - 16.00: Ex4: Expressions of Interaction

09.00-10.00: Feedback Ex4.  
10.00 - 16.00: Ex6: Informative Art

## THURSDAYS

09.00 - 12.00: Lecture: Basic concepts. History of industrial design  
  
Afternoon: Excursion, Röhsska Museet

09.00 - 12.00: Lecture: Aesthetics in interaction design: The aesthetic turn  
  
Afternoon: Excursion, My Animal Park, Sjöfartsmuseet

7.30 - 21.00 ca: Excursion to Lund to visit Chinese exhibition at Kulturen, and The Museum of Sketches

09.00 - 12.00: Ex5/Discussion: Temporal Paint  
  
Afternoon: Writing feedback, homework

09.00 - 12.00: Lecture: Aesthetics in interaction design: Personality and gestalt  
13.00 - 14.00: Discussion: THree Levels  
SUNDAY: Deadline essay draft

**THURSDAYS****TUESDAYS**

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09.00-10.00: Feedback Ex4.

Portfolio work

10.00 - 16.00: Ex7: Design the

Apple

15.30-17.30 Tue + 9.30 – 14.00

Wed: Feedback-meetings on aesthetics-essay

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Portfolio work

Portfolio work

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Portfolio work

09.00-13.00: Oral presentations

Deadline: Portfolio hand-in!

# SCHEDULE FOR AOI2

The course took place between September 1 and October 25 2009. Due to clashing schedules, an extra supervision session was added 9-14 on Wednesday weeks 3-7. "G1" and "G2" refers to the two feedback groups used for crit-sessions; there were ten students in each group.

## TUESDAYS

09.00-10.00: Introduction to the course  
 10.15-12.00: Lecture: Basic issues - aesthetics and interaction  
 13.00-16.00: Ex1: Design the Apple  
 16.00-17.00: Feedback session

09.00-17.00: Groups work on first Literature assignment.

09.00-10.00: Lecture: Coherency and the Gesamtkunstwerk  
 10.00 - 17.00: Ex4: The Office Assistant

08.00-09.30: Feedback Ex4: G1  
 09.30-15.30 Ex5: Expressions of Interaction  
 15.30-17.00 Feedback Ex 4: G2

08.00-09.30: Feedback Ex5: G1  
 09.30-15.30 Ex6: Designing Emotions  
 15.30-17.00 Feedback Ex5: G2

## THURSDAYS

09.00-12.00: Lecture: Qualities of Interaction  
 13.00-16.00: Ex2: The schizophrenic iPod  
 16.00-17.00: Feedback session

09.00 - 11.00: Lecture: Temporality  
 11.00-16.00: Ex3: Informative Art  
 16.00-17.00: Feedback: Art Exhibition!

09.00-17.00: Groups work on second Literature assignment.

09.00 - 12.00: Lecture: Aesthetic ideals I: Emotion and Sensing  
 13.00-17.00 Group work on third Literature assignment.

09.00-12.00 Lecture: Aesthetic ideals II Criticism, Efficiency and Playfulness  
 13.30-15.00: Excursion to Röhsska Muséet

**TUESDAYS****THURSDAYS**

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08.00-09.30: Feedback Ex6: G1  
09.30-15.30 Ex7: Calculator on  
the Runway  
15.30-17.00 Feedback Ex6: G2

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09.00-17.00 Portfolio work

08.00-09.30: Feedback Ex7: G1  
09.30-15.30 Ex8: Face...what???  
15.30-17.00 Feedback Ex7: G2

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Portfolio work or catching up on  
missed exercises

13.00-14.30: Feedback Ex8: G1  
14.30-16.00: Feedback Ex8: G2

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09.00-17.00: Portfolio work

FRIDAY 9.00-ca 12.00 Oral pres-  
entations

SUNDAY: Portfolio deadline.

# LITERATURE QUESTIONS, AO11

Students worked in small groups, dividing the questions amongst them and sharing their answers. All students but one had previously read texts by among others, Hallnäs and Redström (2002b), Monö (1997), Petersen et al (2004) and Ziff (1979).

## LECTURE II: Basic concepts. The history of industrial design.

David Gelernter: **Deep Beauty**. Chapter 1 in *Machine Beauty: Elegance and the heart of Technology*, Basic Books, New York, 1988

- On page 2, Gelernter claims that a piece of software can be just as beautiful as a rose; what are his main arguments?
- What does the notion “deep beauty” mean, according to Gelernter?

Lars Hallnäs and Johan Redström: **Computational Technology as a Design Material**. Chapter 5.2 in *Interaction Design: Foundations, Experiments*, Textile Research Centre, Swedish School of Textiles, University College of Borås and Interactive Institute, 2006.

- Hallnäs and Redström describe computational technology as a conceptual material; what do they mean by that? And what consequences does this have for designing with it?
- Not all researchers agree with the idea of computational technology as a design material; for instance a counter argument is that the execution of code depends solely upon the hardware used (e.g. how fast a processor can be), just like the use of electricity depends on the wiring – in this text’s example about the lamp the argument would be that how the lamp lights up the room lies solely in how the physical materials (like the lamp screen, the glass in the bulb etc.) are constituted. In this view, electricity and algorithms are just a kind of medium, just as air is a medium for spreading sound. What do you think? Why?
- “Thus a more sensitive approach to the use of rhythm in interaction design is needed” (p 112). Can you think of an example (own or already existing, but other than music programs) where rhythm is used as a design element too? Do you like or dislike your example? Why?



## LECTURE III: Aesthetics in interaction design: The aesthetic turn

John Dewey: ***The Aesthetic in Experience***. Excerpts from *Art as Experience*, first published by G. Putnam's Sons in New York 1934. This summary consists of pages 13, 16-17 and 35-50 of the original version and was published in Feagin, S., and Maynard, P. (Eds.) *Aesthetics*, Oxford University Press 1997

- Dewey talks about “an experience”. What denotes such experiences? Can you describe one of your own; why was it an experience? Which property characterized it?
- Are aesthetic experiences always positive / “good” according to Dewey? What is your opinion and why?

Lars Hallnäs and Johan Redström: ***Abstract information Appliances; Methodological Exercises in Conceptual Design of Computational Things***, Proceedings of DIS2002: Serious reflection on designing interactive systems, pp. 105-116. ACM Press.

- What are the authors' view on aesthetics, and what do they think is significant for the aesthetics of computational things?
- The described exercises (the examples) can be seen as rather obscure, but they are used for the authors to explore two important points – which ones?

Lev Manovich: ***Interaction as an aesthetic event***, Reciever # 17 (online magazine), Vodafone Group 2006

- Manovich discusses how “interaction is treated as an event.” Read one of Jonathan Ive's texts (the correct link is <http://www.design-museum.org/exhibitions/online/jonathan-ive-on-apple>) and find an example of this affected how product design.
- Manovich refers to the LG Chocolate phone as being a *Gesamtkunstwerk*. What is a *Gesamtkunstwerk* (check out the web!)? Now, would you say that interaction design is about creating *Gesamtkunstwerke*? Never? Sometimes? Always? Why?

Lars Erik Udsen & Anker Helms Jørgensen: The aesthetic turn. Unraveling recent aesthetic approaches to human-computer interaction, *Digital Creativity* 2005, Volume 16, No 4, pp 205-216

- Which one of the four approaches do you find to be most appealing? Why?
- Which one of the four approaches do you find to be least appealing? Why?

## LECTURE IV: Aesthetics in interaction design: Personality and gestalt

Lars Erik Janlert and Erik Stolterman: *The character of things*, *Design Studies*. Vol.18, no.3, pages 297-317. Elsevier 1997

- What is the difference between inscribing character into an object, and describing beliefs and values into it?
- What is the difference between using character as a way to imply how something works, and to use non-functional metaphors? Do you think that it is easy to combine them?

Youn-kyung Lim, Erik Stolterman, Heekyoung Jung and Justin Donaldson: *Interaction gestalt and the design of aesthetic interactions*, *Proceedings of the 2007 conference on Designing pleasurable products and interfaces*, 22-25 August 2007, Helsinki, Finland, ACM Publishing

- What is the authors' perspective on interaction? How does it differ from the other mentioned perspectives?
- Pick any one of the following attributes in Table 1: Continuity, Directness, Movement, Orderliness, Pace, Time-depth. Check out the examples for the attribute you chose, and then try to find two new examples that feature this attribute and that are somewhere in between the two extreme points. Then, try to write a richer description of the attribute.
- Take your Informative Art piece and analyze it using the terms in Table 1.

Byron Reeves and Clifford Nass: **Media and Personality**. Part II in *The media equation*, CSLI Publications, Center for the study of Language and Information, Leland Stanford Junior University, 2002

*Comment: The Media Equation is the theory that interactions with computers, television and new communication technologies are identical to real social relationships and to the navigation of real physical spaces. Hence "a mediated personality" is a fictional character, e.g. an agent or a person in a TV-series.*

- Mediated personalities have a few advantages when it comes to shaping and displaying their personality. Which ones?
- In chapter 7, an experiment with computers with personality was conducted. In which ways did the computers display their personality? If the computers had communicated with voice instead of text, what properties could then have been used?
- Are there any similarities between Reeves' and Nass' idea about imitating personality, and Cooper's and Reimann's thoughts on considerate software? Are there any differences?

# LITERATURE QUESTIONS AOI2

Each student had to answer one question per text. Students worked in study groups that divided the questions amongst them, sharing answers. Thus, each student answered, or at least had access to an answer, to each question.

## LITERATURE SESSION I: Interaction and Temporality

Landin, H. (2009) ***Anxiety and Trust and other expressions of interaction***, Doctoral thesis, Chalmers University of Technology, Gothenburg, Sweden. Pages 35-68. Read pages 35-36 (Form properties) and 46-52 (Expressions of interaction) thoroughly, and go through the examples on the other pages.

- Looking back at the design you did the first day “Design the Apple”, which form properties can you find in your design? If none of Landin’s fit, make up and describe your own.
- Looking back at the design you did the first day “Design the Apple”, which expressions of interaction can you find in your design? If none of Landin’s fit, make up and describe your own.
- (If you missed “Design the Apple “: Analyze Google. Which expressions of interaction can you find in your design? If none of Landin’s fit, make up and describe your own.

Lim, Y., Stolterman, E., Jung, H. and Donaldson, J. (2007) ***Interaction gestalt and the design of aesthetic interactions***, Proceedings of the 2007 conference on Designing pleasurable products and interfaces, 22-25 August 2007, Helsinki, Finland, ACM Publishing

- Do you think that the list of gestalt attributes is correct? Can it be improved? Perhaps some attributes are missing, or others are too alike? Create a better version of the list. If you come up with new properties, write a short description.
- Pick any one of the following attributes in Table 1: *Continuity, Directness, Movement, Orderliness, Pace, Time-depth*. Check out the examples for the attribute you chose, and then try to find two new examples that feature this attribute and that are somewhere in between the two extreme points. Then, try to write a richer description of the attribute.

Löwgren, J. (2002) *The Use Qualities of Digital Designs*, Download from: <http://webzone.k3.mah.se/k3jolo/Material/uqDDv1.pdf>

- Compare Löwgren's use qualities and Landin's form properties and expressions. Differences? Similarities? Which view do you prefer (if any) and why?
- Compare Löwgren's use qualities and Lim et al's gestalt attributes. Differences? Similarities? Which view do you prefer (if any) and why?

Lundgren, S. and Hultberg, T. (2009) *Time, Temporality and Interaction*, interactions, XVI.4 July/August 2009, ACM Press

- Compare *Echo* and *Perspective* at <http://demo.iconara.net/temporal-paint/>. Which temporal themes can you find in them? And how do they affect your interaction?
- Do you agree with the author's suggestions of temporal themes or do you think that the list can be improved? Are some themes missing or could some be merged? Write your own suggestion.

## LITERATURE SESSION II: Emotion and Sensing

Janlert, L-E. and Stolterman, E: *The character of things*, Design Studies. Vol.18, no.3, pages 297-317. Elsevier. 1997

- What is the difference between using character as a way to imply how something works, and to use non-functional metaphors? Do you think that it is easy to combine them?
- Analyze the Office Assistant you created on Tuesday. Which expectations does it generate? Which explanations? What is the context for interpretation?

Jordan, P. (2000) *Designing Pleasurable Products*, Taylor & Francis, London, UK, pages 12-56

- For each one of the four pleasures, give one example of an interactive product (not already mentioned by Jordan), that strongly evokes this pleasure.
- Make a four-pleasure analysis of a famous person of your choice. Motivate your conclusions.

Djajadiningrat, T., Wensveen, S., Frens, J., Overbeeke, K. (2004) ***Tangible products: redressing the balance between appearance and action***, Personal and Ubiquitous Computing, Volume 8 , Issue 5 (September 2004), Pages: 294 - 309, ACM Press

- In section 1.2 the authors describe three factors which they think play a role in aesthetics of interaction. Choose one of the following design examples in the paper: The videodeck, the digital camera, the programmable heating controller or the alarm clock. Analyze them in the terms of these three factors. To which extent do they exist? And, is the design coherent? Could it be improved in this aspect?
- Compare Djajadiningrat's approach with Schiphorst's, especially when it comes to the theoretical background they base their ideas/designs/conclusions on.

Schiphorst, T. (2009) ***Soft(n): Toward a Somaesthetics of Touch***, Proceedings of CHI 2009, April 4-9, 2009 ~ Boston, MA, USA. ACM Press.

- Despite the length of the paper, it is quite unclear how the soft(n) sculptures actually work in action. Based on the bits and pieces of information, write a scenario describing how you believe that they interact (with you and with each other). Also link this to the underlying theories described in the paper.
- Compare Djajadiningrat's approach with Schiphorst's, especially when it comes to the theoretical background they base their ideas/designs/conclusions on. (Yes, obviously you can't choose this question for both texts!)



## LITERATURE SESSION III: Playfulness, Efficiency and Criticism

Dunne, A. (1999) *Hertzian tales*, Royal College of Art Computer Related Design Research, London. Browse the project descriptions at <http://www.dunneandraby.co.uk/content/projects/67/0>

- Analyze The Faraday Chair, The Pillow, Tuneable Cities and Thief of Affection. Which one do you think best highlights the issue of all the invisible signals that surround us? Why? Can you improve the design further to state the point even stronger?
- Analyze *The Faraday Chair*, *The Pillow*, *Tuneable Cities* and *Thief of Affection*. Which one provokes you the most? Why is that, what is it that triggers this response in you? How could you make it more provoking? Less provoking?

Lundgren, S., Johansson S., Nilsson F., Stenberg P., and Thorin, P. (2003) *Mapping Fabrics to Music: Lessons Learned*, Proceedings of The ninth IFIP TC13 international conference on Human-Computer Interaction (Interact 2003), Zürich, Switzerland. Download from: [http://www.cs.chalmers.se/~lundsus/lundgren\\_johansson\\_mapping\\_fabrics\\_to\\_music.pdf](http://www.cs.chalmers.se/~lundsus/lundgren_johansson_mapping_fabrics_to_music.pdf)

- If you were to make a second version of the Intelligent Quilt, aiming more towards the original aim of functionality and ease of use, how would you improve it?
- If you were to make a second version of the Intelligent Quilt, enforcing the element of playfulness and intrigue, how would you improve it?

Krippendorff, K. (2006) *The semantic turn: a new foundation for design*, CRC Press, Boca Raton, USA pages 298-303

- Here, Krippendorff describes the functionalism taught at Ulm. Analyze your cell phone in terms of technical function, production function and material function (“Materialgerechtigkeit”). What’s left for the aesthetic function? How does it manifest itself?
- Analyze the Ulm stool. Is it a great design or not. Why? Are there any issues/limitations? Does the multifunctionality bring with it certain drawbacks? Are there more possible functions?

## CHOOSE ONE OF THESE PAPERS AND ANSWER ITS QUESTION

Lundgren, S., Bergström, K. och Björk, S. (2009) ***Exploring Aesthetic Ideals of Gameplay***, Proceedings of DiGRA 2009: Breaking New Ground: Innovation in Games, Play, Practice and Theory, London 1-4 September 2009

- Analyze your favorite game in terms of the gameplay properties the authors describe.

Gaver, W. W., Beaver, J. and Benford, S. (2003) ***Ambiguity as a resource for design***, Proceedings CHI'2003. ACM Press, NY, pp. 233–240.

- Consider your cell phone. Redesign it, inscribing either ambiguity of information, ambiguity of context or ambiguity of relationship into it. How do you think the redesign affects use? Does it intrigue, challenge or provoke - or something else?

# COURSE EVALUATION, Aol1 AND Aol2

Both Aol1 and Aol2 were evaluated with a course questionnaire, which was handed out at the last scheduled occasion, the oral presentations. So, students had not gotten their final grades yet when commenting upon the course. The questionnaires were very similar to enable comparison, and here are the results. For the questions 1,2 and 9 I used the scale Bad – Not Good – OK – Good – Very Good, which is translated to the numbers 1 – 2 – 3 – 4 – 5 to be able to calculate an average. Several of the questions are related to what the students learnt the most from, there is of course a small risk that they just chose the alternatives they found the most fun, despite the formulation of the question. Apart from the questions below the questionnaire also contained a couple of open questions about what they appreciated, what should be omitted, suggestions etc. The comments on those questions have been discussed in the relevant parts (e.g. Feedback).

Another thing important to know is that nine of the ten Aol1-students answered the questionnaire, and 17 of the 20 Aol2-students, but all questions were not answered by everyone.

## ***1. What grade would you like to give to the course?***

*Aol1 (max 5)*

Average grade: 4,6

Median: 5

*Aol2 (max 5)*

Average grade: 3,9

Median: 4

This is a nice result of course; clearly the students liked the course. It's hard to speculate as to why the Aol2-students liked it less when I actually thought the material was better; it could be due to the fact that they were not as engaged as the Aol1-students, prioritizing other courses etc. It may also be due to the fact that the feedback did not work as intended.

## ***2. Sus' teaching, supervision and ability to give valuable feedback was...?***

*Aol1 (max 5)*

Average grade: 4,3

Median: 4

*Aol2 (max 5)*

Average grade: 4,7

Median: 5

**3. What did you learn in this course? Check more than one alternative if you want to.**

Aol1 (max 9)

What I expected: 2

More than I expected: 5

Less than I expected: 2

Something else than I expected: 3

Very little: 0

Aol2 (max 17)

What I expected: 0 (!)

More than I expected: 10

Less than I expected: 2

Something else...: 11

Very little: 0

It's strange that so few students claimed to have learnt what they had expected, and so many claim to have learned something else than expected. Either the question is ill formulated, or – more possibly – the students have the view that aesthetics is synonymous with the visually beautiful when entering the course. I think that this comment from a portfolio summarizes this question:

*"I began the course hoping that I would learn how to make beautiful, functionalistic software. I do not believe I have learned this. Instead, I have learned many other, more interesting, things about aesthetics, design, and myself as a designer."*

**5. What did you learn the most from (not necessarily what you liked the best)?**

Aol1 (max 9)

Lectures: 1

Literature & questions: 2

Excursions: 4

Exercises: 8

Writing and getting feedback: 6

Writing the essay: 3

Portfolio work: 6

Something else, namely...: 0

Nothing: 0

Aol2 (max 17)

Lectures: 5

Literature & questions: 7

Excursion to Röhsska: 5

Exercises: 15

Writing and getting feedback: 7

Writing the essay/narrative: 2

Portfolio work: 1

Something else, namely...: 0

Nothing: 0

Trying to draw conclusions from this, we can see that the lectures and literature sessions worked better in Aol2, and that both classes claimed to have learnt a lot from the exercises. We can also see that the Aol2-students appreciated the feedback less (the reasons discussed at length in the Part V). A seemingly interesting difference is the opinion on portfolio work, but here one must keep in mind that the Aol1-students answered

the questionnaire after handing in their portfolios, whereas the Aol2-students till had 2,5 days left until deadline. Given the fact that a vast majority of the portfolios (15) were handed in the last day, I am assuming that most students hadn't really gotten into the portfolio work at the time of the questionnaire.

**6. Which ONE of the lectures did you find the most important or interesting?**

*Aol1 (max 9)*

History of Aesthetics: 1

History of industrial design: 3

Aesthetics in interaction design:  
the aesthetic turn: 2

Aesthetics in interaction design:  
personality and gestalt: 4

None: 1

*Aol2 (max 17)*

Basic issues - aesthetics and interaction: 0

Qualities of Interaction: 1

Temporality: 2

Coherency and the Gesamtkunstwerk: 3

Aesthetic ideals I: 2

Aesthetic ideals II: 3

It's hard to conclude anything from this. Firstly, the Aol1-data is slightly irrelevant since the lectures were improved according to feedback and the change of stance. As for the Aol2-data one must keep in mind that (according to the next question) not all students attended all lectures.

**7. How many lectures did you attend?**

*Aol1*

n/a

*Aol2 (max 6)*

Average: 4,3

Median: 4,5

In Aol1, it did not occur to me to ask the question, since students always showed up for lectures, thus the lack of data. A fairly reliable estimate is that eight of the ten attended all lectures, and the other two just missed one or two.

**8. Which THREE exercises did you learn the MOST from?**

*Aol1 (max 9), rank in parenthesis*

Ex 1: Super Hero Gadgets: 1 (bottom)

Ex 2: Cartoon: 1 (bottom)

Ex 3: Designing Emotions (=angst): 5 (1)

Ex 4: Expressions of Interaction: 5 (1)

Ex 5: Temporal Paint: 1 (bottom)

Ex 6: Informative Art: 3 (4)

Ex 7: Design the Apple: 4 (3)  
Portfolio Ex: Calculator on the Runway: 3 (4)  
Portfolio Ex: The New Office Assistant: 2 (6)  
Portfolio Ex: The Cube: 1 (bottom)

*Aol2 (max 17), rank in parenthesis*

Ex 1: Design the Apple: 2 (7)  
Ex 2: Schizophrenic iPod: 1 (bottom)  
Ex 3: Informative Art: 7 (4)  
Ex 4: The Office Assistant: 10 (1)  
Ex 5: Expressions of Interaction: 10 (1)  
Ex 6: Designing Emotions (=angst): 9 (3)  
Ex 7: Calculator on the Runway: 5 (5)  
Ex 8. Face....what?!?: 5 (5)

Here, both classes place *Expressions of Interaction* on top, and *Designing Emotions* is also high ranked in both classes. Aol2-students placed *The Office Assistant* on top as well, whereas Aol1-students ranked it very low . This may indicate how much better this exercise became with supervision and a concluding discussion. Note also the differing opinions on Design the Apple; Aol1 ranking it as no. 3, Aol2 as no. 7, indicating that this exercise does not work well in the beginning of a course.

### **9. What do you think of the portfolio as an examination form?**

<i>Aol1 (max 5)</i>	<i>Aol1 (max 5)</i>
Average grade: 4,2	Average grade: 4,0
Median: 4	Median: 4

Here, the students seem to agree that the portfolio works as an assessment form. A few suggested an essay instead.

The most interesting question of all was the fourth one, which has been left until last here for the sake of discussion. Here, students were asked to assess the course, and the results are shown below. The numbers in the boxes indicate how many students chose that alternative (e.g. 3 Aol1-students gave the maximum 5 grade for "Fun").

Aol1		5	4	3	2	1	0	1	2	3	4	5	
Fun		3	2	2	1	1							Not fun
Demanding, but in a good way				4	1	1	1		1		1		Demanding, but in a bad way
Easy			1				4	1			2	1	Hard
It made me think about new things		2	1	3	2							1	Too philosophical for me
Interesting		4	1	1	2		1						Uninteresting
There was plenty of time			1				1		1	1		5	Time-consuming

Aol2		5	4	3	2	1	0	1	2	3	4	5	
Fun		4	5	5	2								Not fun
Demanding, but in a good way		1	4	6	3	2							Demanding, but in a bad way
Easy			1	1	2	3	3		4	1	2		Hard
It made me think about new things		3	6	3	2	1		1					Too philosophical

There are a few things worth pointing out in this diagram. Firstly, we can see that most answers are on the left end of the scale, towards the more positive judgments; even more so for Aol2, which indicates that the course in general has improved. Also, as a teacher one prefers the students to be in the middle of the Easy – Hard-scale; in Aol1, the level seemed to be exactly right for roughly half of the students, and too hard for a third, in Aol2, the opinions were more spread out with a slight bias towards “Hard”. This is rather good since it suggests that the course is on the right level. For Aol2, this seems to be in line with that the course is seen as demanding in a good way, but not too demanding. The biggest difference is the view on time; roughly half of the Aol1-students said it was very time consuming, marking the extreme value of 5. In Aol2 again the opinions are more biased, but much more close to the center. There are three obvious reasons for this; the Aol2-students were more ambitious, spending more time on exercises, they had nine exercises and their portfolio included the improvement and extension of exercises. In Aol1, the students had only eight exercises, and did not have to extend their portfolio exercises.

Although I state that Aol2 went better than Aol1 in very many aspects that the students seem to agree on (see question 5), e.g. that they liked both the lectures and the literature better in Aol2, it is remarkable that the general “grade” that the students gave the course is lower in Aol2 than in Aol1; 3,9 vs. 4,5. I think there are two reasons for this, one being that it is simply harder to get a higher grade with a larger class (albeit I’ve attained



a 4,4 grade with 60 students in Graphical Interface, but that was after five iterations). The other reason is probably the feedback-failure. Interestingly though, I/my teaching seems to have been better in Aol2; its grade improved from 4,3 to 4,7.





