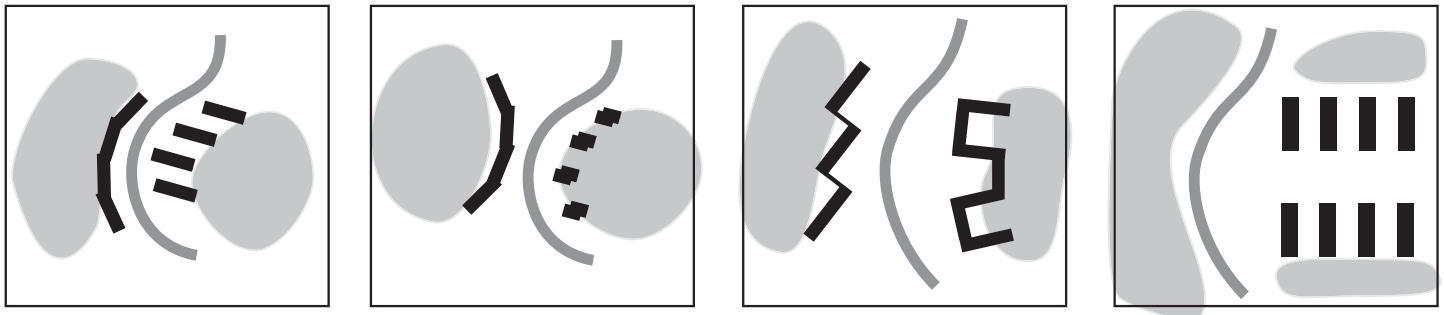
THESIS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

Suburban Navigation

Structural Coherence and Visual Appearance in Urban Design

ANNA-JOHANNA KLASANDER



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Abstract

This thesis is written within the field of architecture and urban design. Its main subject is the morphology of housing estate suburbs that were built in Sweden from the 1940s to the 1970s. With the issue of environmental legibility as point of departure, structural and visual properties of urban settings are studied. The transformation of relationships between the basic urban elements streets, buildings, and open space during the investigated period is illuminated, as well as changes in spatial configuration. While the ideals for urban growth were the same during the period, the gradual changes of principles for layouts of urban elements led in the end to fundamentally different conditions for urban life. The thesis argues that these morphological transformations among other things resulted in a loss of legibility. Orientation is more difficult in the latter areas of the period, where patterns of buildings are not coherent with patterns of movement networks.

The thesis is based on three empirical studies: the first one a historical account of the morphological transformations with examples mainly from Göteborg; the second one a space syntax study, which highlights the particular spatial and functional conditions in the housing estate areas; and the third one a study where cognitive maps are used to compare points of reference for orientation in three urban typologies.

In a wider sense, the central theme of the thesis is connected to general urban qualities, understood as spatial potentials for encounters and exchange. The findings of the thesis can be used in architectural and urban design to address issues of urban qualities in suburban settings, and thus to improve spatial conditions for everyday life there.

Keywords: urban design, legibility, orientation, urban morphology, housing estates, suburbs, urban typologies, environmental cognition, space syntax, cognitive mapping

Preface

Urban planning and design is a fascinating field because the result of it has a profound influence on life for us all. For me, the performance of urban space has to do with democracy and equal rights. In that sense, I share the concerns of the functionalist planners of the mid-1900s: it is a beautiful thought that the built environment can contribute to a better life for people – although we must always accept that it can never create it.

It is a long way from the first ideas to a completed thesis. Along mine I have been helped and encouraged by a number of people, all of whom deserve my heartfelt thanks. My supervisors, professors Hans Bjur and Claes Caldenby, have been critical readers and patient listeners, and I appreciate the support they have given. Professor emeritus Björn Klarqvist introduced space syntax theories in my undergraduate years, and supervised my own studies in the field, both deeds equally important and valued. I am indebted to Dr. Lars Marcus, who examined my work at the final seminar and gave me things to think about; Professor John Peponis agreed to read my draft, and I highly appreciate the comments he gave me.

At the School of Architecture, I have been helped forward in many different ways by many different people. I am grateful to them all, and I particularly wish to mention: Kaj Granath, long time collegue; Bertil Malmström, Carina Listerborn, and Gabriella Olshammar, my roommates and fellow doctoral students; Katarina Nylund and Ola Wetterberg, senior researchers in the Urban Peripheries programme; Mir Azimzadeh and Matts Heijl, researcher and teacher at the department of UD&P. Through their contributions at seminars and informal meetings they have all made me understand my own work better.

I have also enjoyed help from outside Chalmers. I wish to thank GöteborgsLokaler AB for letting me use the company's survey data. I am grateful indeed for help from both staff and students at the four schools of my cognitive map study: Internationella skolan in Gårdsten, Tynneredskolan in Tynnered, Karl Johanskolan in Majorna, and Bikupan in Lessebo. Gerd Bloxham Zettersten, University of Copenhagen, gave me valuable support and advice at a late stage of writing. John Krause

has revised my English, which I am thankful for; remaining mistakes are entirely mine. For help and encouragement and for rewarding discussions about urban design I wish to thank Karin Ahlzén at White Arkitekter in Uppsala.

On the private side, my parents and parents-in-law have been invaluable during these years, and their support is vastly appreciated. Special thanks go to my mother, who is always willing to help when needed.

Finally, I want to express the most deeply felt gratefulness to my husband Fredrik and our sons Adrian and Albin. In a double sense, they have (each in their own way) put my work in perspective.

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To cover costs for field trips and conferences I have received grants from Adlerbertska forskningsfonden and Chalmersska forskningsfonden.

I am also the proud receiver of a grant from Stiftelsen Markussens studiefond in the county of Kronoberg. For this finacial support I am very grateful.

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Legibility as a design quality

This thesis is an exploration of urban space and some of the different forms it has been given in the last century. The central theme is to investigate Swedish housing estate suburbs from an urban design point of view: in what ways these suburbs can be said to represent a typology of their own, in what ways they are related to other urban typologies, and what their typological features mean for legibility and the conditions for urban orientation.

In my studies of the housing estate areas I have found that they are both simple and complex. Their planning schemes and basic environmental properties can be characterised in a few words – we recognise them as urban enclaves with housing blocks in open-plan layouts, functional zoning, traffic separation, and a local centre with a stop for public transport. Yet they are challenging to investigate, not least because architectural terminology largely lacks adequate concepts to describe the spatial particularities we find in these urban environments.

My aim with this thesis is to shed light on Swedish housing estate areas from different perspectives, while using one and the same filter: the interrelated issues of legibility and urban orientation. I have chosen not to put forward any hypothesis for the thesis as a whole, since the intention of the work is not to prove a case, but to explore the housing estate typology in search of both missing concepts and misconceptions in the discourse of architectural and urban design.

Although the work as a whole concerns people and our use of urban space, the thesis will first and foremost deal with structural properties of the environment. Urban elements – such as buildings, streets, voids, greens – are discussed with the focus on their forms, their interfaces, their connections and relationships. This means that the scope of the thesis is limited to features of the urban environment which are handled by planners and architects, in other words land use and design.

Legibility and urban orientation: the problem

For a long time I have been interested in how environments such as complex buildings and urban areas become understandable – to myself and others. My curiosity has been raised at every encounter with confusing, not to say illegible, architectural expressions or spatial organisations.

Urban legibility is an established scientific field that attracts diverse disciplines, including psychology, geography, architecture, and urban design. Furthermore, the field offers a range of methods, and the results of various empiric investigations can bring useful findings into debate. Urban legibility is also a common topic in general architectural discourse.

From a narrow perspective, legibility and urban orientation may seem a trivial problem. Most people probably never consider it in their everyday environments, but carry out their routines rather effortlessly (at least when it comes to urban orientation). In unknown places we may be more hesitant, and even recognise that we need help to orientate ourselves, but as long as we finally reach our destinations the problems seem to vanish.

I had an interesting experience in Nya Masthugget, a popular 1960s residential estate in central Göteborg. The area has a clear plan figure consisting mainly of L-shaped four storey buildings situated on a slope. There is no vehicular traffic inside the area, no hierarchy of the pedestrian paths through it, and hardly any spatial differentiation to help orientation. The semi-open courtyards are dominated by vegetation and playgrounds. I walked around searching for a sports hall, which I ex-

pected would be a noticeable public building. There was no one to ask and it took a while before I eventually found the place. The facilities turned out to be located in the basement of one of the residential buildings, but apart from a sign on the wall outside there was no way to distinguish this building from the others. Nor was the entrance of any help: an inconspicuous steel door of the sturdy kind used for waste disposal rooms or basement entrances. I went in and walked through a narrow corridor at the end of which I found my destination. There it was: a large sports hall, full of activity, with children playing handball and adults in the stands watching and cheering. I was amazed, to say the least. Here was a space of public interest, used by different clubs and their match spectators, and there were no features in the design that hinted in any way at its existence.

In the end I found the place – is there anything wrong with the design then? Yes: I argue that there is something to gain when design is used to make environments legible. My own wayfinding problem above

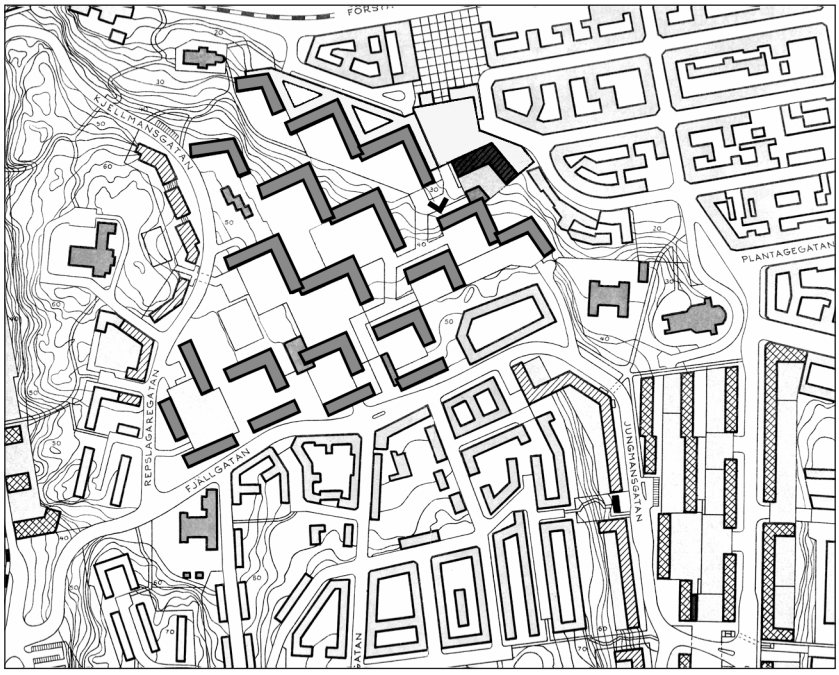

Figure 1.1
The housing estate Nya Masthugget, with a layout of a different spatial logic than the surrounding urban grid. The lack of architectural differentiation and spatial hierarchy within the estate area makes orientation difficult for visitors. The arrow indicates the sports hall entrance.

was of course trivial, but for some people it is not, and there are times when illegible design can even be fatal. A friend of mine who used to work as an ambulance nurse recounted a case where both the ambulance and the fire-brigade, independently of each other, lost their way in a housing estate area in Stockholm. The problem was that the street patterns within the area failed to correspond in any comprehensible way to the layout of the buildings. Urban orientation for them was not only difficult, but dangerously time-consuming.

Still, for most of us finding our way is not a matter of life and death, but a subtle struggle with spatial conditions in everyday life. In this larger context, the issues of legibility and urban orientation are relevant to urban life in yet another non-trivial way: sharing public space with fellow citizens – friends and strangers alike – is a vital part of an open and integrated society. The conditions for urban orientation and navigation are important features of the physical environment, because urban environments which are possible to understand and easy to use increase people's chances to move about on more equal terms. An easily accessible and legible cityscape is not only more comfortable to use, it also works in favour of the necessary integration in our cities.

So there are a number of reasons why architects and urban designers should care about legibility, and I hope this thesis will contribute to a greater understanding of how to treat the issue in design. In a wider sense, the particular aspect of legibility has also been useful in highlighting more general urban design aspects and the specific spatial conditions of the housing estate typology.

Hidden and visible properties that guide orientation

While theoretical foundations will be accounted for in greater detail in the coming chapters, I want to mention briefly the three sources of inspiration that initially set me off in the direction of orientation and wayfinding in cities. Their common denominator is that they explicitly deal with aspects of legibility: Swedish architecture historian Björn Linn writes about legible patterns of urban structures, space syntax theory founder Bill Hillier labels different configurations of space more or less

intelligible and easy for wayfinding, and cognitive mapping pioneer Kevin Lynch proposes that legibility concerns visual qualities of the built environment.[1]

From a morphological point of view, Linn states that detectable building patterns are 'the more or less subconsciously experienced structure which makes it possible to "read" the city and to orientate oneself in it'[2]. Linn stresses that it is not a matter of geometry but of topology: structural patterns can have different shapes and still maintain their spatial order. His example is the perimeter block of the traditional urban grid. As a morphological type it can be regular and right-angled, or it can be deformed, for artistic purposes or in response to topography; still both patterns belong to the same typology, the enclosed building block lined by streets. Linn clarifies the morphologic approach:

> To isolate the description of the physical pattern means that one exposes different interfaces where relations are found, making these possible to see and to study.[3]

In this passage Linn triggers two concepts that are central in my thesis: interfaces and relations. A further step is to place these interfaces and relations in contexts, approaches which are offered by Hillier and Lynch.

Broadly speaking, Hillier and Lynch represent two diametrically opposed yet complementary sides of questions concerning urban orientation and legibility. Hillier has developed space syntax theory, which deals with configuration of space. Configuration can be described as systems of spatial relationships, which may not be immediately obvious for the users, but still influence how space is used. The example in Figure 1.2 illustrates why I have chosen to call these structural condi-

---

[1] Linn, Björn 1991, "Bebyggelsemönster som analysmodell", in Hall (ed.) 1991, *Perspektiv på planering. Frågeställningar och frontlinjer inom planeringshistorisk forskning*. HSFR ["Building patterns as a model for analysis", in *Perspective on planning. Questions and frontlines within research on planning history*]; Hillier, Bill 1996, *Space is the machine. A configurational theory of architecture.* Cambridge University Press; Lynch, Kevin 1960, *The image of the city*. Cambridge.

[2] Linn 1991, p. 66, my translation.

[3] Linn 1991, p. 67, my translation.

tions the *hidden properties* of the built environment. Lynch's method, working with sketch mapping, deals mainly with how the visual appearance of the physical environment influences people's cognition of the urban landscape. This approach illuminates primarily the *visible properties* of the environment that are significant for orientation.

I have found it not only fruitful but necessary to combine the two perspectives – to study the built environment in terms of the underlying, hidden, properties on the one hand, and its overt, visible, properties on the other – to reveal the critical characteristics of the much criticised, but less investigated, urban typologies of the latter half of the twentieth century in Sweden.

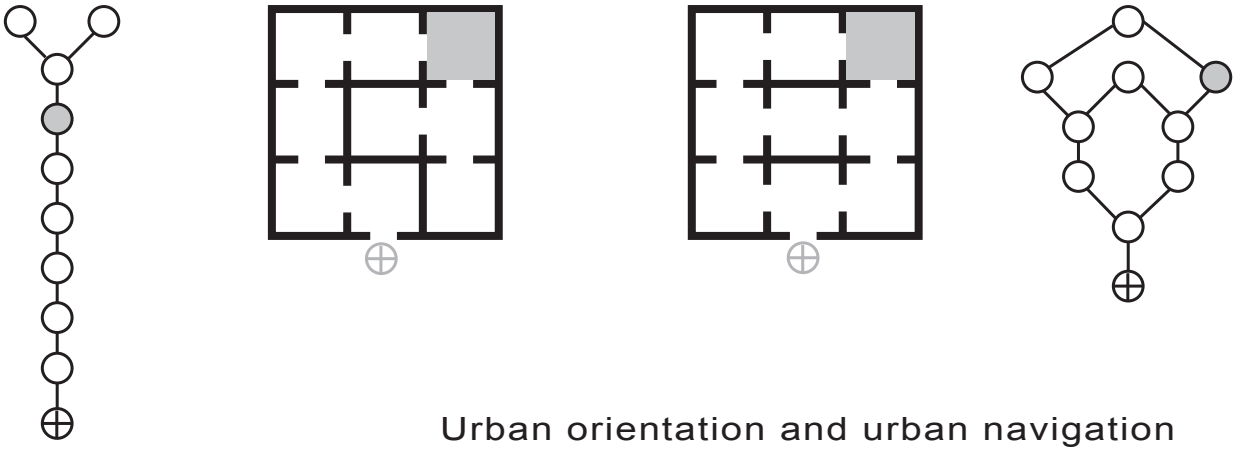

Figure 1.2
An illustration of 'hidden' properties that studies of configurations reveal. The grey spaces up to the right in each layout are identical if seen in isolation. However, on the structural level the configurational properties of the two spaces are totally different (and so their potentials for different use).

The depth of the two structures and the possible routes through them are made clear in the so-called *justified graphs*, which represent the topological relationships within each layout. (From Hillier 1996)

Urban orientation and urban navigation

Urban orientation is a broad term used for different approaches to wayfinding in the built environment. The concept covers both conscious and sub-conscious orientation, that is both when we actively use different aids for orientation, and when we reach our destination more or less without active reflection. I have chosen to distinguish urban orientation from urban navigation: navigation is a broader term that includes not only orientation but also the act of reaching our destination.[4] In this

[4] Other terms for navigation could have been *movement* or *circulation*, but these words lack the connotations to wayfinding strategies which are inherent in the term *urban navigation*.

sense, *urban navigation* is about following the route, whereas *orientation* concerns how to identify one's position on it.

This distinction between orientation and navigation corresponds partly to the thesis' notions of visible and hidden properties of the environment. *Orientation* is seen as mainly connected to visual properties, the environmental cues that people use to figure out where they are and where they are going (while standing still or moving). *Navigation*, in the sense of actually moving through the landscape, is deeply dependent upon the hidden properties, understood as the underlying spatial structures of the built environment. The distinction is useful because, as we shall see later, some of the suburban areas studied offer better conditions for orientation than for navigation. For example: we see a landmark but we cannot find the route to it.

The main point is that both hidden and visible properties of the built environment influence legibility, and so the conditions for urban orientation and navigation. Kitchin and Freundschuh point out that:

> Several studies have shown that environmental features can influence the rate, success and accuracy of spatial learning. […] Similarly, city layout, structure, and size have all been found to affect the cognitive knowledge of urban areas. For example, […] cities with a regular layout made the city more 'legible'.[5]

Regularity of the layout is but one aspect of legibility, and in itself a complex one. In some cases a very regular system of streets may even be confusing if it is not combined with some sort of differentiation.[6] Lost in the middle of the regular grid of the Cerda plan in Barcelona, for instance, I believe many would agree that orientation can be difficult. But there are also other sorts of spatial regularities that influence urban navigation: Mir Azimzadeh's space syntax analyses of Iranian cities, with seemingly very irregular street patterns, show that there is a hidden logic in the configuration of space – a sort of legibility that is not

[5] Kitchin, Rob & Scott Freundschuh 2000, "The future of cognitive mapping research", in Kitchin & Freundschuh (eds.) 2000, *Cognitive Mapping. Past, present and future*. Routledge, London and New York, pp. 251-252.

[6] Cf. Mitchell, Lynne, Elizabeth Burton & Shibu Raman et al. 2003, "Making the outside world dementia-friendly: design issues and considerations", *Environment and Planning B: Planning and Design* 2003, volume 30, p. 623.

immediately obvious for the single observer, but which reveals itself in the all but random distribution of movement through the cities.[7]

A model of basic components in spatial design

To disentangle how different aspects of spatial design relate to legibility I made a simple sketch model in my licentiate thesis. It suggests one way of seeing the broad components of spatial design in both architecture and urban planning. Still undeveloped, I present the model in figure 1.3 as part of the background for my thesis inquiries.

I see *spatial relations* as the underlying conditions in design. To establish spatial relations is a point of departure for all urban planning and architectural design. This is when the functions of a brief get their topological relations, from the simplest spatial layout, such as a bicycle shed, to the most complex structures, such as airports or large industries. Examples of different principles for spatial relations are the grid and tree structure; whether if they concern a hospital layout or a traffic network, these configurations give quite different conditions for space use.

Spatial relationships are defined by *spatial interfaces*. These interfaces are the border zones between spaces, thus often between functions. These zones can be clear-cut or vague. Consider the difference between the Pantheon in Rome, which is just about as enclosed as a space can be and still be entered, and Mies van der Rohe's Barcelona pavilion – the icon of modernist open space building, with dynamic spatial relationships, open to interpretation and changing with our movements through the building. The examples can be taken from the scale of urban planning as well: compare the urban grid to the free floating space of the housing estate suburbs. In the first case spatial relationships are fairly easy to define, in the second they are often elusive and shift with the position of the observer. The design of spatial interfaces determines the

[7] Azimzadeh, Mir 2003, *Evolving Urban Culture in Transforming Cities. Architectural and Urban Design in a Fluid Context*. Diss., Chalmers University of Technology, Göteborg.

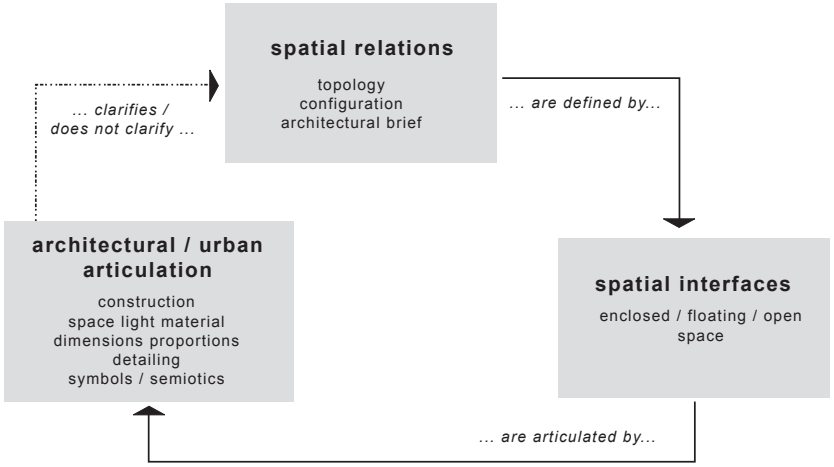

Figure 1.3
A model of basic components in architectural and urban design.

perceived size and boundaries of spaces, our possibilities to move from one space to another, and the visual contact between spaces.

A*rchitectural and urban articulation*, lastly, decide the form and character of the spaces which have been (clearly or vaguely) defined by spatial interfaces – the buildings, their interiors and exteriors, and urban space. Architectural and urban articulation can be given different styles to create different atmospheres without changing the underlying structural conditions: a fire station *can* be built in a deconstructivist manner, just as an airport *could* be rustic in style. That is a matter of taste and personal preferences. Articulation can also be used to accentuate functions. This is an important field for the experience of built space, and – and this is a crucial point – it is also vital for how we understand the context that the individual space is part of. With its visual information, architectural and urban articulation can give clues to how the environment as a whole can be understood: articulation can help explain the spatial and functional order. If the articulation is coherent with the structure, we complete the circle of the model. But it happens now and then that articulation of space does not contribute to any understanding at all, for instance when the entry to a residential block can be mistaken for the door to the waste room, or when a neighbourhood's most representa-

tive public space turns its back on the paths that lead to it. Such design breaks relations that make the built environment legible, reasonably predictable, or intuitively understandable.

Still, the extent to which articulation makes the built environment legible depends on the cultural (and sub-cultural) background of the observer. People interpret buildings and places according to their own experiences. For instance, when Robert Venturi puts a big (unconnected) gold anodised TV-antenna on top of Guild House as a symbol for the elderly living there[8], we can expect some people to miss the message.

The broad field of urban and architectural semiotics has addressed these issues at different levels of abstraction, and with plenty of disagreement on how to generalise knowledge of architectural expressions, signs, and symbols.[9] It is obvious, for instance, that linguistic and structuralist approaches can give rise to inspiring analogies in theory, but for my dissertation I have found it more rewarding to relate to how the built environment affords a *behavioural meaning* for its everyday use by people.[10] This must be distinguished from the linguistic/symbolic and emotional meanings that individuals or groups ascribe to the built environment. For example: in this sense, a stair is not a symbol for moving upwards to the next floor, it is a real environmental possibility. Most people will understand its behavioural significance.

I argue that architectural and urban design essentially deal with conditions for the behavioural meaning of the environment, whereas the equally important symbolic meaning is a creation of individuals and thus beyond the control of architects.

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[8] Venturi, Robert, Denise Scott Brown & Steven Izenour 1994 [1972], *Learning from Las Vegas: the forgotten symbolism of architectural form*. The MIT Press, Cambridge, Massachusetts, p. 92.

[9] Cf. Jencks, Charles & George Baird (eds.) 1969, *Meaning in Architecture*. The Cresset Press, London; Broadbent, Geoffrey, Richard Bunt & Charles Jencks (eds.) 1980, *Signs, symbols, and Architecture*. John Wiley & Sons, Chichester.

[10] The concept of *affordance* originates from Gestalt theory, and has been elaborated by e.g. J.J. Gibson. Cf. Sundqvist, Fredrik 2003, *Perceptual Dynamics. Theoretical Foundation and Philosophical Implications of Gestalt Psychology*. Diss., Göteborg University, Chapters 7-8.

Meaning and use

In relation to this distinction between symbolic and behavioural meaning, there are two particular links between the built environment and the people who use it upon which I would like to comment here. The first link concerns the *symbolic meanings* people ascribe to the buildings and places they come across. However little we may reflect on our everyday surroundings, we still have some sort of emotional connection to the places we use.[11] Certain places and buildings are more significant to us than others, even if we are not always aware of why.

Ingrid Appelbom Karsten describes a workshop about urban renewal in the city of Racheve, south of Budapest in Hungary.[12] The invited urban designers wanted to preserve the particularities of the old town fabric. Contrary to the local planners, the foreign guests intuitively felt that some of the old design features were very significant for the identity of the city. The invited urban designers decided to let a group of children draw maps of the city. The maps turned out to convey precisely the urban qualities that the workshop participants had seen as typical for the city, for example an old market street with a characteristic widening, and open views to the Danube River (*Donau*). And so the local planners were made aware of urban design features that were significant – features that gave the city its character because they were memorable for the inhabitants.

The other link concerns behavioural meaning, in other words the functional and spatial conditions for *use*. Needless to say, the functions of buildings and places are important features in urban settings, because their use influences actions and movements in their vicinity. In this sense they affect human behaviour in easily measurable ways:

---

[11] Cf. Nordström, Maria 2002, *Instängd på platsen. En miljöpsykologisk analys av upplevelsen att växa upp och bo i ett segregerat bostadsområde*. Stockholm (*Stuck in the Same Place: An Analysis of the Experience to Grow up and Live in a Segregated Housing Area from the Perspective of Environmental Psychology*, English abstract).

[12] Appelbom Karsten, Ingrid 1985, "Barnens deltagande i bevarandet av närområdets identitet – ett ungerskt experiment" in *Barn och byggd miljö*. Centrum för barnkulturforskning, Stockholm University ["Children's participation in the preservation of the neighbourhood identity – a Hungarian experiment" in *Children and built environment*].

if there is a nightclub in the basement of a building it is likely to draw certain kinds of people there at certain hours. The same goes for car washes, drugstores, supermarkets, theatres, residential blocks, and football grounds.

These two links between people and the built environment are perhaps equally important when it comes to our experience of the urban environment, but the phenomena of use and symbolic meaning are fundamentally different from a research point of view. Our *use* of places give them inevitably some sort of *meaning* for us; on the other hand, even in cases where places carry emotional or symbolic *meaning*, this will not automatically incite *use*.

This is where different theories on urban morphology become useful. In order to correlate people's experiences of symbolic or emotional meaning, as well as facts of use, to properties in design we need to identify critical categories of the built environment. Design professionals must have tools and concepts that identify the *structural properties* of design, not merely the superficial ones that are obvious for any observer, such as style, age, material, or size of the buildings. The objective of this thesis, then, is to stay clear of symbolic and emotional meaning, and instead account for basic structural properties of the built environment, which provide conditions for urban orientation and navigation. The focus is a search for spatial characteristics of suburban typologies, whereas the implications for potential use will only be suggested.

The Swedish housing estate suburbs

This thesis will deal with Swedish housing estate suburbs that were built during the neighbourhood unit paradigm, a period which stretches from the 1940s to the middle of the 1970s[13]. During these years the suburban developments changed their appearance radically. The areas from the last phase of the period are called the Million Programme suburbs, named from a political project initiated by the Social Democratic government in the mid-1960s to build one million apartments in ten years, 1965-1974. Roughly two-thirds of the Million Programme dwellings were built as multifamily housing estates, in areas that also came to be called 'concrete suburbs', simply because of the visual impact of the building material. The nickname was originally used only pejoratively, but is now slowly turning into a more neutral label, by and large thanks to youth culture with roots in the suburbs: when the inhabitants themselves use the expression they disarm its negative connotation. In my thesis, I use the concept 'concrete suburb' as the shorter term for 'Million Programme housing estate suburbs'.

Large housing suburbs are an international phenomenon. They can be found on the outskirts of big cities around the world. From an international perspective the physical environment of the Swedish ones may seem almost idyllic: most are made up of buildings of moderate size in rather small areas close to nature. Still, the look and performance of the Swedish suburbs have been targets of criticism for decades. Most often the complaints have been directed towards the architectural style of the buildings, but the lack of urban qualities has been recognised as a problem as well.

Since the aim of this thesis is to highlight issues of urban design and morphology, I leave aside the problems of social, economic, and ethnic segregation which have been part of the history of the concrete suburbs for a long time already. Still, I acknowledge that these widely

[13] The time frame is adopted from Franzén, Mats & Eva Sandstedt 1981, *Grannskap och stadsplanering. Om stat och byggande i efterkrigstidens Sverige*. Diss., Uppsala University, Uppsala (*Neighbourhood and Town-planning. On the State and the Building Process in Sweden Since the Second World War*, English abstract, German summary).

recognised and politically addressed problems provide a background for the discourse on the built environment[14]; without them the planning and design of these areas would probably not have been questioned. It is important to keep in mind, though, that many people like their Million Programme areas and how they are built. They appreciate their neighbourhoods, and see the assets of the environment apart from the social problems in it.

Previous research on Swedish urban morphology

In spite of all the debate on the subject, there is relatively little research available regarding the specific issues of the urban design of the Swedish housing estate suburbs. Several accounts of the theme confirm that there is a knowledge gap to fill[15]: issues related to the modern Swedish urban morphology are essentially still unexplored. Related to

[14] For accounts of issues concerning the housing estate suburbs, see for instance: the Government's Bill *Development and justice – A policy for metropolitan areas in the 21st century* (Proposition 1997/98:165); Hall, Thomas (ed.) 1999, *Rekordåren – en epok i svenskt bostadsbyggande*. Boverket [*The Record Years – an epoch in Swedish housing construction*] with summaries in English pp. 214-220, and a bibliography which also covers relevant reports of Swedish Government Commissions; Molina, Irene 1997, *Stadens rasifiering. **Etnisk boendesegregation i folkhemmet***. Diss., Uppsala University, Uppsala *(Racialization of the city. **Ethnic residential segregation** in the Swedish Folkhem)*; Ristilammi, Per-Markku 1994, *Rosengård och den svarta poesin. En studie av modern annorlundahet*. Diss., Lund University, Lund *(Rosengård and the black poetry. **A study of modern alterity**)*; Bodström, Kerstin 1994, *Marken, makten och bostäderna. Markanvisning inom mark- och bostadspolitiken i Stockholm*. Diss., Stockholm University, Stockholm *(Land, political influence and housing)*; Daun, Åke 1974, *Förortsliv. **En etnologisk studie av kulturell förändring***. Diss., Stockholm University, Stockholm *(Suburban life. An ethnological study of cultural change)*. All dissertations with English summaries.

[15] Linn 1991; Rådberg, Johan & Anders Friberg 1996, *Svenska stadstyper. **Historik, exempel, klassificering***. TRITA-ARK-1996:13, Stockholm [*Swedish urban types. History, examples, classification*]; Berg, Kristan 1999, "Miljonprogrammet som forskningsfält", in Hall (ed.) 1999 ("The million programme as a research field"); Klasander, Anna-Johanna 2001b, *Stads-delar. **Förorter som stadsbyggnadsfråga***. Lic., Chalmers University of Technology, Göteborg (*Urban Parts. The Suburbs as Urban Design*).

my work, there are three important sources of knowledge I would like to mention as a background for the research subject.[16] Architect Ingemar Johansson's work on urban growth and suburban developments, *Den stadslösa storstaden. Förortsbildning och bebyggelseomvandling kring Stockholm 1870-1970*, shows among other things how land ownership and the development of transportation influenced the shape of suburban growth. Architect Johan Rådberg has treated the question of how modernist doctrines on building density influenced urban morphology in the twentieth century. His thesis *Doktrin och täthet i svenskt stadsbyggande 1875-1975* deals with building typologies and (sub)urban design on an overall level. Sociologists Mats Franzén and Eva Sandstedt have given a thorough description of how the socially grounded ideology of post-war neighbourhood planning determined the design of the physical environment. Their thesis *Grannskap och stadsplanering. Om stat och byggande i efterkrigstidens Sverige* demonstrates the significance of social political policies for urban design.[17]

Within the field of urban design and planning, the suburbs have largely been treated at two separate scale levels with a gap in between: on the one hand the finer scale of the architecture[18], and on the other hand the larger scale of general urban layout and planning, as in the three references above. Yet there are some relevant investigations in urban morphology that should be mentioned (here in chronological order): Björn Linn's study of the perimeter block typology, Ye Min's spatial analysis of Swedish and Chinese neighbourhood layouts and their use, Johan Rådberg's tentative proposal of typology classifications of Swedish cities (or rather urban areas) according to building density and

[16] For a more complete list of references, see my licentiate thesis: Klasander 2001b.

[17] Johansson, Ingemar 1974, *Den stadslösa storstaden. Förortsbildning och bebyggelseomvandling kring Stockholm 1870-1970*. Diss., Royal Institute of Technology, Stockholm (*The townless city*, English summary); Rådberg, Johan 1988, *Doktrin och täthet i svenskt stadsbyggande 1875-1975*. Diss., Royal Institute of Technology, Stockholm, (*Doctrine and density in Swedish urban developments 1875-1975*, English summary); Franzén & Sandstedt 1981.

[18] Cf. Söderqvist, Lisbeth 1999, *Rekordår och miljonprogram: flerfamiljshus i stor skala. En fallstudiebaserad undersökning av politik, planläggning och estetik*. Diss., Stockholm University, Stockholm (*The record years and the million-homes programme. A case study of politics, planning and aesthetics*, English summary).

building form, Lars Marcus' thesis on twentieth-century urban form and its functional performance with emphasis on inner city land use conditions, Gunila Jivén's investigation of different morphological analyses as tools for cultural heritage evaluations, and Abdellah Abarkan's models for typo-morphological characteristics of housing estate layouts.[19]

This then is the Swedish context to date. Altogether the morphological approach of this thesis relies on several fields of research. These will be presented along the way as I use them in the coming chapters, where I will present theories, methods, and empirical studies.

Disposition

The thesis is put together in a straightforward way. After this introduction of the main research issues and the research subject, Chapter Two gives an account of the theories I have used to approach the questions of legibility and urban navigation. The theory chapter is divided into two sections. The first one treats the issue of *spatial organisation*, and accounts for different ways to classify urban elements and urban structures. The second section treats the field of *environmental communication* and theories of environmental cognition and spatial orientation.

In Chapter Three I present the empirical material of the thesis. It consists of three independent studies for which I have used three different methods, all with the aim of illuminating the conditions for urban orientation and navigation in the modernist urban typologies.

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[19] Linn, Björn 1974, *Storgårdskvarteret, ett bebyggelsemönsters bakgrund och karaktär*. Diss., Chalmers University of Technology, Göteborg (*The perimeter block*, German summary); Min, Ye 1993, *Housing Layout and Space Use. A Study of Swedish and Chinese Neighbourhood Units*. Diss., Chalmers University of Technology, Göteborg; Rådberg & Friberg 1996; Marcus, Lars 2000, *Architectural Knowledge and Urban Form. The Functional Performance of Architectural Urbanity*. Diss., Royal Institute of Technology, Stockholm; Jivén, Gunila 2003, *Stadens morfologi som kulturarv*. Diss., Chalmers University of Technology, Göteborg (*Urban morphology as cultural heritage*, English summary); Abarkan, Abdellah 2003, *Bebyggelsemönster och stadsmorfologi. En typo-morfologisk studie av Stockholms stadsbebyggelse 1880-1930*. Stockholm (*Stockholm's Urban Patterns and Morphology from the 1880s to the 1930s. A Morphological Approach*).

In the first study I take a morphologic perspective on neighbourhood unit history and describe the gradual transformation of the design of the Swedish housing estate suburbs. The spatial developments are mainly followed through the interfaces between streets, buildings, and open space as urban elements, combined with views on the configuration of movement networks.

The second study is based on a space syntax analysis of fourteen local squares, all of them neighbourhood unit centres in Göteborg. The background for the study was my personal impression from numerous visits that some of these local centres seemed to thrive, while others were rather deserted in spite of seemingly similar conditions. Although the point of departure for the study was the spatial properties of the local centres, the result of the investigation is used to discuss the spatial and functional specifics of suburban planning and design as a whole.

The third and last empirical study is based on cognitive mapping and compares maps drawn by fifteen-year-olds living in different urban settings: two Million Programme housing areas, a traditional mixed-use grid, and a low-density mixed-use small town. The students were asked to give directions for wayfinding, and so their maps reflect what they see as cues for orientation in their environments. The results of each of the three empirical studies are discussed in the separate sections.

In chapter four, I bring the findings together in a discussion which includes remarks on the concrete suburb typologies in relation to legibility and general urban qualities. Finally, I conclude and propose further issues for research in line with the findings of the thesis.

Environmental cognition and urban navigation

What is there in design that makes physical settings more or less legible to their users? What sorts of logic that support urban navigation can be found? And what kind of information do we obtain from the physical environment? To understand and to know our way around the city and its buildings we use different sorts of environmental knowledge. This knowledge comes from the input we get from our senses: visual impressions are accompanied by the sounds, smells and even tactile sensations we constantly get from the environment; we get other sorts of knowledge from moving around, and others still from using buildings and places. We can also get information about the environment from secondary sources, such as maps and verbal directions, but the focus in this thesis is on the first-hand information we get from the environment itself.

This chapter will outline the theoretical contexts I have used as points of departure for the discussions in the thesis. The basic assumption is that urban legibility depends upon how the vast and continuous urban space is constituted – by what parts, how these parts are connected, and also how they can be distinguished from one another.

Concerning conditions for urban orientation and the legibility of urban space, I propose that there are two aspects of particular interest for design: the structural coherence and the visual appearance of the urban environment that goes to support it. Visual properties of urban elements are often discussed as questions of aesthetic interest, but in this case the

visual properties of the built environment are primarily investigated as a help to guide us through the urban landscape. The division between structure and appearance reflects what I have called the hidden and the visible properties of the environment. Here I will ground these aspects in the wider theoretical fields of *spatial organisation* and *environmental communication*. As noted in the introduction, the points of departure concerning spatial organisation have been space syntax theory and urban morphology, whereas the main input on environmental communication comes from the method of cognitive mapping, an approach which is theoretically based in psychology. Still, the research is entirely about architecture and urban design, and the architectural discourse provides an obvious reference field for the chapter as a whole.

Urban elements and urban structures

All human settlements are made up of an almost infinite number of interrelated parts, from the largest, such as highways and districts, to the smallest, such as street furniture and façade details. People normally manage to assemble some sort of coherent whole out of all the diverse parts that together make up the urban landscape. Kevin Lynch's 1960 study of Boston, Los Angeles, and Jersey City was one of the first attempts among architects and urban designers to understand how the complex environments of large cities are conceived by everyday users[20].

Environmental cognition is a precondition for all urban navigation, whether we find our way rationally or intuitively. Without help of media, such as maps, or directions from people, urban orientation relies upon two sorts of recognition. Firstly, we recognise places or buildings because we know them from direct experience – we have actually been there or seen them before. I call this *place recognition*. It is our place recognition we use when we, for example, seem to navigate without reflection through our everyday landscape. Secondly, we recognise broad *types* of places, buildings, or structures – these types help us interpret

[20] Lynch 1960.

new environments when they are of a familiar kind. I call this *type recognition*. Type recognition is mainly connected to orientation.

I needed to make this distinction because the intent of this thesis is to go beyond place recognition, that is the individual's knowledge of his or her particular surrounding, to deal also with the more general implications of type recognition and how different typological features of the built environment relate to issues of legibility and orientation in the urban landscape.

Classifications and relations

There are many different ways to classify the elements of the built environment, each relevant in its own rights, but none of course complete. A number of morphological discussions in architecture and urban design begin with the most basic shapes and volumes, and vary these with great zeal. Both solids and voids have been treated as urban elements, which means that buildings as well as spaces have been accounted for.

The scientific field of urban morphology covers a wide range of aspects of urban form and transformation. Anne Vernez Moudon sums up the field as based on three principles: that urban form is defined by the basic elements plot, buildings, open spaces, and streets; that urban form can be understood at the different scale levels of building, block, city, and region; and that studies of urban form must take the time aspect into account.[21] Urban morphology has largely emerged from on the one hand the British school stemming from geographer M.R.G. Conzen and on the other the Italian school stemming from architect Saverio Muratori. My impression is that the backgrounds of the founders are mirrored in the problems addressed in the field today: issues are mainly treated either at the larger scale level of urban geography or at the level of buildings and plots, that is the scale of architecture. (Incidentally, this seems to correspond to the distribution of the Swedish research on housing estates suburbs mentioned in the introduction.)

[21] Vernez Moudon, Anne 1997, "Urban morphology as an emerging interdisciplinary field", *Urban Morphology* 1997/1, p. 7. In this article Vernez Moudon gives a concise account of the genealogy of the field, together with its theoretical basis and major research issues.

All in all, urban elements and spaces have been investigated and classified within diverse theoretical frameworks. Less common are systematic approaches to the issue of spatial relations, yet this is one of the most influential aspects of urban use and experience. Where spatial relations are considered, a necessary dimension is added to the analysis of the built environment: the dynamic dimension of movement, which is fundamental to all urban use. But to be able to talk about spatial relations, we need to have concepts for space as well as for relations. Thus, I begin with different views on the most basic elements of urban design and then move on to theories on how they are related. Going back to the distinction of urban orientation and urban navigation, the identification of elements is largely connected to urban orientation, whereas the issues of spatial relations address the conditions for urban navigation.

Point, line, and area

In a first and very simple classification, the elements of the physical environment are divided into three structural categories: points, lines, and areas. This classification is based on basic two-dimensional geometry and can be found in relevant fields such as art, architecture, and GIS (geographical information systems). For example: Kandinsky's aesthetic investigation of the basic forms, *Punkt und Linie zu Fläche* ('Point and line to area')[22]; Bernard Tschumi's design of the Parc La Villette in Paris with the basic forms as 'the organizational principles of the park: the superimposition of systems of points, lines and surfaces'[23]; in GIS the digital maps are made of points, lines and polygons. Since the categories are supported by environmental psychology research[24], they seem well qualified for discussions of architectural and urban form.

[22] Kandinsky 1959 [1926], *Punkt und Linie zu Fläche. Beitrag zur Analyse der malerischen Elementen*. Benteli-Verlag, Bern-Bümpliz.

[23] Tschumi, Bernard 1994, *Event-cities (praxis)*. The MIT Press, Cambridge, Massachusetts/London, England, p. 19.

[24] Gärling, Tommy & Reginald G. Golledge 2000, "Cognitive mapping and spatial decision-making", in Kitchin & Freundschuh 2000, pp. 49-50.

The morphological approach in architecture is mainly static and based on how things appear when looked upon. Thomas Thiis-Evensen uses the concepts point, line, and grid to describe urban elements.[25] All three concepts refer to the visual appearance of the elements; spatial relationships as such are not considered, and Thiis-Evensen treats for example the 'direction' and 'dynamics' of a place or a street as aesthetic variables.

Kevin Lynch's five urban elements – *landmarks, nodes*, *paths*, *edges* and *districts* – can also be sorted into the three categories of point, line and area.[26] The point category is represented by *landmarks*, which are easily defined physical objects of different scale, and *nodes*, which Lynch distinguishes as strategic points in urban life, or in the structures of movement. Psychological research has highlighted the relevance of points, such as landmarks and nodes in the Lynchean sense, for urban orientation. The points of reference may be visual or functional – in any case they seem to order the space around them, and become reference points for less prominent elements in their surroundings.[27] This is part of a phenomenon called nesting, which I will address later. Lynch's line category is represented by *edges*, which are dividing elements (like borders, barriers, or 'seams'), and *paths*, which are channels of movement. Seen as lines, edges and paths are similar as perceivable elements, but when it comes to use they represent two opposites: the edge as a potential obstacle for movement and the path as a carrier of it. *Districts*, lastly, represent the area category. In Lynch's terminology, districts are areas which are distinguishable through some common and identifiable character.

The benefit of these simple classifications is that they are easy to understand and to combine with other categories in cases where more complex analyses than visual/aesthetic ones are needed.

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[25] Thiis-Evensen, Thomas 1999, *Archetypes of urbanism, a method for the esthetic design of cities*. Universitetsforlaget, Oslo.

[26] Lynch 1960, pp. 47-48.

[27] Tversky, Barbara 2000, "Levels and structure of spatial knowledge", in Kitchin & Freundschuh 2000, p. 26.

Space

Although one of the richest and most diverse elements of architecture and urban environments, *space* is sometimes treated as something rather unproblematic and coherent in architectural thinking. In these cases, space is regarded as a geometric volume, more or less regular and defined, and evaluated by virtue of its spatial expression. But there are also discourses in which the concept of space is so packed with content that it seems overloaded for the purpose of design.

Space has indeed social, philosophical, and political dimensions, and it is obvious that designing is never an innocent act, but for the actual decisions at the drawing board the non-physical dimensions of space must in the end be translated to geometry and matter. And as I said before, I carry out my investigation with the particular tasks of architects and urban designers in mind.

In an extensive account of the concept of *space* in architecture, Adrian Forty points out that space did not exist as a term within the profession until the late 1800s, and that the concept is closely connected with the development of modernism. In the German context, where the concept of space in architecture has its origins, the term for *room* was the same as the one for *space (Raum)*, which implies that space originally was thought of as something enclosed. With the development of the concept during early modernism, Forty proposes that *space* then was used in three senses: space as enclosure, space as continuum, and space as an extension of the body.[28]

Eventually, it was continuous space that became the hallmark of modernist architecture and urban design, and I say it seems ironic that a movement which was so eager to investigate space also has been blamed for dissolving it.

Forty claims that postmodernists took little interest in space, and that there was ‘more symbolism than “space” in postmodern architecture’[29]. Although he is right about the abundance of symbolism in post-

[28] Forty, Adrian 2000, *Words and Buildings. A Vocabulary of Modern Architecture*. Thames & Hudson, New York, pp. 256-275.
[29] Forty 2000, p. 269.

modernism, I think Forty overlooks a clear tendency to take on space, namely space in a premodernist fashion. When the nineteenth century theories of Camillo Sitte were brought up by postmodernists in their reactions against the modernist ideals, urban space became something to enclose and to define. Rob Krier, as a standard postmodernist reference, lists only two sorts of urban space: the street and the square.[30] His typology is based on three basic shapes – the square, the circle, and the triangle – which he varies systematically in an impressive number of ways. The variations are made in both two and three dimensions, that is both as plan figures and as volumes, which is an obvious merit for basic spatial design. The deficits of Krier's work are firstly that his numerous variations of forms in the end make the morphological types more specific than general and thus miss the point of classification. Secondly, that Krier frankly ignores the more complex and demanding urban spaces of modern times. His interest lies entirely in enclosed and well defined urban spaces; he even claims that there 'are almost no further discoveries to be made in architecture'[31]. All in all Rob Krier's findings are more normative than analytical, and therefore not generally applicable in investigations of modern urban space, such as the large variety of open spaces we find in the housing estate areas.

A normative stand on urban space is also manifest in a work like Roger Trancik's *Finding Lost Space: Theories of Urban Design*[32]. Trancik distinguishes the enclosed pre-modern urban spaces from the open – that is the *lost* – spaces of twentieth century planning. He argues that urban space must be visually defined, thus enclosed, to be 'found'. Like Krier, Trancik dislikes the modern urban landscape, and by adding new buildings his proposals transform the allegedly lost spaces into visually defined urban space. What Trancik misses is to take other aspects than visual ones into account, and as with Krier the theoretical foundation of the spatial thinking appears too simple to be useful in the complex urban landscape of the late twentieth century.

[30] Krier, Rob 1979 [1975], *Urban Space*. London.

[31] Krier 1979 [1975], p. 62.

[32] Trancik, Roger 1986, *Finding Lost Space: Theories of Urban Design*. Van Nostrand Reinhold Company, New York.

Urban morphologist Albert Levy has pointed out the problems of analysing the contemporary urban fabric.[33] He argues that changes in the relationships between the primary urban elements plot (P), street (S), constructed space or buildings (B), and open space (OS) calls for refined ways of identifying the new conditions. In figure 2.1 the elements are presented in a matrix. *Open space* in Levy's terminology, which I follow, is to be understood as squares, gardens, courtyards, and other urban spaces that are not streets. In the old urban fabric the plot was a structuring element, with a direct relationship to the street (P-S) and to constructed space (P-B); open space related directly to, and was often defined by, the other elements (S-OS, B-OS). In the modern urban fabric, Levy argues, 'the new elements are entirely autonomous. Constructed space no longer corresponds to the plot. There is no longer a clear relation between one building and another, and between buildings and streets or open spaces'[34].

Figure 2.1
Levy's matrix of relationships between the primary elements of the urban fabric. (From Levy 1999)

	plot (P)	street (S)	building (B)	open space (OS)
plot (P)	P – P	P – S	P – B	P – OS
street (S)	S – P	S – S	S – B	S – OS
building (B)	B – P	B – S	B – B	B – OS
open space (OS)	OS – P	OS – S	OS – B	OS – OS

[33] Levy, Albert 1999, "Urban morphology and the problem of the modern urban fabric: some questions for research", *Urban Morphology. Journal of the International Seminar on Urban Form*. Volume 3, Number 2, 1999.

[34] Levy 1999, p. 83. In his matrix Levy uses the abbreviation CS where I have chosen to use B for constructed space/buildings.

The new circumstances will be highlighted in my historical overview of the morphological transformation of the housing estate suburbs. We can then observe that open space becomes a mediating element between buildings and streets and that different sorts of open space increasingly relate to one another (OS-OS). Among other things, this makes the open spaces difficult to define as geometric shapes.

In some cases simplifications of the concept of space are justified by practical considerations. Space syntax theory uses a visually based concept called *convex space*[35], invented as a tool for analyses of spatial relations. Convex spaces are used to divide a continuous space into separate units (as few and as large sub-units as possible). In a convex space all parts are visible from all points in that space.

In a dense urban fabric it is quite easy to define convex spaces of squares or streets that correspond with the intuitive impression of the shapes of these particular urban spaces. In the open plan layouts of most housing estate areas, discrete spaces which make sense as convex spaces are harder to identify and the logic in the intellectual construction is therefore weakened (see Figure 2.2).

Figure 2.2
These simplified examples illustrate that convex spaces are more open to interpretation in the open-plan layouts of the housing estate areas and therefore more difficult to define convincingly than in the urban grid.

[35] See for instance Hillier 1996, pp. 125-128.

Interesting attempts to define quantifiable spatial qualities in open-plan interiors have been presented by John Peponis et al.[36] Their approach is based on the perspective of a moving subject. The continuous space is divided into sub-fields with stable spatial information. When a person moves and new spatial information – such as an edge, a corner, or an opening – comes into view with the changed perspective, she enters into another spatial field. In simple layouts the partitions of sub-fields are quite easy to make, and the numbers of sub-fields are low. In a simple case the map depicts a spatial experience that is mainly stable, or static. But in open modernist spaces, where the spatial divisions make the perspectives shift more frequently, the number of sub-fields is high, and so the maps come to represent a spatial experience that is more unstable, or dynamic. Even if the method as such may be too complicated to handle in urban settings (the authors acknowledge that the method is laborious), their different analyses provide a stimulating contribution to the issue of the complexities of spatial relations and spatial interfaces.

The work by Peponis et al. confirms that the concept of open space as a morphological entity is indeed challenging as soon as we leave the more easily defined enclosures of the dense urban fabric.

Spatial relations and configuration

It is tempting to argue that spatial relations are the most fundamental properties of urban design. The reason is simple: all urban life relies on movement, and spatial relations provide the conditions for where we can go and how we can get there. When it comes to legibility, the difference between individual spaces and spatial relations is clarified by Bill Hillier: 'The passage from the simple space to a configuration of space is also the passage from the visible to the intelligible'[37]. This makes configuration the *hidden property* of environmental design in my investigation of legibility – it is there, but we do not see it.

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[36] Peponis, John, J. Wineman, M. Rashid, S. Hong Kim & S. Bafna 1997, "On the description of shape and spatial configuration inside buildings: convex partitions and their local properties", *Environment and Planning B: Planning and Design*. 1997 Volume 24, pp. 761-781.

[37] Hillier 1996, p. 26.

So whereas observations of architecture and urban spaces as discrete objects (and/or works of art) are mostly static, the concepts of spatial relations and configuration rely on the dynamics of movement. Without maps, we need to move through a given environment to understand its structure because, as Hillier says, 'relationality in space is rarely accessible to us as a single experience'[38].

From an environmental psychology point of view, Tommy Gärling, Anders Böök and Erik Lindberg have proposed three categories of the way people think of movement in the urban environment: *places*, *spatial relations* and *travel plans*. The three components are interrelated in so far as *places* have *spatial relations*, which are ordered in *travel plans*.[39] The spatial relations Gärling et al. point out as important features of environmental cognition are distance, topology, and nesting. Distance needs no further explanation; topology refers to the relations of places or spaces regardless of distance (a fundamental condition for space syntax theory, which we will come back to later); nesting is a mental phenomenon, which means that sites or areas of different scale become bundled together, so that one is thought of as a part of another.[40] An example of nesting is when a bedroom is thought of as part of an apartment, which in turn is part of a building block. Or when a landmark, such as a prominent school, is thought of in the context of its neighbourhood. Another aspect of nesting, mentioned by Barbara Tversky, has to do with the hierarchy of spatial memories.[41] This means that the landmark, in this case the school, becomes the organising feature of its surrounding: one thinks of the streets or buildings around it as relating to the school.

[38] Hillier 1996, p. 27.

[39] Gärling, Tommy, Anders Böök & Erik Lindberg 1985, "Adults' Memory Representations of the Spatial Properties of their Everyday Physical Environment", in Cohen (ed.) 1985, *The Development of Spatial Cognition*. New Jersey, London, pp. 147-153.

[40] See also Tversky 2000, pp. 26-27; and Gärling, Böök & Lindberg 1985, p. 150, for references to empirical studies.

[41] Tversky 2000.

These studies of psychology deal with how we organise knowledge of the environment in our brains, and use the knowledge to, among other things, create action plans. Studies in architecture mostly consider the experience that comes with direct encounter – how we react, or in some cases are believed to react, when we meet the environment.

In architectural discourse, spatial relations are often treated as the connection between adjacent spaces. One example is how the visual contact from one space to the next is investigated in Gordon Cullen's sketches of urban walks.[42] The design of the interface between spaces affects not only our experience as we move from one space to the next, but also how we distinguish one space from another. As such the spatial interface is an important feature of design. Still, even if we manage to identify critical spatial interfaces, these space-to-space relationships do not tell us about the overall structural level of the built environment.

Regarding the structural level of spatial relations, examples of basic patterns of circulation systems are grids, rings, and trees. In many cases common sense will tell us what impact one shape or the other will have on space use and legibility, both in urban settings and in buildings. We can for instance assume that more movement will be found in the trunk of a tree than in the branches, still less in the smallest twigs, just as we can assume that movement will be more evenly distributed in a grid than in a tree. And apartments are commonly held to be more attractive when the rooms are connected as a ring since the choice of route allows flexibility. In terms of legibility, we can make some assumptions about the three configurations: for instance, that both a ring and a grid are easier to navigate in than a tree, because with a ring we are never more than one turn away from our destination, and in a grid we have alternative ways to reach our goal. In a tree structure our destination may be geographically close, even in sight, but far away when it comes to actually getting there.

[42] Cullen, Gordon 1986 [1961], *The Concise Townscape*. The Architectural Press, London, p. 17.

However, most of the spatial structures we come across in cities are more complex than a ring, a regular grid, or a tree. The more complicated the spatial configuration is, the harder it is to intuitively predict any consequences of the layouts. This problem is addressed by space syntax theory, which was first outlined by Bill Hillier and Julienne Hanson in *The social logic of space*[43]. Space syntax theory manages to present consistent ideas about spatial relations at a larger scale and in complex systems, and about how spatial configuration influences the use of space.

The theories of space syntax and the proposals of environmental psychology above bear many similarities. They approach urban orientation from two complementary directions: the psychologists from the perspective of individual spatial cognition, and space syntax theory from a structural point of view. The common denominators here are topology, and that both approaches are based on the fundamental urban condition of movement.[44]

According to space syntax, topological relations are more significant than distance. This is one of the points on which space syntax theory has been questioned, but with the psychology research at hand it seems plausible that legibility – and in many cases movement – has more to do with how spaces are related to each other than with the distance between them. For example: to make up our travel plans, we move through the environment in our minds, and think of spaces not as metric units but as entities following a consecutive order or as parts of spatial hierarchies. Thus it seems justified in this case to single out topology as a critical determining factor for the choice of route between two given points, even before distance.

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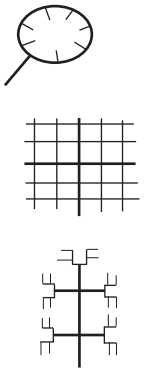
[43] Hillier, Bill & Julienne Hanson 1984, *The social logic of space*. Cambridge University Press.

[44] For examples of the combination of perspectives, cf. Penn, Alan 2001, "Space syntax and Spatial Cognition. Or, why the axial line?", pp. 11.1-16; Saif-ul Haq 2001, "Just Down the Road a Piece. The development of topological knowledge of building layouts", pp. 48.1-17; Kim, Young Ook 2001, "The Role of Spatial Configuration in Spatial Cognition", pp. 49.1-21, all in Peponis, Wineman & Bafna (eds.) 2001, *Proceedings*. Space Syntax 3rd International Symposium, Atlanta.



The basic ideas of space syntax theory are presented in easily accessible graphic representations of spatial structures, such as the justified graphs in Figure 1.2, and the axial maps in the appendix. The analysed spaces can be rooms in a building as well as urban spaces. In both cases space syntax analysis uses the construction of convex spaces to define the topology of the spatial structure. The convex spaces are connected by axial lines, and these axial lines are important elements since they are the carriers of movement in the given environment. The theoretical construction matches the simple facts that moving is basically linear and that we move through series of spaces. Central and useful concepts in space syntax analysis are *depth*, *integration*/*segregation* and *connectivity*. For example, a tree structure has greater spatial depth than a grid, and the branches of the tree are less integrated in the spatial structure than the trunk; in a regular grid all streets have the same number of connections, and therefore the same connectivity.

In space syntax theory, the configurational properties of spaces are defined by mathematical operations, which are simple at a basic level. In a small spatial structure the calculations are manageable by hand, but in larger systems, like whole cities or large buildings, they require computers for practical reasons. These calculations may seem overly tech-

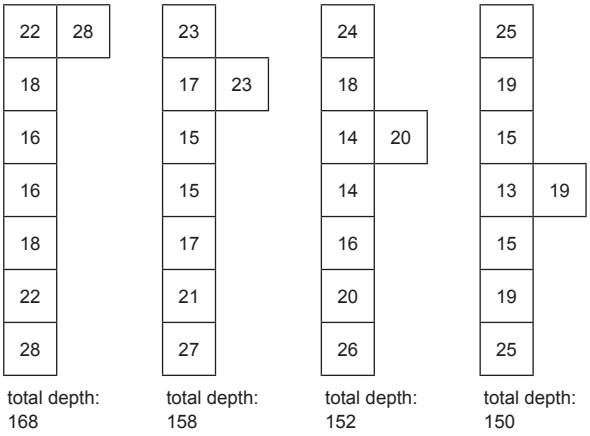


Figure 2.3
In this model, the number in each space represents how many spatial steps it is from that particular space to all other spaces in the structure. It is all simple counting: 1 to the nearest + 2 to the next + 3 etc. The model shows that changing the configuration by moving one part, changes not only the configurational properties of that particular unit, but of the structure as a whole. (Hillier 1996)

nical and remote from more conventional architectural analyses, but if we look beyond the numbers and understand what they represent, space syntax analysis has much to offer the study of spatial relations. The purpose of the calculations is to figure out how far (in topological steps) it is from each individual space to every other in a spatial structure. The number we get for each space represents how well integrated it is in the structure as a whole: if there are few steps from a given space to all other spaces, that space is highly integrated, and if there are many steps to the others, it is spatially segregated. Space syntax analysis is based on the condition that changes in connections in one part of the structure affect the configurational properties of the structure as a whole, as shown in Figure 2.3, and that these changes have implications for use.[45]

Numerous empirical space syntax analyses show an actual correspondence between spatial configuration and movement, both in buildings and urban settings.[46] The more integrated the space, the more movement will pass through it. Of course, this does not happen on a deterministic individual level, but with a critical mass of movement people tend to disperse according to integration values. Hence, configuration can be said to be an underlying pattern which is used for navigation. With these findings, and above all the graphic representations

[45] For an extensive account of configuration, see Hillier 1996, Chapter 3: Non-discursive technique, pp. 88-145.

[46] A summary of the space syntax field of research with a selection of references is presented by Peponis, John & Jean Wineman 2002, "Spatial structure of environment and behavior", in Bechtel & Churchman (eds.) 2002, *Handbook of environmental psychology*. New York. Peponis & Wineman refer to e.g. Hillier, Bill 1985, "The nature of the artificial: The contingent and the necessary in spatial form in architecture", *Geoforum* 16 (2), pp. 163-178; Hillier, Bill, R. Burdett, J. Peponis, & A. Penn 1987, "Creating life: or, does architecture determine anything?", *Architecture and Comportment/Architecture and Behavior* 3 (3), pp. 233-250; Hillier, B. & A. Penn 1991, "Visible colleges: Structure and randomness in the place of discovery", *Science in Context* 4 (1), pp. 23-49; Penn, A., B. Hillier, D. Bannister, & J. Xu 1998, "Configurational modeling of urban movement networks", *Environment and Planning (B): Planning and Design* 25 (1), pp. 59-84; Peponis, J., C. Ross, & M. Rashid 1997, "The structure of urban space, movement and co-presence: The case of Atlanta", *Geoforum* 28 (3-4), pp. 341-358; Read, Stephen 1999, "Space syntax and the Dutch city", *Environment and Planning (B): Planning and Design* 22 (5) pp. 555-590.

of configurational structures, space syntax theory makes an essential contribution to architectural thinking. The space-use correlation, and in some cases the lack of it, will be discussed in chapter three in connection to my space syntax analysis of housing estate areas in Göteborg.

Criticism of space syntax analysis

Space syntax is a young, broad, and growing field of knowledge. It is also controversial. Critics of the theory claim that since the methods need to be adjusted and the results interpreted for each new context, they are not generally applicable and thus not scientifically reliable – the researcher does not know if it is the environment or the method that is being tested. Other critics claim that space syntax analyses only confirm what intuition already tells us, but in that case I argue that such a confirmation is still more than most theories of architecture can offer.[47]

In connection to my space syntax study in the next chapter, I will comment on some of the methodological problems. The most relevant and knowledgeable criticism, though, is to be found within the community of space syntax research, where theories and methods are continuously being questioned and developed.[48]

Nevertheless, however relevant for understanding the built environment, the concept of spatial configuration renders space as something rather abstract – stripped of all its sensuous features as it is in space syntax theory. If configuration can be said to represent *hidden properties* of the built environment, we use various kinds of *visible properties* to find our way through the configuration. What elements we notice and what sort of information they convey is the topic of the next section.

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[47] According to my experience, these sorts of objections are raised at almost any seminar where space syntax analyses are presented, most often by people who are only faintly familiar with the field.

[48] A comprehensive introduction to the field can be found on the internet site www.spacesyntax.org, homepage of The Space Syntax Laboratory at the Bartlett School of Graduate Studies, University College London, GB.

Environmental communication

When we navigate through our everyday environment, our tacit knowledge of its configuration is normally sufficient for us to manage. We know what spaces we need to pass, how they are interconnected, and which route to take to reach a given destination. This is how we use what I call place recognition. But in new environments the situation is different. Where we do not know the spatial organisation, we rely on other design features for orientation, for instance through type recognition.

In a study of wayfinding problems for people who suffered from dementia, the architectural and graphic expressions which were necessary for orientation were labelled *environmental communication*.[49] The concept is adequate and useful for this investigation, because it covers a wide range of information sources in the environment. Here, the meaning of environmental communication is extended beyond architecture and graphics to include other elements in the urban landscape, such as street furniture and green elements. The criteria is what can be regarded as points of reference when it comes to wayfinding and orientation – simply put what the environment communicates.

The research on environmental communication is not relevant only for the specific group of people with dementia, but has implications for design in general. As an example, signage is sometimes found to be more confusing than helpful: 'All too often graphic information tries to compensate for poor architectural communication and mostly with insignificant results'[50]. This goes to say that the hidden property of configuration is always accompanied by the visible features of environmental communication – for better or worse, as we all know from personal experience.

[49] Passini, Romedi, Constant Rainville, Nicolas Marchand & Yves Joanette 1999, "Wayfinding and Dementia: Some Research Findings and a New Look at Design" in Nasar & Preiser 1999, *Directions in Person-Environment Research and Practice*. Ashgate publishing Ltd., Aldershot, p. 195.

[50] Passini et al. 1999, p. 196.

Legibility, architecture and urban design

In 1960 Kevin Lynch published his seminal work *The Image of the City*, in which he examined the visual quality of the cityscape from the perspective of 'clarity' or 'legibility'[51]. One of his reasons for investigating legibility was that 'a distinctive and legible environment not only offers security but also heightens the potential depth and intensity of human experience'.[52] Lynch even makes a short biologistic deviation and states that 'structuring and identifying the environment is a vital ability among all mobile animals. [---] This organization is fundamental to the efficiency and to the very survival of free-moving life'[53].

It may seem drastic to talk about legibility as a prerequisite for survival in the city, and most likely Lynch does not mean it literally, but without doubt legibility is an important feature of urban environments. For instance, most people do feel more at ease when they can find their way than when they get lost. If personal experience is not convincing enough, there are psychological studies that support this notion[54].

In a familiar setting we seldom have to consider legibility as an aspect of the physical environment. Most of the time we navigate through our everyday surroundings without having to reflect on them. When we visit new or unfamiliar areas, however, we rely visual information in the built environment to find our way though it. Of course we can ask people (if any are about) for directions, but anyone we ask will probably give directions based on visual signals anyhow, which brings us back to the issue.

Visual information comes from things like buildings, voids, paths, vegetation, topography, signposts, equipment, texture, colour, size, and light conditions. People can also constitute a visual signal, but are in this case rather to be seen as an indirect indication of something in the

[51] Lynch 1960, p. 2.

[52] Lynch 1960, p. 5.

[53] Lynch 1960, p. 3.

[54] Cf. Gärling, Tommy, Anders Böök & Erik Lindberg 1986, "Spatial orientation and wayfinding in the designed environment. A conceptual analysis and some suggestions for postoccupancy evaluation", *Journal of Architectural and Planning Research*, Volume 3, Number 1, 1986, p. 61.

physical environment, for example a queue (people) to the match (function) at the arena (building).

Writers within the discourse of architecture and urban design often declare that buildings and cities should be designed to be legible in one way or another. A passage from Francis Tibbalds' book *Making people-friendly towns: Improving the public environment in towns and cities* is one example:

> Different places mean different things to different people. We probably all perceive our urban environment in slightly different ways. What matters is to put together buildings and bits of towns in ways that are easy to understand. […] Good urban areas are legible – they can be understood or read like a book.[55]

Tibbalds represents a common position in the discourse of architecture and urban design; there is clearly an ambition to make buildings and cities legible – the question for this thesis is how legibility can be achieved through design. That the built environment could be read like a book is, however, a misguiding analogy. As I pointed out in the introduction, any analysis of the physical environment needs to distinguish between on the one hand the symbolic (or, as in the case above: the semantic) meaning that needs intellectual interpretation, and on the other the behavioural meaning that comes when we understand how to use and get about an environment.

Differences in interpretation of the urban environment

As Tibbalds correctly says, we all perceive the physical environment in slightly different ways. Apparently there are not only individual differences in perception and interpretation; there are also cultural differences, and sub-cultural ones too. Tibbalds illustrates some problems we come across in this field. His book is written as a reaction to modernist urban design and the decay of public space, described as 'full of medio-

[55] Tibbalds, Francis 2001 [1992], *Making people-friendly towns: Improving the public environment in towns and cities*. London and New York, p. 63.

cre and ugly poorly maintained buildings'[56]. Still he sympathises with the functionalist idea that form and function are related:

> Individual buildings can contribute too – especially if they are memorable, useful markers in the townscape. It should be obvious from outside a building what its function is and how to enter it.[57]

Many of us share the same references, but not concerning everything all the time. For example, for some a *centre* is a square surrounded by prominent civic buildings, in line with the ideals of New Urbanism expressed by Andres Duany and Elisabeth Plater-Zyberk in the following passage:

> The center is always a public space, which may be a square, a green or an important street intersection. […] The center is the locus of the neighborhood's public buildings, ideally a post office, a meeting hall, a day-care center and sometimes religious and cultural institutions.[58]

For others the centre might be recognised as an inconspicuous box surrounded by parking lots, like many suburban centres of the 1970s – accepted, perhaps 'almost alright', or even acclaimed as 'the ugly and the ordinary'[59], though they are likely examples of the buildings Tibbalds dislikes.

It is obvious that personal experience plays an important role in our understanding of the environment. To get information about what people find significant in the environment, cognitive mapping, as set off by Lynch, is one useful method.

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[56] Tibbalds 2001, s. 1.

[57] Tibbalds 2001, s. 63.

[58] Duany, Andres & Elisabeth Plater-Zyberk 1994, "The Neighborhood, the District and the Corridor", in Katz 1994, *The New Urbanism. Toward an Architecture of Community*. McGraw-Hill, New York, p. xvii.

[59] For discussions of the ugly and ordinary, see Venturi, Scott Brown & Izenour 1972.

Cognitive mapping

How do we think of the physical world we know? We certainly know more about it than what is immediately visually available. The mind seems to be full of guiding images and ideas, which can be brought forward when we need them. These preconceptions are part of our environmental cognition, and they help us to navigate through the urban landscape. Whenever we decide to move from one place to another we employ these mental models of the world. This is a general skill:

> Research has demonstrated the capability adults possess to cognitively map the spatial layout of the large-scale environment. Furthermore, adults do not seem to differ much from each other in this capability.[60]

A large-scale environment is here defined as 'something that cannot be perceived at once. Size per se is thus not crucial'[61]. The distinction is important, because whereas *large-scale* is a term often used to describe sheer size, particularly in the housing estate areas of the Million Programme period, here it is related to contexts of spatial relations and spatial interfaces.

Without our spatial imagination and preconceptions of the world we would always be lost. Even our most trivial moves are dependent on this spatial knowledge, and without this skill even a simple routine like walking from the bedroom to the kitchen in the morning would be impossible without thinking. The search for the kitchen, as for all other places, would be a time-consuming daily trial.

Cognitive models of the physical environment stretch over all imaginable scales, from how we think of our own home, over the building and the area, to the city, the region, the country and the world. In our minds the cognitive models are not like maps at all. They can rather be described as fragments of images, which glide over from one to another, and as the feeling of knowing one's way. These models of the environment are difficult to represent, but when someone is asked to draw a 'cognitive map' it tends to become rather map-like, however de-

[60] Gärling, Böök & Lindberg 1985, p. 141.
[61] Gärling, Böök & Lindberg 1985, p. 159.

formed. Still, it reflects to various degrees our environmental cognition. The drawing difficulties are explained by the very nature of 'cognitive maps' of the mind. They are not static images, but 'dynamically created anew, each time, as ad hoc entities: The brain is capable of creating a multiplicity of cognitive maps with specific perspectives, scales and modes'[62]. Less certain, then, is the ability to draw or verbally explain what we literally have in mind. There is a big – and unavoidable – gap between the cognitive 'maps' we have in our minds, and the cognitive maps we draw; the implications of this difference vary depending on the aim of the research. I want to stress that I have used the method to discuss the environment, not to understand the human mind.

Mapping the mind and the environment

There are a number of different approaches to the phenomenon of cognitive maps. In principle all research on the subject departs from two questions: (a) What properties of the environment are represented and (b) How are these properties represented?[63]

The relevant research is basically divided into two fields, one that focuses mainly on the environment, the other mainly on the mind. In the environmental field disciplines such as geography, sociology, planning, and architecture use cognitive maps as a means to study diverse aspects of the environment and people's knowledge of their world. In the mind field we find disciplines such as biology, zoology, and cognitive, developmental, and environmental psychology, which study cognitive maps in relation to the brain and its internal processes. Quite naturally, the border between the two fields is open, because there is always an *interaction* of environment and mind to be considered.

There is no reason here to get into the details of human perception, yet there are a few concepts we need to define before we start the discussions of urban legibility. The definitions put forward are by no means all-embracing; in fact, each concept is in itself a field of research

[62] Portugali, Juval 1996, "Inter-representation networks and cognitive maps", in Portugali (ed.) 1996, *The Construction of Cognitive Maps*. Kluwer Academic Publishers, Dordrecht, London, p. 16.
[63] Gärling, Böök & Lindberg 1985, p. 147.

and the ambition here can only be to explain how I use the concepts in my discussions.

The starting point is the physical environment, which the human agent perceives. The mind's perception of the environment is understood as the various sensuous stimuli that reach the brain: visions, smells, sounds, tactile sensations, and so on. Perception is accompanied by the cognitive phase of experience, the process of creating knowledge out of our perceptions. Environmental cognition is also based on the knowledge we derive from moving about, the crucial knowledge of spatial relations and structures (configuration), and the knowledge we get from using the environment. Environmental cognition, in all its complexity, is partly represented in the mind by cognitive models, which can be translated into cognitive maps.

A simple model of the relationships may look like Figure 2.4, with my field of interest within the dotted oval.

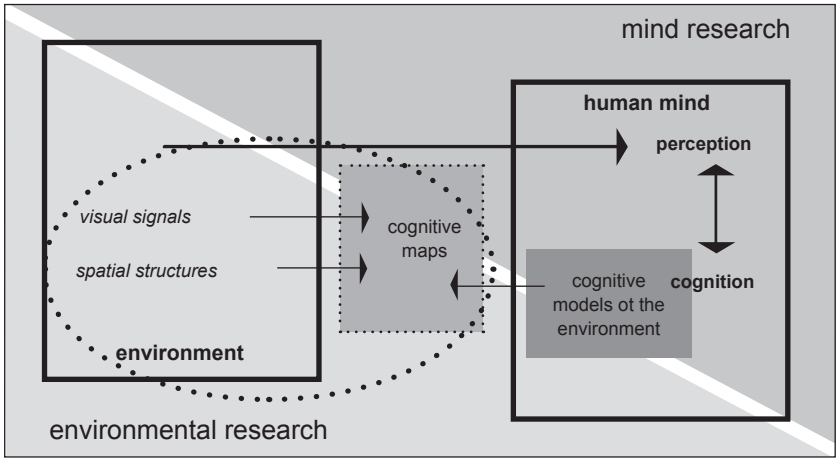

Figure 2.4
One way of seeing the relationship between mind research with interest in environmental cognition and environmental research using cognitive mapping as a tool. The position of this thesis is suggested by the dotted oval.

In psychology, researchers mainly take interest in the mental processes that transform perceptual stimuli to cognitive models. They are also interested in how people make representations of their cognitive models, that is what sort of maps they draw or what verbal expressions they use to describe specific spatial concepts.

Researchers with interest in the physical environment, such as architects, planners, environmental psychologists, and sociologists with spatial approaches, study the actual content of the cognitive maps that people present: what features are included, what emphasis is put on each, and also what is left out.

The focus of my investigation is the built environment and the urban landscape. Concerning the role of our minds, suffice it here to recognise that we have the environments we know stored in our minds, and that we use our knowledge to comprehend new environments as we meet them.

Criticism of Lynch and cognitive mapping

The problems concerning cognitive mapping as a research method have been widely recognised and discussed.[64] First of all we must recognise that different drawing abilities can affect the outcome of the task. Cartographic map-making in general includes three operations: rotation of the visual field to a vertical perspective, change in scale, and transformation to abstractions or symbolizations.[65] These three operations are normally carried out when our cognitive models of the physical environment are translated into drawings, and it is obvious that individual drawing inclinations will make a difference. An often referred to Dutch study by De Jong in 1962 is a good example: the informants could depict an orthogonal grid with greater accuracy than a deformed street pattern, which led to discussions of how to interpret the result. Is the regular pattern more legible and easier for orientation than the irregular one, or is it just easier to draw?[66] In this case it seems reasonable to believe the drawing difficulties explanation.

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[64] For accounts of method criticism, see for instance Kitchin, Rob 2000, "Collecting and analysing cognitive mapping data", in Kitchin & Freundschuh 2000; Pipkin, John S. 1983, "Structuralism and the Uses of Cognitive Images in Urban Planning", in Pipkin, La Gory & Blau (eds.) 1983, *Remaking the City. Social Science Perspectives on Urban Design*. State University of New York Press, Albany.

[65] Downs, Roger M. & David Stea 1973, "Cognitive Maps and Spatial Behavior: Process and Products", in Downs & Stea (eds.) 1973, *Image and Environment. Cognitive mapping and Spatial Behavior*. Aldine Publishing Company, Chicago, pp. 11-12.

[66] Here taken from Werne, Finn 1987, *Den osynliga arkitekturen*. Vinga Press/Lund, p. 77.

Furthermore it has rightly been said that the information gained from sketch maps is difficult to quantify and to interpret. This is true, but there are reasons to propose a more qualitative approach to the interpretation.

The work of Kevin Lynch (and his followers) has been questioned by many. Gottdiener and Lagopoulos, who work in the socio-semiotic tradition, claim not only that Lynch's approach is limited and his methods questionable, but above all that the epistemological grounding for the research is doubtful, at least when it comes to the signification of the city.[67] This is indeed severe criticism, but some of it falls if the claims they ascribe to the approach of cognitive mapping are examined more closely.

'In sum', they write, 'the perceptual approach to the image of the city falls short as a means of analyzing the symbolic nature of that image'.[68] The socio-semiotic approach that Gottdiener and Lagopoulos advocate builds upon conception rather than perception of the environment. Socio-semiotics takes the symbolic meaning into account, and it is on this point Gottdiener and Lagopoulos find the lacunas in cognitive mapping as used by Lynch and others. They criticise cognitive mapping (or what they call 'the Legacy of Lynch') for dealing with perception of *physical form* rather than conception of *meaning*. But what if we do not claim to deal with symbolic meaning but with physical form and its implications for orientation? There is a fundamental difference between maps depicting objects or places with social or psychological significance for individuals or societies and indications of visual information for orientation. This is, again, the difference between symbolic and emotional meaning on the one side and behavioural meaning on the other that I distinguished in the introduction.

The concepts Lynch developed with aid from the cognitive maps – path, node, district, edge and landmark – are readily available for a first and crude description of any urban environment, but even Lynch himself expressed some regret that the concepts were too easy to use:

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[67] Gottdiener, M. & Alexandros Ph. Lagopoulos 1986 (eds.) *The City and the Sign. An Introduction to Urban Semiotics*. Columbia University Press, New York, pp. 6-9.

[68] Gottdiener & Lagopoulos 1986, p. 8.

designers found no reason to talk with the users and others that the method was created for. Lynch wrote, 'The words were dangerous precisely because they were useful'[69]. A reservation like this over the seemingly simple method could be used for the axial maps of space syntax analysis too, as I will discuss in Chapter Three.

Despite the criticism, the work by Lynch is still seen as a major contribution to environmental cognition research, and I admit that I have been surprised to find that *The Image of the City* is a standard reference also in the field of environmental psychology.

Spatial orientation

Environmental psychologists Gärling, Böök and Lindberg propose a system for classification of the environment to increase the possibilities for spatial orientation and wayfinding. The following three aspects are taken into account in their proposal: degree of differentiation, degree of visual access, and complexity of spatial layout.[70] The aspects are related as shown in the matrix (Figure 2.5) on the next page, which Gärling et al. also propose as a model for evaluation[71].

The matrix predicts that a low degree of differentiation with poor visual access in a complex layout would lead to very high problems in spatial orientation and wayfinding. On the other side, high differentiation combined with good visual access and a simple layout give the best conditions for spatial orientation. According to the authors the matrix should be read with some precaution: it can, for instance, be argued that good visual access cannot compensate for poor differentiation.

Nevertheless, all three environmental categories are inherent in architectural discussions. They can be sorted into the fields of design in my model: layout belongs to the field of spatial relations, visual access to spatial interfaces, and differentiation to urban and architectural

[69] Lynch, Kevin 1985, "Reconsidering *The Image of the City*", in Banerjee & Southworth (eds.) 1990, *City Sense and City Design. Writings and projects of Kevin Lynch*. MIT Press, Cambridge, Massachusetts, p. 251.

[70] Gärling, Böök & Lindberg 1986, p. 58.

[71] From Gärling, Böök & Lindberg 1986, p. 59.

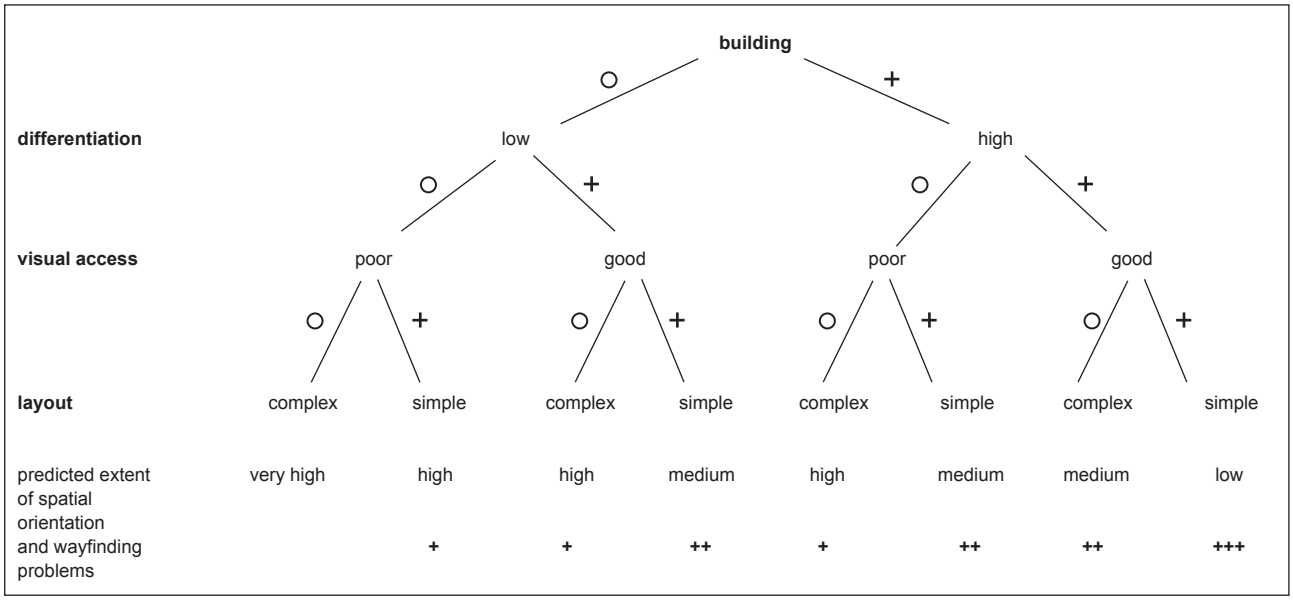

Figure 2.5
Proposed matrix for predicting wayfinding problems, proposedly also applicable in urban environments. (From Gärling, Böök & Lindberg 1986)

articulation. As we shall see, the aspects of the matrix can be further elaborated, and to some extent also questioned, in the context of architecture and urban design.

Concerning *differentiation* Gärling et al state that:

> the degree to which different parts of an environment look the same or different, will affect people's ability to recognise places, and […] this will affect both newcomers' and more experienced users' spatial orientation and wayfinding in a particular environment.[72]

This is in accordance with the findings of Passini et al. in their study of dementia patients. They found a need for significant architectural elements, such as entrances and stairs, to be well articulated to facilitate wayfinding, and they proposed that different zones should be given identifiable characters. I believe most people – architects in particular – will acknowledge these findings as something that agrees with intuition.

[72] Gärling, Böök & Lindberg 1986, p. 58.

The properties of differentiation mentioned by Gärling et al. – size, form, colour and architectural style – can be developed and investigated in the architectural field. For the everyday use and orientation in urban environments, the differentiation of functions is also an aspect to consider. For instance, the monofunctionality of the housing suburbs make them less differentiated than the mixed-use areas of other urban types, which in turn gives fewer function-related points of reference for orientation.

Architects and psychologists alike argue that *the degree of visual access* affects spatial orientation and wayfinding. But visual access needs to be accompanied by physical access to be useful for navigation to our destination. An abundance of examples can be taken from the housing estate suburbs, where the visual access may be unrestricted, but the physical access is limited by different sorts of barriers, most of them stemming from the traffic separation system. You can see where you want to go, but cannot figure out how to get there – you have to search for the right way.

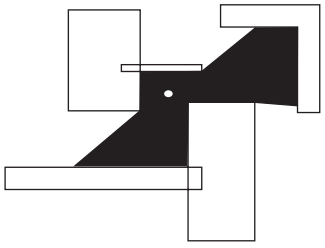

Figure 2.6
An *isovist* is the field which can be seen from one given point, here represented by the white dot.

However, all in all visual access increases the possibilities for urban orientation, provided it interacts with the movement structures. With my distinction, it means that visual access facilitates orientation, but not necessarily navigation. Space syntax theory uses the concept of *isovists* to define what is visually accessible from a given point. Since space syntax analysis is based on movement, the interesting part is how the isovists are connected, that is how they can lead from one space to another by giving useful spatial information in any given space. Isovists are part of the analyses of spatial configuration, and so related to the fields of spatial *relations* and spatial *interfaces* in my design component model. Properties belonging to the field of architectural and urban *articulation* – such as colour, material, light conditions and others – are deliberately left out of the isovist analyses of visual access.

These aspects of visual access are treated by Gordon Cullen in his *serial vision* city walk sketches.[73] Cullen's method aims at describing the visual appearance of spaces and their interfaces, but it does so largely without theoretical foundation. Cullen writes:

> We can get no further help from the scientific attitude and […] we must therefore turn to other values and other standards. We turn to the *faculty of sight*, for it is almost entirely through vision that the environment is apprehended.[74]

Although the scientific value of the method as such is limited, Cullen's approach to visual access treats the two fields of spatial interface and spatial articulation.

As a source of inspiration for contemporary urban planners, Camillo Sitte should also be mentioned in relation to visual spatial properties.[75] His artistic approach to urban design was partly aimed at *restricting* visual access to make urban space more interesting and attractive. With the right treatment of views, restrictions in visual access need not be a threat to orientation, since all spaces cannot be taken in at once anyhow. The key is good connections of isovists[76].

The third orientation variable of the environment that Gärling et al. propose is the *complexity of the spatial layout*. They acknowledge that this is an aspect which is hard to define concisely, and obviously this is a variable where the theories of space syntax can contribute, as described above.

Gärling et al. assert that a simple layout should make it 'easier to choose destinations and routes, to maintain orientation, and to learn about the environment'[77]. This is in line with the argument of this thesis,

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[73] Cullen, Gordon 1986 [1961], *The Concise Townscape*. The Architectural Press, London, pp. 9, 17-20.

[74] Cullen 1986 [1961], p. 8. Why Cullen thinks the faculty of sight could not be scientifically treated is not clear to me.

[75] Sitte, Camillo 1945 [1889, *Der Städtebau nach seinen künstlerischen Grundsätzen*], *The art of building cities. City building according to its artistic fundamentals*. Reinhold Publishing Corporation, New York.

[76] Cf. Hillier 1996, pp. 124-132.

[77] Gärling, Böök & Lindberg 1986, p. 58.

but a question still to be answered is what properties a simple layout has. A grid and a tree structure, to stick to the two well-known examples, are both simple layouts regarded as plan figures. Yet the experience of moving around in one is quite different from moving around in the other.

Points of reference in environmental cognition

The concept of *points of reference* needs some explanation. First we must clarify that it is not a question of *points*, as in the point-line-grid categorisation, but of *references*. In the method of cognitive mapping, the drawings show what people consider as noticeable or significant elements in the environment. These elements can be of the most diverse kind, from references to the smallest details up to larger structural features. Gärling et al. state that reference points function as the spatially organising elements of our environmental cognition: it is in relation to the reference points that we maintain our environmental orientation, because even though they are not perceptually available all the time, they are cognitively available.[78]

According to my definition, Kevin Lynch's five urban elements, *districts*, *edges*, *paths*, *nodes,* and *landmarks*, are all examples of points of reference when they are denoted in maps meant for wayfinding. His concepts are useful both for analyses and to communicate design intentions, but they are theoretically developed by professionals, and not all of them can be expected to be spontaneously represented by map-drawing people. However, for work within urban design the concepts are simple to detect and denote, although they are commonly held to be more apt for analyses on a larger scale, that is at city or neighbourhood level.

In our minds some points of reference are more prominent than others, because of visual appearance or functional significance, and become the organising elements of their surroundings, like the school in the example of spatial nesting above. These salient elements have been called *anchor points*.[79]

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[78] Gärling, Böök & Lindberg 1985, p. 166.
[79] Gärling & Golledge 2000, pp. 49-50.

The three concepts – points of reference, urban elements and anchor points – roughly cover the same phenomena, that is features of the urban environment which are significant enough to be part of the individual's environmental cognition, for example as indications in cognitive maps.

Using the environment: tools and signs

A (not too far-fetched) caricature is that architects look at the environment, whereas other people use it – and that the two groups value the environment accordingly. Referring to research on the topic, Gary T. Moore summarises that:

> features of architectural form seem to relate very little with people's memory for buildings or urban landscapes, but rather that use significance, siting, visibility, and ease of linguistic labeling are more important to memory.[80]

The professional eye of architects and urban designers is biased toward the appearance of buildings and places. There is nothing strange or suspicious about that, and the fact that lay people find other aspects of the built environment more significant than design does not diminish the value of aesthetic considerations. Design professionals must deal with aesthetics, but for those who want their designs to make an impression, it may be a useful reminder that use comes before form in people's memories[81].

In cognitive science the concepts *tools* and *signs* are sometimes used to describe two types of mediators in psychological processes.[82] I find these concepts useful also in discussions of people's relationship to their surroundings. Here, in the context of built environments, tools are associated with immediate and unreflected use and interaction, whereas

[80] Moore, Gary T. 1983, "Knowing About Environmental Knowing: The Current State of Theory and Research on Environmental Cognition" in Pipkin, La Gory & Blau (eds.) 1983, p. 24.

[81] Moore 1983, p. 39.

[82] Portugali 1996, p. 19. Portugali's discussion is based on concepts from the psychologist Vygotsky, L.S. 1978, *Mind in Society*. Cambridge Mass., Cambridge University Press.

signs are representations based on preconceptions, which ascribe significance to the sign.

The built environment works as a *tool* for our actions: we *use* rooms, buildings, and places in different ways. One could say that the physical environment in itself is a structuring device: seen as a whole, the built environment is a tool that facilitates movement and provides conditions for action. This is done by the design of spatial relations and the definitions of their spatial interfaces – the layouts, for instance, of streets, stairs and doors decide how we can get about and use the environment. We use these physical objects as tools, but on a basic level it is space in itself that is the mediating tool, as space syntax analyses demonstate.[83] Developing the ideas further, the built environment is a tool of social or political power, as Kim Dovey, among others, proposes:

> Most people, most of the time, take the built environment for granted. This relegation of built form to the unquestioned frame is the key to its relations to power. The more that the structures and representations of power can be embedded in the framework of everyday life, the less questionable they become and the more effectively they can work.[84]

Notice how Dovey renders the power aspect of space invisible: the more embedded, the less questionable.

The *signs* we are surrounded by are on the other hand clearly visible properties of the environment. They are mediators of environmental communication, such as signposts with words, pictures, logotypes, and symbols – not to mention architectural styles, which signal different cultural statements: 'this is a mosque', 'there is a bank office', 'here is a bar for the sophisticated', 'there is a new art museum'. The urban landscape is full of signs, and the interpretations of these are based on a

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[83] Cf. Hillier's 1996 title *Space is the machine*, paraphrasing Le Corbusier's house–machine analogy.

[84] Dovey, Kim 1999, *Framing places. Mediating power in built form*. Routledge, London/New York, p. 2. Other examples are Markus, Thomas 1993, *Buildings and Power. Freedom and control in the origin of modern building types*. Routledge, London; Hanson, Julienne 1998, *Decoding homes and houses*. Cambridge University Press.

cognitive understanding, which is socially and culturally constructed[85]. Signs help us interpret our surroundings, and of course they can be expressions of power, too, provided we understand their meaning.

The notions of tools and signs seem to sum up what this theoretical outline has been dealing with. Tools have behavioural meaning and are largely something we relate to by their use significance. In that sense spatial configuration and what I have called the hidden properties in urban design are tools.

Signs rely on visible properties of the environment and on the symbolic significance that these environmental cues have for different people. The concepts of tools and signs are not mutually exclusive, but closely connected: almost any 'tool' can be given the features of, or be understood as, a 'sign'. This is largely what the field of architectural and urban articulation is about. For example, an important building given an inconspicuous appearance may be confusing to identify for potential users, just as an insignificant door, staircase, street, or any other device for spatial connection, given a prominent expression, may lead visitors in the wrong direction.

In this chapter I have discussed the theoretical aspects of hidden and visible properties of the urban landscape in relation to environmental cognition and urban orientation. In the next chapter I give a more detailed account of my methods and present my empirical studies of the themes.

[85] Cf. Portugali 1996, p. 19.

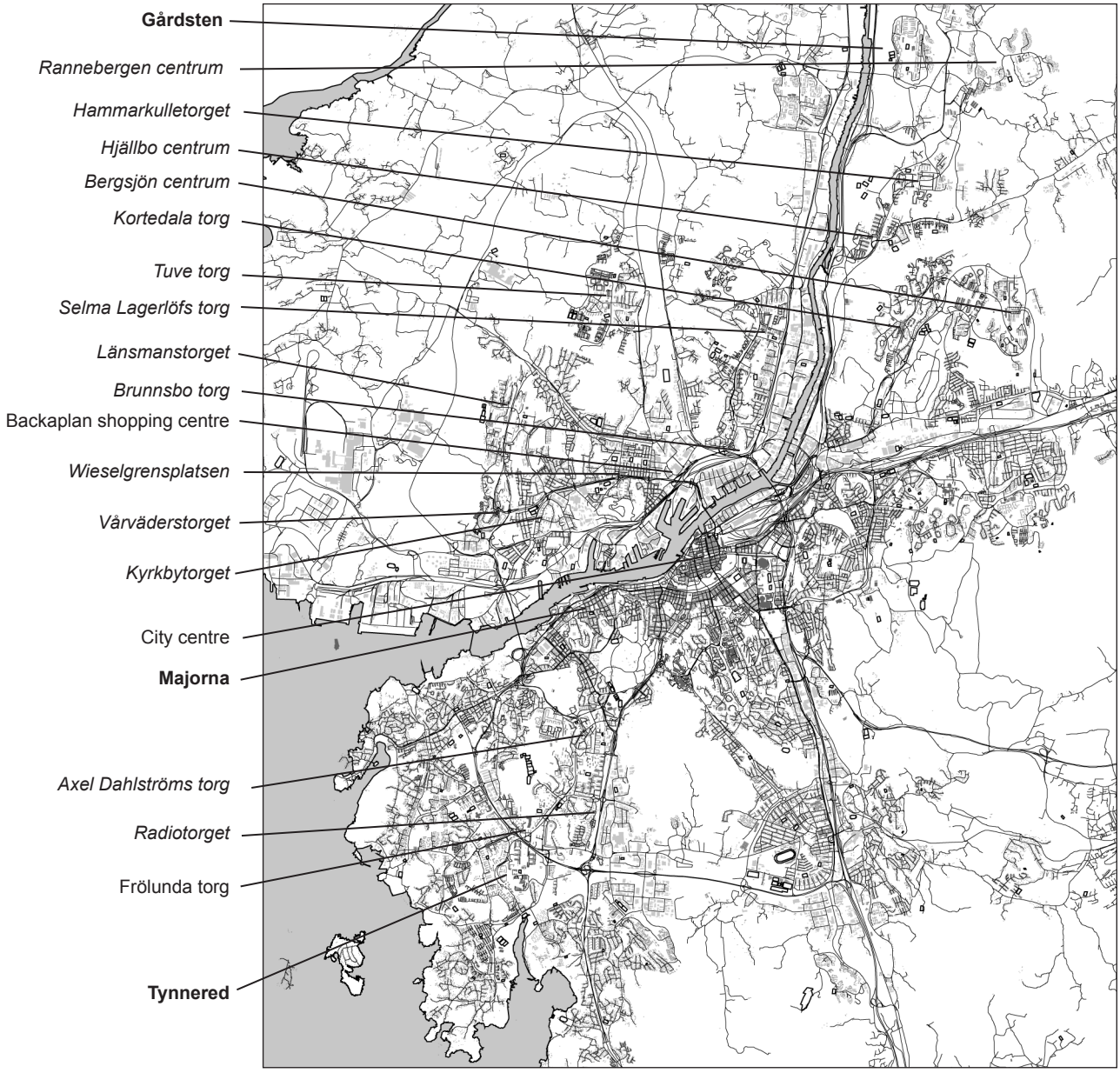


Figure 3.1
Map of Göteborg with central places of the empirical studies indicated. Normal font for the neighbourhood unit history references and other places of interest. *Italics* for the local squares of the space syntax study. **Bold** font for the areas of the cognitive mapping study.

Hidden and visual aspects of the urban landscape

In the previous chapter I presented the theoretical background for my thesis. I focused on the physical and cognitive conditions for orientation in urban environments, and how structural properties of the environment can be systematically described. The theoretical input will now be accompanied by three independent empirical studies, carried out to explore and illuminate the urban environments of housing estate suburbs from different angles. One could also say that the studies have been undertaken to highlight the seemingly simple urban design of these areas. However uncomplicated they may look on plans, housing estate suburbs have proven to be more complex than traditional urban settings when it comes to analysis of spatial design.

For the three studies I have used three different approaches: urban morphology, space syntax analysis, and cognitive mapping, all related in different ways to legibility and urban navigation. Furthermore, the methods also have in common that they go beyond issues of architectural aesthetics[86]. Although aesthetic considerations are indispensable in design, aesthetic analyses rarely address the crucial structural prop-

[86] Knowing that aesthetics is a discourse of its own, I here take the liberty to use the word in its everyday meaning within architectural and popular language, roughly equal to the visual appearance of different styles.

erties that condition both use and experience of the built environment regardless of style. We can all agree that a wall without a door is fundamentally different from a wall with a door, regardless of whether the architectural expression is baroque or neo-modernist.

I will first briefly present the background for my choice of methods. Then I account for the three studies, with methodological details and discussions of the outcomes in each section.

The first section presents an urban design study of the Swedish neighbourhood unit paradigm from the 1940s to the 1970s.[87] It is a morphological study inspired by three sources: Linn's morphological approach, Levy's systematic way of categorising the relations of basic urban elements, and space syntax theory's concept of configuration.

As described in the introduction, Linn draws attention to the critical zone where buildings are linked to urban space, that is the interface where buildings interact with the structure of movement. This zone has changed dramatically during the twentieth century. The change can be described by the new relationships between basic urban elements proposed by Levy: from the clearly defined building–street interface, urban design moved towards relations that were increasingly mediated by different sorts of open space. An interrelated change is found in the configuration of movement networks, and how these patterns in new ways become independent of patterns of building.

The second section presents a discussion based upon a space syntax analysis of fourteen local neighbourhood unit centres in Göteborg.[88] The study was initiated by the Hillier statement 'A square is more than a local element'[89], by which he means that the potential for a place to be used depends primarily on its location in the urban structure as a whole. Space syntax analyses of numerous urban settings show that spatial

[87] The study was part of my licentiate thesis, Klasander 2001b and it has been revised for this new context.

[88] The study was first published in Klasander 2001a, "Suburban Squares. How come they are not all empty?", in Peponis, Wineman & Bafna (eds.) 2001. The discussion here is developed from Klasander 2001b.

[89] Hillier 1996, p 131.

configuration affects how people use and move around in the built environment, and Hillier argues that:

> the structure of the urban grid considered purely as a spatial configuration, is itself the most powerful single determinant of urban movement, both pedestrian and vehicular.[90]

According to space syntax analyses, then, spatial configuration influences how we use our everyday environments: under certain conditions, which we will come back to in the discussion of the second section, movement in cities disperses according to certain regularities. My study came to confirm that the conditions for these regularities are largely missing in the housing estate areas.

The study of the third section examines legibility and urban orientation from a different point of view. Whereas the first two studies investigate relations of basic urban elements with a professional set of concepts, the third study started from the opposite stance: to investigate what parts of the environment non-professionals explicitly use for orientation. The 'legacy of Lynch' is evident here, with his approach adjusted for my purpose. With the explicit task of giving a visitor directions for orientation, the participants of the study were asked to draw maps of their environments. The aim was to compare the conceptions of housing estate suburbs with other urban types. The material of this third study comes from two Million Programme suburbs, one mixed-use area within the traditional grid, and one independent samll town with predominantly single-family housing.

For several reasons, basically practical, it has not been possible to coordinate the studies as regards the choice of places. The first study provides representative examples of urban design features. The choice of areas for the second study draws on a company survey with a large set of data describing the use of the local centres for these particular areas. The areas chosen for the third study were, concerning the Million Programme typology, in the end determined by where I could find schools that could cooperate.

[90] Hillier 1996, p. 152.

The three explorative studies which now follow are to be seen as a broad background for discussions about the housing estate suburbs and the issue of how urban design of different types can influence the way people conceive and potentially use the built environment.

Study 1. The transformation of the neighbourhood unit design

At a glance, the Million Programme housing estate suburbs appear to be a unique urban type: geographically separate units, traffic precinct neighbourhoods with groups of free-standing building blocks spread out around a local centre, and with dwelling as the totally dominant function of the areas. Yet they are not an isolated design phenomenon. On the contrary, they represent a late stage of the neighbourhood unit planning paradigm, and many design features of the criticised Million Programme suburbs are closely related to those of highly appreciated areas from earlier decades of the very same planning period. The transformation of the neighbourhood unit, from picturesque areas associated with optimism and faith in the future to the seriously questioned and soon deteriorating peripheral areas of the Million Programme, is an interesting example of how the same urban elements – through small gradual changes in design – in the end created fundamentally new conditions for urban life. Whereas most of the easily noticeable characteristics of the neighbourhood units were the same over the decades, such as a sparse open-plan layout, traffic separation, planned local centres, and a predominance of housing, one critical property which did change was the spatial interface between the streets and the buildings.

The changes in the design of the Swedish neighbourhood unit type from the 1940s to the 1970s can be seen through these interfaces. We notice how two separate ideals in neighbourhood planning – the planned and spatially concentrated neighbourhood unit centre on the one hand and the functionalist traffic paradigm on the other – influenced the relationships between buildings and streets from two different directions. From its original position as a social and commercial space, the street was gradually reduced to a functional space for transportation only. At the same time, the residential buildings lost their direct relationship to the distinguishable and indisputably public space of the street, and ended up in a diffuse urban landscape which was neither private nor public in character. Of course, this was in line with Le Corbusier's old rhetoric, calling for planners to abandon the traditional city street altogether and let urban life flourish among buildings-in-the-park.

The aim of this section is to explore circumstances in planning and design that helped these ideas to finally materialise, and to discuss how these changes may influence urban orientation and use of suburban areas. If we follow the spatial development of neighbourhood units through the decades, we find that by themselves neither building patterns nor the structures of movement networks can create legible environments. What we learn from neighbourhood unit design history is to pay attention to the crucial combinations of urban elements.

This transformation of the Swedish suburban morphology has not been systematically tracked before. My contribution here is to treat the issue from a perspective that combines analyses of urban elements, their interfaces, and their spatial relations. The empirical material of this first study consists of maps and drawings, writings in professional periodicals and plan documents, and site visits[91].

The background of the peripheral housing estate areas

The Swedish neighbourhood unit planning period stretches from the 1940s to the mid-1970s, a time when whole housing estate areas were built on the outskirts of our cities. During this period the public sector was the leading actor in housing construction all over the country. The aim was manifold: firstly, to overcome an alarming shortage of apartments in the growing cities; secondly, to increase the standard of housing in general; thirdly, there was also a less clearly stated aim behind the

[91] Maps and drawings, main sources: *Göteborg bygger 1960*; *Göteborg bygger 1965*; *Göteborg bygger 1971*. Stadsbyggnadskontoret, Göteborg [*Göteborg builds 1960*, etc.] all with English text; *Stockholms äldre förorter. Inventeringskartor 1974*. Stockholms stadsbyggnadskontor, Stockholm [*Stockholm's older suburbs. Inventory maps 1974*]; scale 1:4000 plans of Göteborg areas from the City Planning Office. Professional periodicals, main sources: *Plan* [*The periodical Plan*], issues of 1947-1977, *Byggmästaren* (*Journal of Swedish Building*) and *Arkitektur* (*Swedish Review of Architecture*), issues of 1900-1977 (the architect edition of the *Journal of Swedish Building* was replaced by the *Swedish Review of Architecture* in 1959). Plan documents, inter alia: *Generalplan för Malmö 1956-1970*. Stadsingenjörskontoret, Malmö 1959; *Generalplan för Stockholm 1952*. Stockholms stadsbyggnadskontor, Stockholm 1952; *Generalplan för Göteborg 1959*. Stadsplanekontoret, Göteborg, 1960.

construction of the housing areas, an objective today pejoratively called social engineering.

With a long term, stable majority of Social Democrats in the Swedish Parliament, the political climate was favourable for public interventions at all levels. Within three years in the late 1940s the parliament made way for what was to be thirty years of socially progressive housing policies and publicly governed housing construction. Financial matters as well as legislation and administration were addressed by the parliament. Housing came to be viewed as a civil right and the municipalities were given the responsibility of providing for every citizen. The local authorities were given a monopoly on developing urban plans, and regional and master plans were introduced to steer the urban developments. Municipally owned housing companies were established and the Swedish state guaranteed that there was capital available through state loans.[92] Local authorities strategically bought large pieces of land to stay ahead of private speculation and thus cut the costs for building. The public sector was powerful and in charge of great resources.

In the light of the second world war, the planners wanted to raise democratically minded people by bringing them together in smaller communities, where the sense of belonging, and hence of responsibility, would be greater than among strangers in a continuous urban fabric. The planning ideas were brought to Sweden from England by the time of the second world war.[93] With the fresh experience of fascism and repression in continental Europe, there was a deep concern among the leading Swedish architects and planners that the built environment should contribute to a better society built upon values of democracy and equality. This ideological background is fundamental for the history of the Swedish suburbs. The idea of common responsibilities and collective solutions became an important figure of thought not only in politics, but

[92] Blücher, Gösta & Otto Paju 1977, ”Bostadsområden under 30 år”, *Plan* 1977/4, p. 248 [”Residential areas during 30 years”], short English summary on p. 309.
[93] Danneskiold-Samsøe, Otto 1945, *Nutida engelsk samhällsplanering*. Stockholm [*Contemporary English Society Planning*].

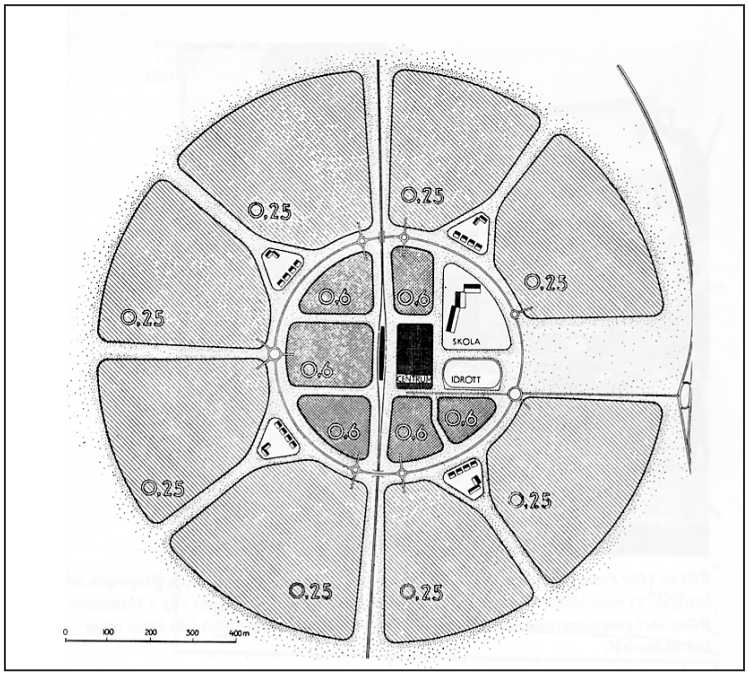


Figure 3.2
The spatial principle for neighbourhood units as it was presented in *Det framtida Stockholm* in 1946.

in planning and design as well. Part of the plan was the neighbourhood unit, which prevailed as a planning paradigm long after the hopes for local communities created by design had been shown to be in vain.

Ideals as built form

Early Swedish models of neighbourhood units were published in planning programmes for Stockholm in the mid 1940s.[94] On paper the neighbourhood ideas were given a strict and logical spatial organisation. The new suburbs were built around a kernel surrounded by concentric layers of different building groups. In the middle of the layout was the planned centre for commercial and communal services. The circular shape of the abstract models was a natural outcome of the intention to minimise walking distances within the areas. In reality most plans were

[94] *Det framtida Stockholm. Riktlinjer för Stockholms generalplan*, 1946. Stockholm (*Stockholm in the future. Principles of the outline plan of Stockholm*, English summary).

naturally distorted by the topography, but the principle was still to be recognised.

To build new self-sufficient urban units, planners were required to consider what urban elements were needed to make a neighbourhood work. The different functional parts of a city were identified: dwellings, commercial and non-commercial services, cultural institutions, places for work, places for recreation, schools and preschools, streets and pedestrian paths. In the new suburbs all these well-known urban parts were put together in previously unknown fashions. It was all done with particular regard for the convenience and comfort of the inhabitants. The original planning was based on the idea that a neighbourhood should be a functional, social, and architectonic unit[95].

Swedish social scientists Franzén and Sandstedt have highlighted the influence of national politics when these neighbourhood unit ideas were turned into built reality. They demonstrate that the actual design of the areas reflected not only planning ideals and housing policies, but also family policies, the political issue of women's employment, and the ideological questions of what actors should be responsible for public concerns.[96]

The interesting aspect for architects and urban planners is that these social policies had spatial consequences – the neighbourhood unit, with its ideological content, became a distinguishable new urban type. Of course, the aesthetic appearance changed radically through time.[97] The changes in design were brought about gradually and for different reasons – sometimes to respond to societal forces such as economy and legislation, sometimes as expressions of aesthetic intention, and in some cases as a result of available technology – but the important thing here is that the *underlying principles* prevailed unaffected. Building geographically isolated neighbourhoods with traffic separation and centralised service was a matter of choice. Within the same economic,

[95] Cf. *Generalplan för Stockholm 1952*, p. 117.
[96] Franzén & Sandstedt 1981.
[97] Cf. Söderqvist 1999.

legal, technological, and even aesthetic framework, urban growth could have taken other shapes if the basic principles had been challenged.

Even today, lifestyle and social patterns are influenced by the ideals that materialised in the neighbourhood design, although most often not in the ways it was originally thought. And as architecture poetically has been compared to frozen music, the materialisation of neighbourhood ideals shows that urban design can end up as petrified politics.

The neighbourhood unit typology features

To characterise the neighbourhood unit as a specific urban type, the original features of a functional, social and architectonic unit are not sufficient, or even relevant, simply because they are not constant over the years. The mix of functions that planners in the 1940s believed would sustain the self-sufficient societies in miniature was never established, and in the later decades practically the only function left, even at the planning stage, was dwelling. The hopes for social communities within the units were also in vain, something that many of the architects and planners themselves had foreseen from the start.[98] The properties of the architectonic unit changed with time as well, most easily noticeable when we look at size and aesthetics.

So instead, regarded as an urban typology of their own, the common denominator of neighbourhood units through the decades is the combination of on the one hand a geographically separated housing area with a planned centre and on the ohter traffic solutions with separation and differentiation of movements to, around, and within the areas. The most (in)famous and lasting property of the neighbourhood unit is the open-plan layout. Oddly enough, despite all the attention that it has garnered among architects, the open-plan layout is not in itself a criti-

[98] For comments on the outcome of the social ambitions behind the neighbourhood unit planning, see for instance Ahrbom, Nils 1948, “Diskussion om bostadsmiljön”, in *Byggmästaren* 1948/5 [”Discussion of housing environments”]; Åström, Kell 1950, ”Nya stadsplaner”, *Byggmästaren* 1950/17 [”New city plans”]; and *Arkitektur* 1966/1 (*Swedish Review of Architecture*), an issue in which nine Swedish writers – poets, novelists, and journalists – were invited to write about their experiences of living in the housing suburbs, ‘almost all of them wholly negative’, according to the editor (p. 1).

cal property for the performance of the housing estate suburbs; it can be found in both popular and unpopular areas of different time periods. The crucial point is the new combination of patterns of movement networks and patterns of buildings. The change in the relationship between streets and buildings is also a change which largely separates the spaces for movement from the points of destination. As said before, these changes were brought about gradually largely by two independent planning features: planned local centres and the new traffic planning paradigm.

Concentrating all neighbourhood service in the centre was a natural outcome of the creation of new and spatially segregated areas. Starting the planning from scratch, with no other urban context to consider, it was quite logical to collect all the service the area needed in one and the same place. It was a practical matter for the customers, and it was a way to bring people together (for social and democratic reasons).

The traffic planning paradigm was based on safety issues. The sole aim was to separate and differentiate movements: pedestrians were to be separated from vehicles, and the street network differentiated for different speeds. In the end this resulted in several parallel systems of movement networks: a fast regional road parallel to a feeder road leading to a slower local street lined by large parking lots, placed there to save the interior of the areas from traffic.

In the next section, examples will show how the gradual changes in neighbourhood unit design were implemented. The story starts in the 1940s when the first Swedish neighbourhood units were built, although we need to look back in time to understand the design context. The stages of transformation are then roughly sorted into decades, although this of course is a simplification. The examples, most of them from Göteborg (Gothenburg), Sweden's second most populous city, will highlight properties typical for each stage in the transformation.

The 1940s: streetscape and local centre

The urban design of the 1940s in Sweden was characterised by a renewed interest in streetscape and in visually defined space on the whole. This was a reaction against the urban developments of the 1930s, which were commonly criticized as having poor spatial features. In the thirties, buildings had been lined up uniformly, primarily with regard to maximizing the influx of natural light in the apartments. The architects themselves found the urban layouts too simple, and from the debates of that time it is apparent that the emerging changes were welcome. A more artistic approach to urban design was needed to make the new areas visually more attractive.

The dominant building type for housing in the 1930s had been the newly invented three-storey linear block; in the 1940s, planners elaborated on the type to meet the new demands. There were no longer any strict requirements among the architects themselves for placing the buildings to maximize sunlight, and that allowed greater freedom in forming compositions of building volumes. Blocks of flats were combined to create semi-open spaces, which would serve as sunny courtyards for the tenants. Many buildings were also shaped to follow the curving lines of the landscape.

Figure 3.3
Norra Guldheden, Göteborg. The buildings follow the curving street in a typical 1940s fashion. Building entrances face the steet and buildings are carefully integrated in the landscape.

Architects set out to define a new sort of streetscape. The layouts of the surrounding buildings were open, in contrast to the dense urban grid, but the streets were still visually defined by buildings, and normally the building entrances faced the street. In that sense the relationship between the public street and private entrances was as it had been in the traditional urban grid: the streets were constituted by the buildings.

With the breakthrough of the new planning ideals in the 1940s, neighbourhood services were concentrated at the centre of each area, as opposed to the shops in the urban grid, which were spread out and established according to market demands. The changes were not immediate, though. In the early neighbourhood units there were still small shops at street level in the blocks of flats: a hair-dresser, a bicycle repairman, a local dairy and so on, facing the street and accessible for both pedestrians and vehicles.

But in time the shops were concentrated to the planned centres. Spatially the local centres of the 1940s were similar to the public squares of the traditional urban grid. Even if the new areas were built with open-plan layouts, the local centres were spatially defined by buildings. They were semi-enclosed and as in the traditional urban grid the new centres integrated the public square with the passing street. The

Figure 3.4
The mixed-use street of the 1940s. In the early neighbourhood units, the buildings had a close relationship with the street and there were small shops at ground level in the residential blocks of flats: a local dairy, a hairdresser, and so on. (The façades here have been altered in the 1980s.)

local centre of the first Swedish neighbourhood unit, Guldhedstorget in the Norra Guldheden area in Göteborg, shows these typical characteristics. The area was designed by architects Wejke and Ödéen, and was finished in 1945.[99] The streetscape of the area is also typical, with buildings visually defining the curved streets (Figure 3.5).

When it comes to the social ambitions in the post-war period, the neighbourhood unit of Årsta, outside Stockholm, is the most striking example. The local centre of the area was not inaugurated until 1953, but it certainly belongs to the ideals of the 1940s. The design of Årsta centre, by architects Erik and Tore Ahlsén, was clearly influenced by the idealism that coloured post-war planning, expressed in both its form and its functions. Just as important as offering good commercial service to the inhabitants of the new area, were places for meetings of different sizes. The design was explicitly intended to support and encourage the citizens' exercise of democratic rights. Most meeting facilities were indoors, but the largest assembly space was the very square at Årsta centre, which was designed as an everyday public place but dimensioned to host 6 000 people (of the area's 25 000 in total) when needed.[100]

The idea of separating vehicles from pedestrians and differentiating traffic according to speed was gradually implemented during the 1940s. Whereas traditional urban developments had built upon the existing street network, the new areas were thought of as separate units, and were built as such. Typical for the period is that the connections between the existing and the new areas were reduced. The new areas were reached by feeder roads, and even if the roads in the 1940s were still built as networks, the loops of the lattices grew bigger. Locally the loops could be broken so that a tree pattern appeared instead of a net.

[99] Cf. Larsson, Malin 1993, *Norra Guldheden. Kulturmiljö av riksintresse*. Göteborg [*North Guldheden. **Cultural environment of national interest***].

[100] See the presentation of Årsta in *Byggmästaren* 1954/12, the architect edition, pp. 269-296.

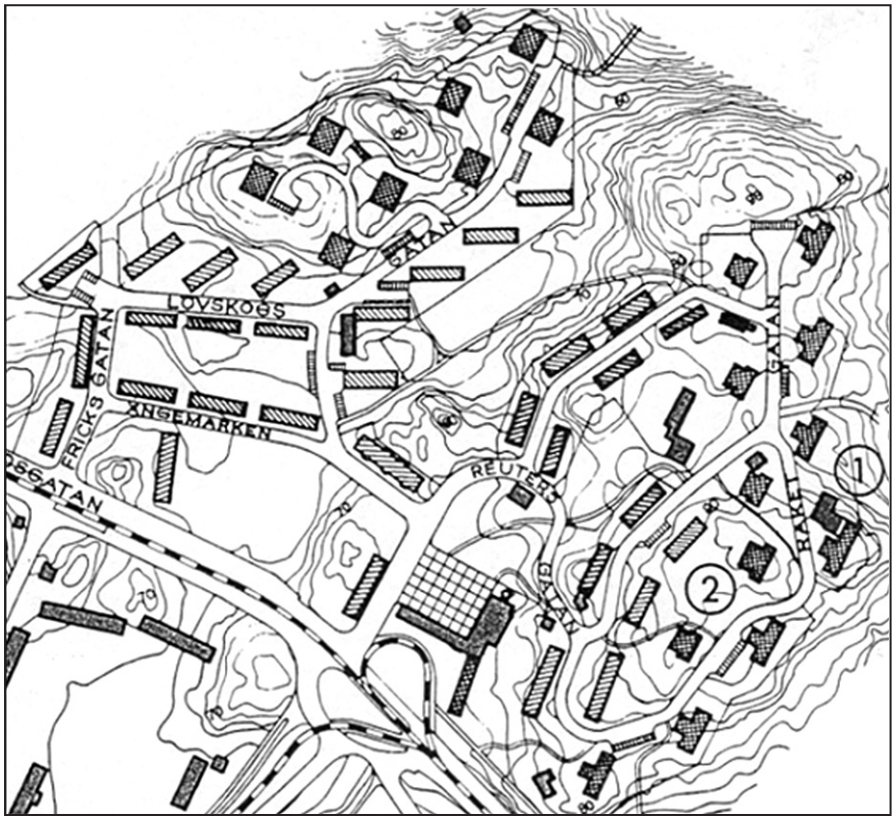


Figure 3.5
Plan of one of the first Swedish neighbourhood units, Norra Guldheden in Göteborg, designed by architects Weijke and Ödéen and finished in 1945. The area is built as a separate unit, and connected to its surroundings by two entrance points for vehicular traffic. The street network is a deformed grid, with buildings lining the curving streets.

The local square, Guldhedstorget, is spatially defined by buildings on three sides and the fourth open to nature. The traffic is integrated in the space of the sqare, which is geographically peripheral in the area but strategically located at one of its entrance points. The main building of the square turns its back towards the tram stop.

Figure 3.6
In Torpa, typical 1940s' linear buildings define both the street and the open green space. The interior of the open-plan super block was a mix of park and semi-public courtyard.

Figure 3.7
Plan of Torpa, Göteborg, by Nils-Einar Eriksson and Erik Ragndal, 1948.

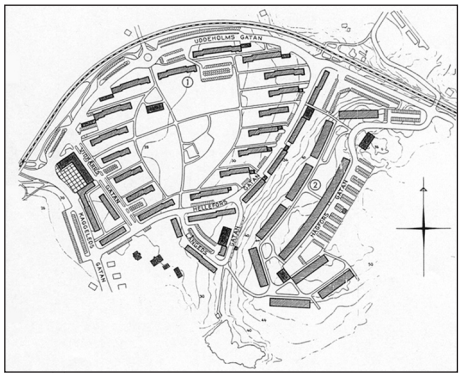


Figure 3.8
Kaggeledstorget, the neighbourhood square in Torpa. With its semi-enclosed public space and an integrated street, Kaggeledstorget is a typical Swedish 1940s square.

In Göteborg, the small area of Torpa, finished in 1948, illustrates the new urban planning ideals (Figures 3.7 and 3.8). The area was designed by architects Nils-Einar Eriksson and Erik Ragndal and although it is not a neighbourhood unit by the book, it still has many of the typical features. The area includes a park protected from traffic, its buildings relate to the street, and so does the little local square, which has three sides enclosed by buildings and a fourth side open and integrating the traffic.

Neighbourhood features which point forward from the 1940s are above all that commercial and non-commercial service was located at the planned centre, that the new areas became more geographically segregated, and that pedestrians were increasingly separated from the vehicular traffic (Figure 3.9). Concerning spatial design, there was in the 1940s an explicitly declared interest in working with the streetscape, but that interest in the street would recede in the next decade.

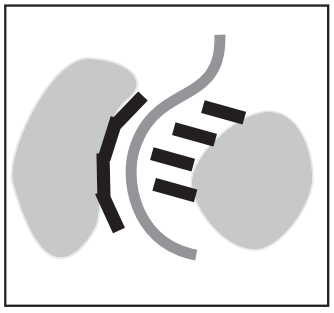
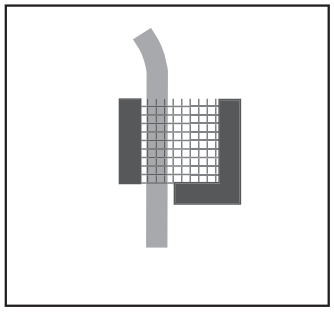


Figure 3.9

The 1940s' principles

Left: buildings define a streetscape and the open plan allows good contact with the landscape.

Right: the local centres are spatially defined with the street integrated in the commercial space.



The 1950s: landscape and pedestrian centres

The spatial issues of design were still highly valued in the 1950s. The local square in the centre of the neighbourhood was most often a carefully designed urban space of moderate size. A new feature was added in the design repertoire: a higher building, a tower block of flats, could be used as a landmark for the place, as for example at Axel Dahlströms Torg in Göteborg, illustrated in figure 3.10. However, the high-rise blocks were probably less intended as points for orientation than as means of achieving a higher population density near the commercial centre and the public transport there.[101] Nevertheless, these high-rise buildings became landmarks for the local centres, and today they seem to represent a political era in which housing could be elevated to such symbolic heights in society.[102]

From the 1950s, vehicular traffic was gradually eliminated from the squares. The 1952 master plan of Stockholm is quite clear in its recommendations:

> [The shops] ought to be concentrated around an enclosed square or to a shopping street directly connected to public transportation in the central, most densely built part of the residential area, and pick up the largest possible pedestrian movements. […] The commercial centre ought to be protected from all vehicular through traffic, but ought to be accessible to motor vehicles from the rest of the residential area.[103]

In Stockholm, the centre of the new suburb Hökarängen was the first local square to turn the shop entrances towards a pedestrian place instead of a street.[104] In Göteborg, the suburbs of Kortedala, Biskopsgården and Södra Guldheden have local centres typical of that era, with shops facing pedestrian squares. The disadvantage of the car-free squares was that they turned their backs outward (Figures 3.11 and 3.12). For those

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[101] Cf. Rådberg 1988.

[102] Caldenby, Claes 1990, *Höga hus i Göteborg. Varför, var och hur samt inte minst om*. Stadsbyggnadskontoret Göteborg, p. 33 [*High rise buildings in Göteborg. Why, where and how and not the least whether*].

[103] *Generalplan för Stockholm 1952*, p. 201-202 (my translation).

[104] Sidenbladh, Göran 1981, *Planering för Stockholm 1923-1958*. Stockholm, p. 326 (*Planning for Stockholm 1923-1958*, English summary).

Figure 3.10
The residential tower at Axel Dahlströms Torg. The tower blocks were used as landmarks and as a means to get a higher population density near the local centre.

Figures 3.11 (above) and 3.12 (left)
Dr. Fries Torg, the neigbourhood centre of Södra Guldheden, is a typical 1950s pedestrian square with two longer sides lined by buildings and open to traffic and tram stop on one short end and to nature on the other. The disadvantage of this design is that the centres turn their backs on approaching visistors.

who came by car, or by foot from any 'wrong' direction, the local centre met the visitors with the less welcoming service areas for goods delivery and waste removal.

As service and commerce in the new suburbs of the 1950s were concentrated in the planned centres of the neighbourhood units, it became less and less important to connect the rest of the buildings in the areas to the streets. Without public enterprises at ground level, there was really nothing that needed to be accessed from the street. On the contrary, it was held as better for all to get away from the traffic. This opened up new possibilities for the architects: the residential buildings could freely relate to the landscape instead of the streets. Consequently, the focus of spatial design shifted from the public street to the semi-public spaces surrounding the residential buildings. The fashionable free-standing tower blocks were well suited to these new spatial conditions, as they could be inserted naturally into the landscape. However, the tower blocks did not define space in the way other building types of the period did. The careful composition of softly curved blocks of flats in Biskopsgården, by Erik and Tore Ahlsén, is a good example of the interest in new spatial forms and relations to the landscape (Figures 3.13 and 3.14). The so-called honeycomb plans of star houses by Backström and Reinius in Rosta, and the meandering building complex by White in Baronbackarna, both areas in Örebro, are examples of the semi-enclosed courtyards of the 1950s.

At the same time as the new building types were designed with a conscious interplay between larger and smaller spaces, there was an intense debate emerging among architects and planners in Sweden. The interconnected issues were on the one hand 'open space' and on the other the 'possibilities of the large scale'. High-rise building became a topic of dispute, and in spite of a great fascination among many architects, there were others who fiercely questioned the proclaimed advantages of the new size and scale of buildings[105]. One particular project which was discussed at length in the press was the spectacular housing estate Grindtorp in Täby outside Stockholm. The questions of scale and

[105] For the debate on high-rise buildings, see for instance *Byggmästaren* 1958/5, architect edition, and *Byggmästaren* 1958/12, architect edition (texts in Swedish).

Figure 3.13
Housing in the 1950s area Biskopsgården. Slim linear buildings are carefully placed in the landscape, with less regard for relating the buildings to the streets. Architects Erik and Tore Ahlsén.

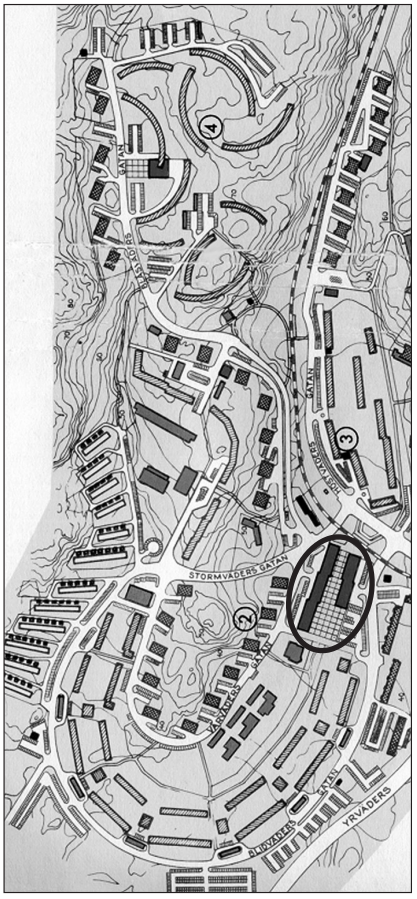


Figure 3.14
Plan over Södra Biskopsgården in Göteborg with all the characteristics typical of the day: a geographically separated area with few points of entry, large loops in the movement network for vehicles, which is in some parts a tree structure. The buildings relate to the landscape or to semipublic courtyards, not to the streets.

Notice the variety of building forms: the curved linear buildings (Figure 3.13), the tower blocks, the semi-detached houses, and the horse shoe with low towers and linear buildings forming a series of courtyards next to a park.

The local square, Vårväderstorget (marked with a ring), has the same characteristics as Dr. Fries Torg of Södra Guldheden: the shops are facing a pedestrian space, with traffic at one end and nature at the other. Since this plan, an additional building in the southeast corner has made the square symmetrical and more narrow.

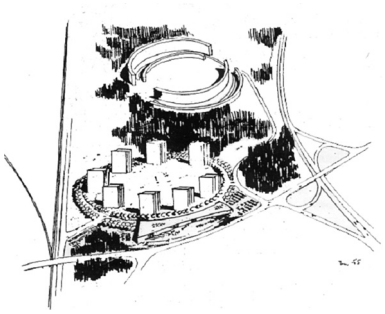


Figure 3.15
Grindtorp in Täby north of Stockholm. The highly controversial project brought a larger scale into the repertoire of Swedish planning.

size were brought up in relation to the concept of something 'urban', as in urban design. What properties of the built environment could support urbanity? At Grindtorp, architect Sune Lindström had given the concept of 'buildings in the park' a totally new appearance: with elegant precision he created a neighbourhood unit of unprecedented form and scale in Sweden. It left no one indifferent. Even the critics were impressed, but they seriously questioned whether the imposing and strict composition could bring about or support an urban life of any real vitality.[106]

Equally known but less controversial than Grindtorp was the *new town* of Vällingby outside Stockholm. The suburb achieved international fame and for a decade or so Sweden was widely known for its urban planning. Vällingby was planned as an ABC-unit, where A stands for work (*arbete*), B for dwelling (*bostad*), and C for centre (*centrum*). In the case of Vällingby, the size of both the area and its buildings was largely determined by demands from market actors. This was something new in neighbourhood planning. Previously the size of the population was determined by social concerns, such as the assumed optimal size of schools. With Vällingby, the volume of trade became a major steering factor for the building density around the centre. The more people within a given distance from the commercial centre, the more customers the shops would get. The planning authorities surrendered to the commercial lobby groups, and this led to higher buildings and a denser building layout.[107]

With Vällingby centre it is also clear that the intentions for the public square had changed since the planning of Årsta:

[106] Voices from the debate on the Grindtorp project are further presented in Klasander, Anna-Johanna 1999, "Miljonprogram och förort – den stora skalans stadsmiljöer", Wetterberg, Ola (ed.) 1999, *Det nya stadslandskapet. Texter om kultur, arkitektur, planering*. Göteborg ["Million Programme and suburb –large scale urban settings"].
[107] Rådberg 1988, pp. 327-330.

> The square […] has been given a moderate size to allow the street life that normally will develop within a centre to make the squares and streets vivid and full of movement. The square is thus not dimensioned to serve as a place for festivities or for congregations and such. These functions will have facilities at their disposal within the planned linear park in the north east.[108]

What we see is the beginning of a trend in which the earlier so highly valued democratic activities are now – in a double sense – removed from the centre of urban planning.[109]

Suburban characteristics that point forward from the 1950s are the increasing separation and differentiation of traffic. This leads to, or at least coincides with, the withdrawal of residential buildings away from the streets in favour of a closer relationship with nature. With this change, it becomes evident that the prior interest in the street had been purely spatial, not social. The essential urban life, with people's everyday encounters, was expected to take place at the local centres. Therefore it was no subject of debate that the street which was constituted by buildings – the mixed-use urban streetscape – disappeared. In the 1950s it was replaced by other types of urban space where the citizens were expected to socialise: on the one hand the local centres, and on the other the carefully designed spaces between the residential blocks and their surroundings. So it was not primarily the open plans that changed public space; the open-plan layouts of the thirties and forties still had the street network as a firm structure, but with the design of the new semi-public spatial categories in the 1950s, we see that the previously so clear-cut borders of public space began to dissolve. This

[108] Markelius, Sven 1956, "Stockholms struktur. Synpunkter på ett storstadsproblem" in *Byggmästaren* 1956/3, the architect edition, p. 60, my translation (*"The Structure of the Town of Stockholm. Some aspects on problems of a big town"*, English summary, pp. 71-76).

[109] Regarding democracy and planning there is an interesting shift in the discourse during the neighbourhood planning period. From the intentions in the 1940s to create environments that would make people *democratically minded*, to discussions in the 1970s about people's *democratic right* to influence planning and design, as expressed by eg. Edblom, Mats 1971 "Samhället – en förutsättning", *Arkitektur* 1971/12, p. 2 ["Society – a prerequisite"]; Johansson, Bengt OH & Allan Westerman 1972, "Tre sätt att planera", *Arkitektur* 1972/6, p. 2 ["Three ways of planning"].

happened quietly. That the street lost its meaning as a public space was not a matter of concern.

Of great concern, though, were the high-rise residential buildings of the day. They were sharply questioned, but in spite of the severe criticism directed at projects such as Grindtorp, a new considerably larger scale entered the repertoire of urban planning. This paved the way for the blown-up scales of the procuction-efficient designs of the sixties, while the questions of urban form and spatial differentiation were largely left by the wayside.

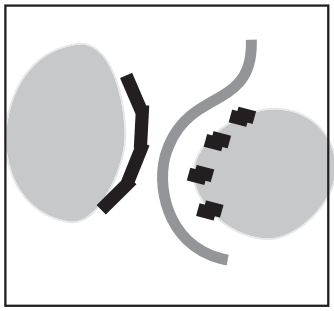
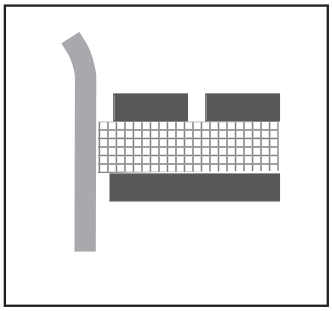


Figure 3.16

The 1950s' principles

Left: buildings relate to the landscape and the street is increasingly treated as a space for transportation.

Right: the local centres are spatially defined but the street now passes outside the commercial space.



The 1960s and the early 1970s: spatial diffusion and centres turned 'outside in'

The conditions for the design of the 1960s' suburbs can hardly be described more concisely than this:

> Planning work is characterized to a great extent by the concentration of house-building work to larger construction companies, the resources of which permit and demand the erection of relatively large connected projects. The requirement of sites for these projects results in the fact that town planning work is mainly concerned with the outlying areas where the land has been acquired by the city through purchase or expropriation.
>
> [---]
>
> Planning work is generally carried out on groups of buildings, the size and design of which is decided by not only the technical production demands, but also demands concerning the realization of differentiated traffic, accessibility of collective traffic systems and various service facilities and good contact between these and the housing elements. Attention is thus paid to units which are suitable for school planning, due respect being taken to the local population as a basis for grocery shops, day nurseries, etc. These service facilities must be located within walking distance from the apartments in question and should be reached without making any contact with motor traffic. Parking lots must also be accumulated to large sites providing good road safety and protection from exhaust fumes and noise without sacrificing accessibility. Many such factors can influence the design of the houing units which are usually grouped round a common, large centre with shops, social and cultural institutions, a senior school, a communal hall, a youth centre, play parks, a sports arena, etc.[110]

The trends from the fifties continued and, since there were no new ideas added, the original concept of neighbourhood unit planning prevailed as the fundamental principle for suburban growth. The new areas were built on the urban periphery – one can say that they became peripheral in a functional, social and architectonic sense. They were built around their planned centres, with traffic separation as the other leading layout principle, something that would be even more accentuated with time.

[110] *Göteborg bygger 1965*. Stadsbyggnadskontoret 1965, Göteborg, pp. 25, 27-28.

During the 1960s, the principles for traffic planning were taken further and were formally fixed with support from research. In 1968 the National Board of Urban Planning (*Statens planverk*) presented guidelines for traffic planning, compiled by traffic researchers at Chalmers School of Architecture (Figure 3.17).[111] The guidelines did not really add anything new to the established practice, but gave it legitimate status. The net structures of streets were finally more or less completely replaced by feeder roads and tree structures and many plans of the new areas looked like blueprint copies of the schematic figures in the guidelines. In that sense, the planning approach came to resemble that of the 1930s, which had been accused of developing plans that were no more than 'concretized analyses'.[112] In the thirties the guiding policies concerned the daylight conditions in the apartments, now the people were to be protected from traffic.

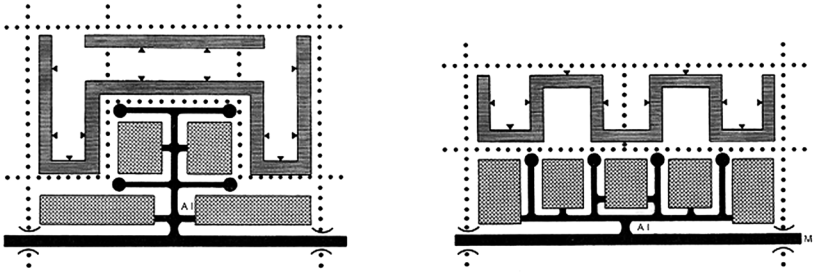


Figure 3.17
Examples from the traffic guidelines, SCAFT 1968, which came to reinforce an already established practice.
The possible points of conflict were to be reduced to a minimum, which resulted in the final break between the buiildings and the streets.

In plans for areas on the outskirts of Göteborg from the 1960s, such as Hjällbo, Bergsjön, Gårdsten, and Rannebergen, it is clear that the contact between building and street definitely has disappeared, with large concentrations of car parks arranged as a buffer zone between the feeder road and the residential building blocks (Figures 3.18 and 3.19). This was wholly in line with the official directives:

[111] *The SCAFT Guidelines 1968. Principles for urban planning with respect to road safety*. Statens planverk, Stockholm.
[112] *Generalplan för Stockholm 1952*, p. 128.

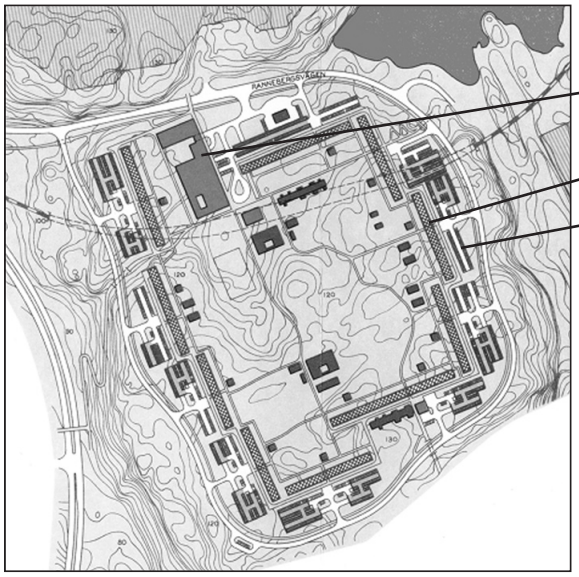


Figure 3.18
In plans of Million Programme areas, such as Rannebergen here, it is clear that the contact between building and street definitely disappears with the large concentrations of parking lots localised as buffer zones between the feeder road and the building blocks.

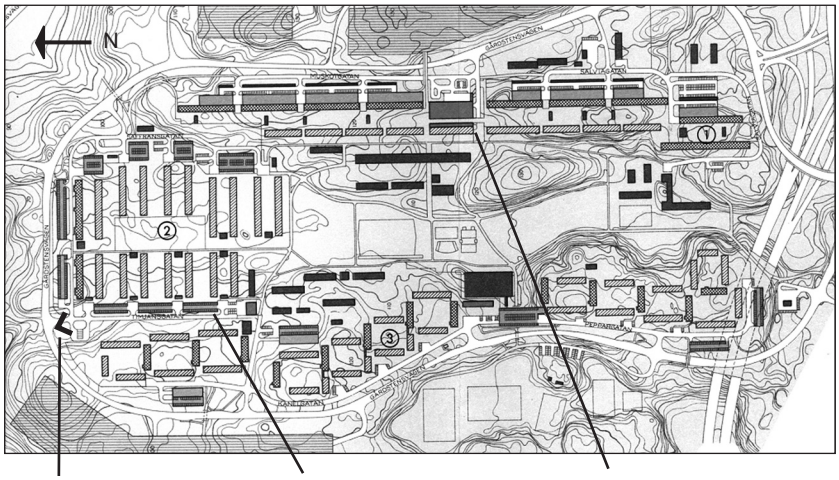


Figure 3.19
Gårdsten. We will get a closer look at the neighbourhood in the last section of this chapter, as one of the areas of the cognitive mapping study. The photograph in Figure 3.20 taken from where the arrow indicates.

> Within each road network the origins and destinations of various classes of traffic should be located as to minimize the possibilities of conflict. For instance, entrances to houses should give on to footways, and car parks should be sited between road and house.[113]

The most noticeable aim of this planning was the struggle to avoid all potential conflicts. The separation of functions finally became manifest during the exceptional building boom of the Million Programme. The fine-grained urban structure was gradually replaced by larger units of different sorts. More than ever the new areas appeared divided into their separate elements: buildings – pedestrian paths – parking – roads – centre, with open space as a mediating element (Figure 3.20).

The trend from the fifties, to pull the buildings back from the streets and instead make them relate to the landscape, or to make them create their own spatial relationships, was now extended to its final version. In extreme cases of urban design in the sixties, there is no streetscape, no landscape, and no spatial differentiation between buildings .

Residential towers had gone out of fashion and most of the architectonic units in the later sixties were built with linear blocks of flats or slab buildings, commonly three to eight storeys high and placed either in straight lines or in various right-angle combinations. Though not eve-

Figure 3.20
An example from Gårdsten showing that the mixed-use street has been replaced by a spatial division of separate elements: residential buildings, a pedestrian path, garages, parking, the local street leading to a feeder road.

[113] *The SCAFT Guidelines 1968*, p. 9.

rywhere, in many places the spatial issues yielded to other aspects, as clearly suggested in the quotation above (the '*many factors'* that could influence the design of building units). In these cases building blocks were lined up repetitively and differentiation of residential urban spaces virtually disappeared. The design returned to the simplicity of the 1930s but at a larger scale and without the mixed-use streets that were still a structuring public element then.

Furthermore, the policies for state loans promoted large projects[114]. The appropriate size for building units was from now on assessed from the producer's point of view, rather than the user's. The size of an 'appropriate' building unit doubled in a decade: from 400-700 apartments in 1960 to 800-1000 in 1971[115]. Västra Frölunda outside Göteborg is a good example of how building units of 'appropriate size' were spread out and given uniform design (Figure 3.21). Still, Västra Frölunda was built with the variety of forms typical of the early 1960s. Soon mass production at all stages (from planning to building) led to less and less variation in urban design and at the same time the large scale that was introduced in the late 1950s was proven well suited to meet the needs of fast and efficient development. Less variation and larger scale than in the forerunning neighbourhood units characterised both the buildings and the spaces between them in the Million Programme housing estate areas.

When Järvafältet (*the Järva field*), with six in(ter)dependent suburbs outside Stockholm, was developed in the late 1960s, the planners returned to a design which in character resembles a strict urban grid:

> The regular, right angle organisation can with its main axes and distribution of volumes give the neighbourhood area an easily comprehensible form.[116]

[114] Cf. Berg 1999, p. 27.

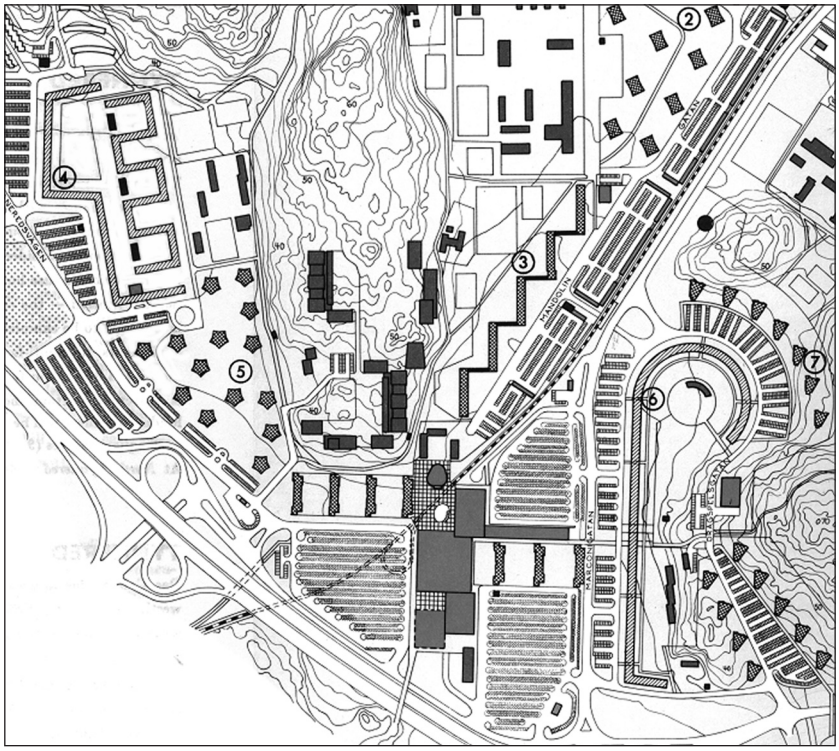
[115] *Göteborg bygger 1960*, p. 18; *Göteborg bygger 1971*, p. 26.

[116] Atmer, Thomas & Igor Dergalin 1969, "Dispositionsplan för Norra Järvafältet" in *Arkitektur* 1969/1, p. 11 (my translation), ("The layout development plan for North Järvafältet", English summary).

Figure 3. 21
Västra Frölunda, south of Göteborg is an illustrative example of how buildings of 'appropriate size' have been spread out and given uniform design. The variety of forms between the groups is typical of the early 1960s. To the far left we can see the meandering buildings by White Architects, which typically create a spatially defined and elaborated series of courtyards, whereas the relationship betwen buildings and street is nonexistent.

Notice the huge concentrations of parkings and that the interior of the area is free from cars.

The big building complex at the bottom of the plan is Frölunda torg, a combined local and regional centre originally planned to serve 100 000 people in the southwestern parts of Göteborg.



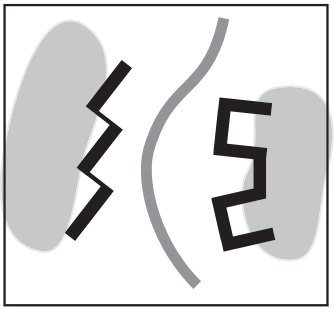
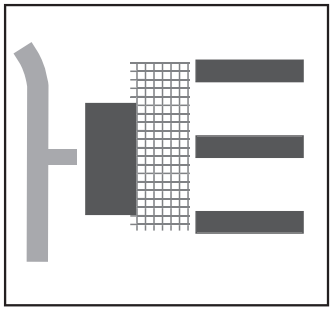


Figure 3.22

The early 1960s' principles

Left: separate groups of buildings create their own spatial relations. The mixed-use street has been turned into a feeder road.

Right: the local centres are spatially open and the street has lost its connection with the commercial space.



The reference to comprehensible form is interesting. On Järvafältet a simple structure of buildings is created, with a continuous pedestrian net that connects the suburbs of Rinkeby, Tensta and Hjulsta into a whole. But for motorists the logic of separation and differentiation prevails with motorways and feeder roads. The planners used residential buildings as landmarks from the motorway:

> Next to the new E18 – up on the heights south of the secondary road of Hjulstavägen – a heavier development of multifamily housing is proposed. It will form the 'spine' of the neighbourhood unit area with massive volumes visible from the great space of the motorway landscape.[117]

The plan to use residential buildings as eye catchers from the motorway seems almost cynical – until you find a statement like this twenty-five years later:

> Emily: I really think that Rinkeby is a better place to live than any other suburb. And it's easy to find your way there. Just by E18, our block is just at the junction where you leave E18 with the whole Järvafältet below.[118]

The idea of using blocks of flats as landmarks seems to have worked.

The centres of the suburbs were also subjected to spatial changes during the late sixties and early seventies. In the 1940s' neighbourhood units, the centres were semi-enclosed squares integrated into the street network. In the fifties they were spatially defined squares but for pedestrians only. In the sixties the local centres were still free from car traffic but started to become spatially open, as for example Hjällbo Centrum, or spatially disintegrated, like Bergsjön Centrum or Selma Lagerlöfs Torg in Göteborg (Figures 3.23 and 3.24). Finally the centres of the suburbs moved indoors altogether. In some cases they appeared

[117] Dergalin, Igor 1969, "Södra Järvafältet" in *Arkitektur* 1969/1, p. 20 (my translation), ["South Järva field"].

[118] Boman, Magdalena & Bo Levin 1994, *Nybyggare i gränsland. Unga stockholmare berättar*. Byggförlaget, p. 74, my translation [*Settlers in new frontiers. The stories of young Stockholmers*].

as an inconspicuous box on a car park, as in Rosengård Centrum in Malmö; in other cases they were ambitiously designed shopping malls like Frölunda Torg in Göteborg (Figure 3.25) or Täby Centrum, next to the Grindtorp area outside Stockholm. Still the character is that of urban space turned outside in.

During the sixties it also became clear that the planning intentions for local centres had changed for good. They were no longer seen as potential places for democratic gatherings but rather as places for shopping. One critic noted:

> The active democratic meeting place has, with the established welfare society, increasingly taken the character of a shopping centre, rationally dimensioned with the base of customers as a firm foundation.[119]

I can add that the increased importance of commerce and service facilities had also been welcomed as a 'democratic breakthrough', a proof that society could provide its citizens not only with good dwellings but also with rich and varied service[120]. At any rate, when the local centre no longer was expected to function as a place for public meetings, it seems to have become less important to give it a large and defined public space, than had been the case with the local public squares of the earlier suburbs and neighbourhood units.

Whereas the neighbourhood centres were still easily accessible by public transport, few of them were now naturally integrated in the traffic network. The tree-like pattern of the vehicular traffic structure meant detours for the cars and increased the average distance to the local centre. For motorists, a visit to the local centre could no longer be a spontaneous stop when passing by (Figure 3.26). The differentiated pattern of roads did not support such behaviour, and a spatially segregated centre in a spatially segregated area had to rely on the qualities of the place in itself to attract visitors or customers. But without good accessibility – which requires more than convenient parking – the local

[119] Westerman, Allan 1965, "Nya stadscentra", *Arkitektur* 1965/8, p. 276, my translation ["New urban centres"].
[120] Olsson, Per-Olof 1961, "Acceptera Farsta", *Arkitektur* 1961/3, p. 67 ["Accept Farsta"].

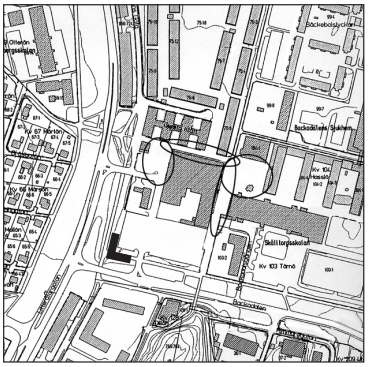


Figure 3.23 (left)
Selma Lagerlöfs Torg: an example of the late 1960s' spatially divided public space of local centres. Pedestrian paths lead across the square and visitors coming with cars have convenient parking, but the representative value of that particular part of public space is questionable. Photograph of Figure 3.24 taken by the black arrow.

Figure 3.24 (below)
Barb wire on top of the fence and a banner welcome motorists to Selma Lagerlöfs Torg.

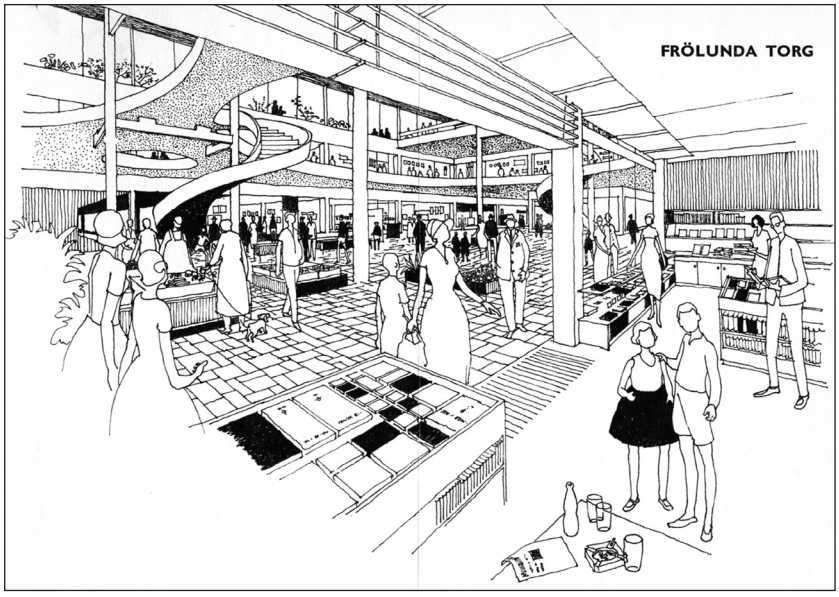


Figure 3.25
In a landscape of parking (see figure 3.21), the commercial centre of Frölunda torg is an urban space turned outside in. The central hall is a two storey public square, which – interestingly enough – today is just as lively as envisaged in the 1960s. Architects were Klemming and Thelaus.

Figure 3.26
The desire to separate and differentiate different modes of movement resulted not only in areas where pedestrians could move unthreatened by motor traffic but also in decreased accessibility to and within the areas.

The local centre Hammarkulletorget, indicated with the grey dot, is not a place that motorists pass on their way somewhere else.

The thicker line is the main artery road leading to the city centre of Göteborg about 10 kilometres southwest of Hammarkullen.

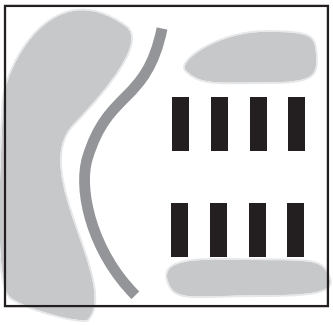
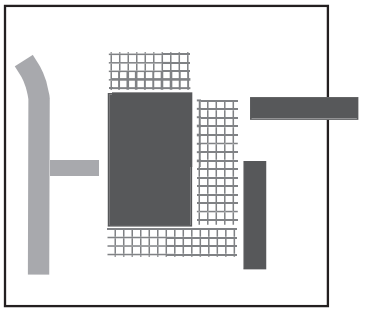


Figure 3.27

The late 1960s' principles

Left: groups of buildings with little spatial differentiation. The feeder road is a barrier to the landscape outside the area.

Right: the local centres are spatially disintegrated and in some cases built as shopping malls. The street has no connection with the commercial space.



centres could not benefit from passers-by, and for motorists they turned into places for purposeful visits only.

To summarise the changes in design during the early sixties and the following Million Programme we can see that the groups of buildings were increasingly simplified in their forms at the same time as they grew in size. Building types became fewer and the groups of buildings larger, and traffic planning policies became the steering factor for the plan layouts of the suburbs. The local centre was no longer emphasised as the representative place of the neighbourhood, but merely a spatial organisation of shops with convenient parking.

All in all, the differences from the picturesque neighbourhood areas of the 1940s seem considerable, but as we have seen the transformations and the reinterpretations of the original ideas came in stages and were all clearly within the ideals of the neighbourhood unit planning paradigm – although increasingly coupled with the supremacy of sub-optimised functional solutions typical of the overwhelmingly efficient society of late modernism.

The structures, again...

One point with this story is to draw attention away from the alleged harm of open space and concrete buildings as such, and instead consider how combinations of basic urban elements, such as streets, buildings, and open space, influence the conditions of urban life.

In the areas built during the first decades of neighbourhood unit planning, the relationship between private and public realms is close, fairly clear-cut, and easy to identify. Although set in spatially open layouts, the residential building blocks relate to the streets. Thus the buildings both define a streetscape and contribute to the social life of the street. The street networks are grid-like and the neighbourhood centres are integrated parts of the grids. In areas from the last stage of the planning period, the relationship between private and public realms is diffuse. The housing blocks do not relate to a public street network but to other private blocks and on the whole spatial differentiation is scarce in these areas. The independent treatment of patterns of buildings and patterns of movement networks breaks the intuitively understandable

connections, and makes orientation more difficult in the areas. The tree-like structure of the street network decreases the accessibility of the sub-urban centres for car traffic at the same time as the spatial segregation of these areas makes them unlikely destinations for random visitors. Social segregation is reinforced by design.

The essential quality of urban life has to do with mixing and encounters and with all the social, cultural, and economic agreements (or friction) they lead to. The easier it is to understand and to navigate in the environment, the more accessible it will be – for locals and visitors alike. Seeing urban life this way, it was primarily the changes in the role of the street during the neighbourhood unit planning period that meant a lost potential for better social, cultural, and economic exchange in the areas on the urban periphery. The transformations of the private-public interfaces meant a move from socially and physically defined spaces to new urban spaces, which on the whole are still to be identified, understood, and appropriated by inhabitants and others. The housing estate typologies will be further illuminated in the two following empirical studies.

Study 2. Local centres and suburban configuration of space

One of the most prominent design features of the neighbourhood units was the planned and spatially concentrated local centre of each area. In the previous section we could follow how the contents and design of these centres changed through the decades of the neighbourhood planning paradigm, from the spatially defined and integrated local squares of the early neighbourhoods to the spatially diffuse and segregated centres of the Million Programme suburbs.

Many centres of the housing estate suburbs have come to look like rather dull places with few visitors and empty shop windows. But there are also local centres that manage to attract people, places where for example small markets spontaneously have emerged and where you see people socialise. The obvious differences in the use of these places, in spite of their similar physical characteristics, and in many cases similar demographic conditions, raised the question of whether the differences depend in some way on the spatial configuration of the areas. A space syntax analysis was therefore carried out to study the spatial conditions of a selection of local centres in housing estate areas in Göteborg. The larger issue was not the squares as such, but the 'hidden' featues of urban space – the underlying structural properties of the suburban functional and spatial layout.

The local centre in its context

The local centres of the Swedish suburbs got increased public attention in the 1990s, and in 1999 the Swedish Urban Environment Council declared that local public squares could be seen as the engines of the work to upgrade the housing estate suburbs altogether.[121]

[121] Nyström, Louise 1999, presentation at *The Urban Environmental Council's Autumn Conference*. Göteborg 29 October 1999.

The urban square is an emblematic public place, associated with markets and gatherings of different kinds, such as festivities and demonstrations.[122] Consequently, the local centres were connected to public life in the suburbs, or rather the lack of public life there, and the council wanted to publicise examples where the local squares successfully had been turned into 'public living rooms' for their neighbourhoods.[123]

What features are needed to make a local square attractive for visitors, and how is it possible to increase its popularity? I propose that there are mainly three approaches to this question. The first is the number and kind of attractive shops. If the local square can offer good service people are thought to be more willing to go there. Second is the design of the square. This is the most common approach by architects, and there are plenty of studies which have investigated the spatial properties and aesthetic expressions of popular squares. The third aspect is the location of the square in the larger context of the city. Contrary to the usual focus in architectural discussions, where the emphasis often is on the two first aspects – the quality of service and the design of the place as such – the stance of space syntax theory is that the most important property for the potential of a place to attract visitors (or enterprises, real estate developers, and so on) is its level of integration in the whole spatial configuration. Supported by the findings of space syntax analyses, Hillier points out that 'places do not make cities. It is cities that make places'[124].

Movement, configuration and spatial use

Movement is the most common use of urban space. This is quite obvious when we think of it: everyday life in cities is full of people who go to work, go home, pick up children on the way, go shopping and

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[122] Cf. Klasander 2001b for an account of the discourse on public squares. NB: In Swedish the local centres of the neighbourhood units are commonly labelled squares. The words for square (*torg*) and place (*plats*) have become more or less interchangeable in the Swedish nomenclature.

[123] "Stadsmiljörådets utmärkelse 1999", in Nyström, Louise (ed.) 2000, *Stadsdelens vardagsrum. Ytterstadens offentliga platser och liv*. Stadsmiljörådet, Karlskrona, p. 198 ["Urban Environment Council's Mark of Distinction 1999", *The Neighbourhood's Living Room. Life and Public Places in the Urban Periphery*].

[124] Hillier 1996, p 151.

so forth, just as the transportation of goods and waste go through the movement networks of public space. Space syntax analysis is based on the condition that movement under certain circumstances is predictable, and that movement is both generated and generative: it is a function generated by the spatial configuration, and at the same time it is generative in so far as it tends to bring about other activities. The sum of all movement is what Hillier calls the *movement economy* of a city. In a mixed-use urban layout, where points of origin and destination are spread out, movement is roughly going from everywhere to everywhere else, and each trip passes through a series of spaces along the way. The passage through these spaces is called the *by-product* of movement. Space syntax analyses have shown that more movement passes through highly integrated spaces, which in turn means that the by-products of movement tend to generate changes in land use. We see it happen when, for instance, shops and cafés are established in places many people pass on their way somewhere else.[125]

With space syntax theories applied to the suburban centres, the well integrated ones would seem to have a greater potential to become thriving public places. However, Hillier states that the urban movement economy depends on 'a certain size, a certain density, a certain distribution of land uses, a specific type of grid that maintains the interface between local and global, and so on'.[126] What sorts of environments reach these 'certain' levels is not obvious, but in a footnote Hillier points out that housing estates, seen as isolated spatial systems, commonly fail to show correlations between level of integration and movement.[127]

In fact, this lack of correlation, which seems to be reflected also in my study, is an important indicator of the spatial and functional particularities of the housing estate typologies. This issue will soon be discussed at length as the 'suburban logic of space'. First a brief account of the study.

[125] For an extensive discussion on movement economy and by-products of movement, see Hillier 1996, Chapter 4 'Cities as movement economies', pp. 149-182.
[126] Hillier 1996, p. 175.
[127] Hillier 1996, p. 214.

Aim, hypothesis, and conduct of the space syntax study

The aim of this study was to investigate if the hidden property of configuration could be found to influence the use of suburban local centres. That is, could differences in the conditions for navigation in the areas explain why some of the local centres attracted few visitors, while others were well used?

My pilot study suggested a possible hypothesis, which was that centres that were well integrated in their areas, in both the vehicular and the pedestrian movement networks, would be more used. To highlight this issue, three definitions had to be made: firstly, how to define the values of integration for the local centres; secondly, what was meant by a 'well used' centre; and thirdly, how to delineate the local areas.

Facts about the squares and the areas together with values of integration are presented in a table in Appendix 1, and the axial maps in Appendix 2.

Integration values of the local centres

Using space syntax analysis on the open-plan layouts raised a few questions on how to draw and interpret the lines of the axial maps. In the traditional dense grid, where the method was developed, it is relatively simple to identify the convex spaces that make the base for the axial lines. All movement is channelled through the same urban space, and both pedestrians and vehicular traffic follow the same axial lines. The situation is different in the sparse urban layout of the housing estate suburbs: it is difficult to identify coherent convex spaces, and even where possible, these spaces do not necessarily correlate to streets or walking paths. As we saw in the previous section, the relationship between building patterns and the structures of movement networks is weak in many housing estate suburbs.

I decided to concentrate on the actual movement networks and not on convex space. Contrary to city centres, the movement networks in housing estate suburbs are totally different for pedestrians and for vehicles, and naturally this separation influences how people move in their local areas. The everyday use of the local centre was assumed to be based on visits made on foot or by bicycle. However, as cars are often

used for weekly shopping, the movement network for vehicles had to be considered too, and I decided to make separate maps for vehicular and pedestrian movement networks.

The axial maps were based on scale 1:4000 maps and processed with the computer programme Axman, which calculates integration values, and gives the individual lines colours that show the difference in integration graphically. The least integrated lines turn out blue, and the values rise with warmer colours via green and yellow to red for the most integrated lines. The integration values in this study included both so-called global (radius n) integration, that is the mean syntactic depth of each line from all other lines, and local (radius 3) integration, which means values of integration counted at a syntactic depth of three steps. The maps presented in the appendix show global integration.

Definitions of a well-used centre

The estates of the fourteen centres in this study are all managed by the same property management company. In 1999, the company carried out a so-called 'Satisfied Customer Survey' in the neighbourhoods of twenty local centres, with around 17 000 respondents altogether.[128] The responding households were sorted according to catchment areas. In the survey the respondents accounted for, among other things, how often they visited their local centre and for what purposes. I was given access to this data and used the material to make tentative definitions of what a 'well-used' local centre could mean. Facts of interest included the average number of visits per respondent and week; for what purpose people visited their local centre; if they mainly went to their local centre, to a large shopping centre or to another local centre to buy everyday things; and the ratings the food shops at the local centres got from the respondents. To get a better understanding of general circumstances, I correlated the survey results to the number of car owners in each area,

[128] Temaplan AB, *Nöjd kundundersökning*, Göteborg 1999 (unpublished). Six of the local centres were in the city centre and therefore not within my particular field of interest.

the overall number of households and inhabitants, and the number of functions, that is shops and non-commercial services, in each centre.[129] Few car owners in an isolated area with poor service, for example, could explain if a spatially segregated centre would get many visits, just as a great number of shops at a spatially segregated centre could explain high rates of visits.

A well-used local centre is in this study understood as a centre where the inhabitants in the catchment area specify a high average number of visits per week, and also a centre that the people in the catchment area prefer to local centres of other areas, or to larger shopping centres.

The delineation of the local areas

The areas of the axial maps needed to correlate to the neighbourhood areas of each local centre as they were defined in the survey. Some limits of the customer survey areas were, however, placed with regard to neither topography nor other barriers in the physical environment, actually distance being one. In doubtful cases, two sets of axial maps were made, one that covered the survey area and one that placed presumed customers within more natural demarcation lines.

In this study the local squares have been investigated in their neighbourhood context only. Since many of the housing estate areas are geographically separate districts, it seemed justified to regard them as independent units, just as a small town would be. Still, explanations for the posed problem may be found in the centres' positions within the global context of Göteborg. This will be addressed in the discussion.

Integration and use in the suburban centres: examples

When the axial maps were processed, the result of the integration analysis turned out to be a disappointment as regards my hypothesis. No certain correlations between the layouts of movement networks and the use of the local centres could be detected. One could see that many of

[129] Observations on site and statistics from the year 2000; demographic statistics are accessible on the internet: Göteborgs stadskansli 2000, "Göteborgsbladet". <www.goteborg.se/prod/G-info/Statrapp.nsf>, 030702.

the well-integrated squares had a high average number of visits, but so did some of the more segregated squares. A few examples will suffice to point out contradictions concerning space and use in the material before we get into the discussion about the reason for the mismatch: the suburban logic of space.

Wieselgrensplatsen: highly integrated, well used

The most outstanding square in every respect was Wieselgrensplatsen. It is the square with by far the most shops and non-commercial services. The great number of shops can be explained by the fact that the supporting area is larger than the estimated catchment area of the survey, and that the place is also well integrated in the larger urban context of Göteborg. The syntactical properties of Wieselgrensplatsen seem to confirm space syntax theory. The neighbourhood area as a whole has the highest mean global integration value as well as the highest mean local integration value, for vehicles and pedestrians alike, which means that the area has good internal connections. Furthermore, the most integrated line of the area goes through the square, again both for cars and pedestrians. In a highly integrated system, the square is spot on the integration core. It is, to no surprise, among the top five most visited squares of the study, and 84 percent of the people in the area do their shopping for everyday needs at Wieselgrensplatsen.

Brunnsbo Torg: segregated, well used

In contrast to Wieselgrensplatsen, as far as spatial integration is concerned, stands Brunnsbo Torg. In spite of bad integration values, Brunnsbo Torg scored a top 4.4 visits per week, and 78 percent prefer it to shopping centres or other local squares for shopping for everyday needs. Neither spatial nor non-spatial features seem to support this high level of use by people in the neighbourhood. The square is not near the integration core of the area, but located six syntactical steps from the most integrated line in both the vehicular and pedestrian movement networks. This makes Brunnsbo Torg one of the two least integrated squares in that sense. The neighbourhood area as a whole is only average in the study concerning mean global integration of the vehicular network, and one of the least integrated concerning the pedestrian net-

work. For mean local integration it has the highest value in the study concerning vehicles and again one of the lowest concerning pedestrians. Non-spatial explanations do not support the high number of visits either: there are only eight functions in the square, none of which can be considered an attractor of magnitude. The public transport consists of a bus stop, and the square is not served by tram. Still Brunnsbo Torg is one of the most visited and most appreciated squares of the study, despite the spatial properties and other facts like the second highest rate of car owners of the areas in the study and that the square is close to one of the biggest shopping centres in Göteborg.

Kortedala Torg: segregated, well equipped, not well used

Kortedala Torg makes another interesting comparison. It has almost the same spatial properties as Brunnsbo torg, concerning global and local integration values for the areas, as well as the integration values of the line crossing the square. They are in the bottom third of the study in almost all spatial aspects of the pedestrian network. Kortedala Torg is on the whole closer to the integration core of its area than Brunnsbo torg, yet it gets only about half as many weekly visits by the respondents. There are also non-spatial factors in Kortedala that would seem just right to generate a higher number of visits: Kortedala Torg has nearly four times as many functions as Brunnsbo Torg, including attractors such as a pharmacy, post office, banks, public library, and liquor store; still more than 50 percent of the respondents of the area say they go somewhere else to buy everyday goods.

Hammarkulletorget: segregated, integrated, well used

Hammarkulletorget is one of the most frequently visited squares of the study, with 4.2 visits per week. The spatial features are quite noticeable. The mean global and local integration values for the vehicular network are low, and the square is located five steps from the most integrated line. In the pedestrian network, on the other hand, the most integrated line goes right through the square. What distinguishes Hammarkulletorget from the other frequently visited centres of the investigation is the low score of appreciation of the service at the square. Furthermore, there are only eight functions at the square, none of which can be considered

an attractor, and as many as eighty percent of the respondents prefer to go somewhere else to do their day-to-day shopping. What then brings people to the square?

According to the survey, as many as one third of the visitors at Hammarkulletorget come for 'other purposes'. These 'other purposes' are the alternatives left after shopping, using non-commercial service, and eating.

'Other purposes': the spatial influence on the use of the centre?

Could the position of Hammarkulletorget right on the most integrated pedestrian line explain the high number of unspecified visits? That is, was there a possible correlation between high pedestrian integration values on one hand, and visits for purposes other than shopping, eating or using non-commercial services on the other?

One interesting outcome of the study was that the four local centres that were located on the most integrated line of the pedestrian movement network were also in the group of squares most frequently visited for 'other purposes'. These four centres were Hammarkulletorget and Wieselgrensplatsen, described above; Selma Lagerlöfs Torg, a local centre with roughly thirty functions but only a middling number of visits per week; and Hjällbo Centrum, a square which has become famous for its spontaneously emerged outdoor market. Needless to say, the material is too small to claim that there is a correlation between the configuration of pedestrian paths and the use of the centres, but there was a tendency worthy of further investigations.

Reflection on the choice of method

For my thesis, the space syntax study is used as a means to illuminate particular properties of the Million Programme housing areas and their suburban logic of space. Many attempts to improve the environments in the Swedish suburbs have aimed at making them more 'urban', with the mixed-use grid of the city centres as models. Since axial analyses evidently succeed to reveal space-use correlations in traditional urban settings, space syntax theories can be used to clarify critical spatial properties of the much wanted urbanity – and consequently suggest which of these properties are missing in the housing estate suburbs.

As I pointed out above, using axial analysis to detect space-use correlations in housing estates areas raised methodological questions. The first point of uncertainty was the local context I wanted to test. The neighbourhood planning idea was to create a local sense of community, and as a result the neighbourhood units came to be built as geographically isolated areas. If axial analyses can be carried out in small towns, then it was possible that they could be useful in spatially isolated suburbs as well. The second point of uncertainty was how to draw the axial lines. As axial lines represent directions of movement, it was reasonable to base the axial maps on the movement networks, even if they did not correspond to definable convex spaces[130]. The third point of uncertainty was how to quantify spatial use. Here the survey data was considered sufficient, with figures on visit frequency sorted by catchment areas combined with other sorts of information, such as the reasons for the visits.

Even though the hypothesis was disproved, the outcome of the study is interesting in many ways. For example: the space syntax findings of space-use correlations are well known, but the reservations about the method are not as commonly recognised. Axial analysis is simple to use, but as a general tool for planning (something that is becoming more and more common as the theories and methods gain popularity) we get close to the regrets Lynch expressed about his method: it is 'dangerous' because it is easy to use.

The problems I see here (based on personal impressions), are not among professionals, as in the case of Lynch, but among people outside the established space syntax circles, who believe that axial analysis is a simple tool to predict movement and guide planning in general. Axial maps are easily drawn and processed and it is important to stress that they can always be used to investigate spatial integration. But to believe that correlations between integration values and spatial use can

[130] Cf. Min, Ye 1993, *Housing Layout and Space Use. A Study of Swedish and Chinese Neighbourhood Units*. Diss., Chalmers University of Technology, Göteborg, pp. 215-216.

be found in every sort of environment is a mistake. The housing estate suburbs are illustrative examples.

My particular investigation was only a first crude attempt to use theories of configuration in the suburban settings of my studies, and it could have been taken further both concerning analysis of the present material, and complementary tests. This was not possible within the scope of my thesis, but the lack of correlation makes it interesting to examine possible reasons for the bias. The functional and spatial conditions are indeed special in the urban typologies of my investigation – and so the hidden conditions for urban navigation.

The suburban logic of space

With the results of this study at hand, the catchy proposal about squares being more than local elements seems invalid in geographically separated areas like the housing estate suburbs. More likely is Hillier's proposition that certain conditions are needed for a movement economy to work, and on the whole the results suggest that the spatial use of the housing estate suburbs follows a logic quite different form that of the urban settings of the traditional grid.

It is obvious that some crucial conditions for space-use regularities found in the dense urban grid are missing in the housing estate suburbs. By just looking at the two types one could with some exaggeration call them opposites: where open space seems cut out of the building masses in the dense city, the buildings are free-standing objects in open space in the suburbs; where borders are clear and in many cases even physical (walls and fences) between the private and the public in the city, they are vague and often non-material (lines on a map) in the suburbs; where functions are mixed within blocks or buildings in the city, the suburbs are mainly assigned to dwelling, thus largely mono-functional.

These differences are interesting for the key aspects of this thesis – legibility and urban orientation and navigation – both for inhabitants and for visitors. Using some of the central space syntax concepts, I will now discuss how properties such as monofunctionality, sparsely built open-plan layouts, and traffic separation influence orientation and navigation in suburban environments.

Monofunctionality, planned centres, and movement patterns

Most suburbs from the Million Programme period were built for one function, namely dwelling, with a local centre as the focal point for public life, and with the commercial and non-commercial service of the area concentrated there. With this combination of housing and a planned local centre, other patterns of movement appear in the housing estate areas than in the mixed-use areas.

Movement economy in mixed-use urban settings consists of people and goods, which altogether go more or less from everywhere to everywhere else. But this variety, which is natural in the multifunctional environments where origins and destinations are spread out, is reduced to a simplified 'origin-destination system'[131] in the housing estate suburbs. The origin is each individual dwelling, and the destination is more or less the same for everyone: the planned centre, where most service and also the public transport stop is located. The main patterns of pedestrian movement in the monofunctional suburbs can be described as pendulums, swinging from each dwelling to the centre and back. Of course this is a simplification. Still we must acknowledge that there is a difference between the *complex patterns* of movement in the mixed-use areas and the *simple patterns* in the suburbs. (I do not speak of movement patterns on an *individual* level; it is only on an aggregate level that we can speak of complex and simple patterns of movement.)

It is tempting to call these simple movement patterns less urban, but it may be more appropriate to acknowledge – at least temporarily – that they just represent another type of urbanity. This goes for traffic separation as well, where there is a fundamental difference between how one moves in the hierarchical tree structure of the Million Programme suburbs and in the net structure of the traditional grid. The tree structure allows only simple and fixed patterns of movement, while the freedom of choice in the net provides for more complex patterns.

[131] Hillier 1996, p. 178. Hillier connects the concept to dispersion, but I find it useful in relation to monofunctionality too.

The conditions for complex or simple movement patterns in the areas also depend on how well connected they are to their surroundings. We could see in the design history of the previous section that the number of entry points to the neighbourhood areas were reduced with time. Geographically isolated areas with few entries, like many of the Million Programme housing estate areas of Göteborg, cannot be expected to benefit from the movement economy of the city. But neighbourhood areas which are located next to other areas can, provided they are well connected to their surroundings.

This was suggested in the study: Wieselgrensplatsen, which is a busy place with high visit frequency, has a favourable location in the city and good connection to its surrounding areas, whereas a place like Kortedala Torg, with low visit frequency in spite of many attractors, is more isolated and peripheral in the configuration of the whole city. These findings are confirmed by an axial analysis of Göteborg as a whole.[132] Likewise, research on Amsterdam shows that there is a significant interaction of local and citywide movement networks, which can affect local public activities.[133] In Amsterdam, the movement networks were found to function on two different scale levels: the local, neighbourhood level, which carries local movement, and the supergrid, citywide level, which carries the more regional movement. In cases where the two scale levels of movement coincide, that is when the large scale movements go through a local network, the supergrid level tends to form centres at the local level. The specific feature of these spaces is that their combined scale of movements simultaneously orientates them:

> to the city and to the neighbourhood and supports the evolution and maintenance of, for example, neighbourhood high-streets whose street-edge economies are supported by city-scale passing trade at the same time as they become local centres for shopping and gathering.[134]

[132] Azimzadeh 2003, p. 213.

[133] Read, Stephen & Luki Budiarto 2003, ”Human scales: Understanding places of centring and de-centring”, in Hanson, Julienne (ed.) 2003, *Proceedings*. 4th International Space Syntax Symposium, London.

[134] Read & Budiarto 2003, p. 13.7

Local centres that have to rely only on the local movement economy are not only less accessible but also more vulnerable. Stephen Read and Luki Budiarto coin the terms *coincident* layout for urban plans where the supergrid and the local movement patterns overlap, and *non-coincident* layout for the typical functionalist traffic planning that separates the larger scale supergrid from the local scale movements.[135] It seems that Wieselgrensplatsen is part of a coincident layout, while the layout of Kortedala Torg makes the centre clearly non-coincident, and so the overall configuration of the area Kortedala may explain why half the group of respondents go somewhere else to do their shopping: they do not naturally pass the local centre on their way into or out of the area.

Hillier uses the term *natural movement* for the proportion of movement that is generated by the spatial configuration, rather than by specific attractors.[136] Basically, a condition for natural movement to appear is that the spatial configuration allows flexibility, and that the attractors are spread out. According to this terminology, the proportion of natural movement is very low in the suburban housing estate areas. Configuration has little to do with movement that is, broadly speaking, fixed with the strict traffic planning and generated by specific attractors, such as the planned centre, the school and the stop for public transport. Nevertheless, no matter what the configuration, the movement towards the centre of a suburb is very *natural* for the person who needs to do her shopping there. Hence, the term natural movement as it is used in space syntax is semantically somewhat misleading. By using the word *natural* for movement which might rather be called *optional* (since it comes from a freedom of choice), the terminology accidentally happens to render the way people most often move in housing estate areas as unnatural.

This conceptual deviation, however, does not change the central points of issue. The conditions for urban navigation and orientation are still fundamentally different if we compare housing estate areas with traditional mixed-use urban settings. One important reason why axial analyses fail to show correlations between spatial integration and

[135] Read & Budiarto 2003, p. 13.8.
[136] Hillier 1996, p. 161.

movement in the suburbs is that there is not enough 'natural' or optional movement to support a rich movement economy. Here further studies are needed to illuminate the actual patterns of movement in these sorts of environments.

Sparsely built open-plan layouts and by-products of movement

Urban places change with time. Some places are more stable than others, but on the whole, and seen through millennia, centuries, or decades, public places evolve, thrive, and lose their position in the life of a city in cycles. With time this will apply to the public places in the housing estate suburbs too. But whereas we know at least something about how the use of the traditional urban fabric reacts to changes in economy, demography, configuration and so on, we still know very little about the urban mechanisms of the housing estate typologies. There are basically two reasons for this: the housing estates suburbs are young in terms of urban history, which means that we can not yet see any certain regularities in patterns of change, and they are so different from the older urban typologies we know about that we cannot uncritically infer knowledge from one typology to the other.

There are some important features in the design of the Million Programme housing estate suburbs that make the conditions for changes different than in the traditional urban fabric. The typical suburban properties of housing in sparsely built open-plan layouts, combined with the separation and differentiation of traffic, condition not only urban navigation and people's movements, but consequently also where thriving places can evolve.

We know that commercial activities normally benefit from good accessibility and exposure to potential customers. In the housing estate suburbs, where the interface between streets and buildings largely was lost in the 1960s, the major paths for movements are typically far removed from the buildings or, in cases where there are buildings near the paths, the buildings are seldom suitable for business. Where streets and buildings have little connection, there is little opportunity to take advantage of what Hillier calls the by-products of movement. Let me give an example: in the 1990s Göteborg University located new faculty

buildings and functions to Vasagatan, a fairly busy but at that time quite ordinary inner city street in Göteborg. In a few years the atmosphere of the street changed radically. The most certain sign was numerous new restaurants and cafés with outdoor seating. This transformation could happen – without further planning efforts or large investments – because the condition for it was already there when the new attractors were added: there were buildings along the street, and the ground floors were suitable for the establishments that the students and other city dwellers apparently desired. It is difficult to imagine a similar scenario in a sparsely built suburb. Even if the same additions of attractors would have created a busy path, it would have been harder for potential economic actors to take advantage of the by-products of movement and benefit from the potential of the passers-by. A path over a grass field, a parking lot or through shrubs is unlikely to cause the kind of development we witnessed along Vasagatan.

In space syntax terminology a street space is *constituted* when building entrances face it.[137] For the use as well as the experience of a street or a pedestrian path there is a big difference if they are constituted or not. Significant for the urban typologies of the housing estates is that neither streets nor pedestrian paths normally are constituted: the buildings are spread out and – more importantly – separated from the major paths of movement.

This is connected to the problems with axial analysis and the 'certain density' that is needed for it to be useful as a general analytic tool. Concerning axial lines, we have to make a distinction which has to do with the sparsely built and open-plan layouts: movements in the built environment function on many separate but interconnected levels. First we have a *macro level* that affords movement on a city and neighbourhood scale, that is all different possibilities to move around in the urban fabric. This is the level analysed in the axial maps, as for example with the interconnected supergrid and neighbourhood movement networks mentioned above. Then we have a *micro level*, which is where movement networks meet the buildings – the street-building interface, or where one can enter the buildings.

[137] Hillier & Hanson 1984, p. 105ff.

Both the macro and the micro levels of movement have to be considered to understand urban navigation and how patterns of movement influence space use, and particularly so in the sparsely built environments of the housing estate suburbs. In urban environments where the 'origin-destination' movements dominate over optional (natural) movements, highly integrated axial lines will not automatically carry a lot of movement – the movement patterns of people will depend on whether there are any buildings along or at the end of the line. Furthermore, there is a crucial difference if the buildings that constitute the urban spaces are single-family houses or high-rise residential towers. Since building layouts in the Swedish neighbourhood unit suburbs were planned with regard to nature and traffic safety rather than as a response to movement economy, practically any type of building can be found at any type of axial line. Hence, the axial maps in urban environments with such uneven building density would be more representative if axial lines (convex spaces) were added at the micro level of movement, with the entrance to the building followed by lines for each floor or each apartment, that is a three-dimensional addition to the analysis.[138] This would give a finer resolution to the analysis, but it would of course not change the basic conditions for movement.

And so, just as monofunctionality and traffic separation and differentiation affect movement patterns, sparsely built open-plan layouts contribute to a logic of space use in the housing estate suburbs that differs from that of the urban grid. The conditions for responding to the by-products of movement according to the 'laws' of space syntax theories are missing, and the new patterns of response have not yet become clear.

Movement predictability and land use changes

We can extend this discussion to speculations about land use, and land use changes in the suburban housing estate areas. The traffic separation and the sparse layouts seem to make these environments more resistant to spontaneous change, as if their layouts generate some sort of *urban inertia*. But why is that? Neither the patterns of building nor the move-

[138] Cf. Hillier 1996, p. 140.

ment networks are really more fixed than in the inner cities. Whatever their layouts, both buildings and street infrastructure are long-term investments that do not change rapidly; it takes considerable resources and in many cases political initiatives to change them.

The difference between traditional grids and the housing estate suburbs is that both the housing blocks and the configuration of the suburbs are less receptive to changing circumstances. Even if functional additions in new buildings bring about new patterns of movement, it is also plausible that it takes longer in the suburb than in the dense grid before the changes have effects on the surroundings.

The first generation of improvements that were carried out in the Swedish concrete suburbs were largely superficial, aiming at 'humanising' the environment with colours or added details in the architecture – to 'break down the scale', it was said. Some local centres were beautified in the same manner, and some were citified with granite and bollards. These improvements have been met with various reactions, but regardless of what we think of them, we must recognise that they do not change anything at the structural level where the more powerful driving forces of urban development seem to work.

This means that within the range of physical planning we should pay more attention to the conditions for the movement economy, because that is a more forceful engine for change (if change is what we want) than are for example the local centres seen as isolated entities. But with this attitude we face a problem: the higher up in scale the investments are made, the more costly they are and possibly also the more uncertain the outcome. We can argue that the suburbs need a more urban configuration, a layout which allows for instance flexibility in movement patterns, but the investments that are needed to bring it about are huge compared to the small-scale changes that make things look better – and it would still not guarantee to achieve a more appreciated environment.

At the same time, we can try to argue the other way round concerning the simple and highly organised patterns of movement in the suburbs: since movement seems to be such a profound force for land use, the planning that leads more or less everyone to the centre could be expected to make this place attractive for business establishment, as

opposed to the by-product spaces leading there. Why this is not the case (because it is not, at least not yet) can be explained by configuration at city level: other customers than the local ones do not simply drop by these spatially segregated areas. So even if a local square is integrated in the neighbourhood area, its isolation from other areas makes it less attractive for economic actors, because it is not part of the larger movement economy of the city. And as we have seen, in many cases the local centres of the Swedish housing estate suburbs are not even easily accessible within their own areas.

In this planned-centre perspective I think there are some interesting recent developments to follow henceforth, for instance in the socially and economically segregated Stockholm Million Programme suburbs of Rinkeby, Flemingsberg, and Kista. In Rinkeby a new politically initiated youth centre for culture and sports has turned out to be a success (though not financially) and seems to have the potential to be a strong attractor. For similar political reasons, the Swedish government located a new prestigious university campus, University of Södertörn, in the Million Programme suburb of Flemingsberg outside Stockholm. In Kista, Scandinavia's now largest indoor centre, that newly opened in Kista Science Park, has become a place with integrating potential because of its location. Sociologist Katarina Nylund points out that the indoor centre – situated in the 27 000-employee IT-cluster, and close to the residential area – has become a place where people of different social, ethnic, and economical backgrounds, if not mix, at least share the same urban space.[139] These sorts of structural changes, with new conditions for urban orientation and urban navigation, are likely to need some time before the results start to show. The new big investments can be seen as full scale experiments to learn from – just like the design of the housing estate areas.

[139] A research group led by Nylund is presently monitoring developments like these in a project called *The Potential of Public Space to Transgress the Boundaries of the Segregated City*. An initial yet thorough account of planning strategies to physically, culturally, and socially integrate the deprived Million Programme suburbs of Flemingsberg and Kista with their prosperous neighbours is given in Nylund, Katarina in prep., "Swedish Outskirts – social polarisation and governance", in Bjur, Hans & Ola Wetterberg (eds.) in prep., *Time, Place and Meaning in the Urban Periphery*. Routledge.

Today we can only say that it will be interesting to follow the long-term spin-off effects of these large-scale interventions. The question is if these new attractors will influence their surroundings, and if so what sorts of effects they will have. Will there be significant changes in the social dynamics without any further changes in the physical environment? Will we see new buildings? Will the existing buildings adapt to the new groups of passers-by? Or is there really something we could call urban inertia? Only time can tell.

Intelligibility as an issue of configuration

The concept of intelligibility in space syntax theories concerns how parts of the spatial structure relate to the whole[140]. This perspective, which is based on spatial configuration, is necessary if we want to understand how different conditions for urban orientation and navigation influence how movement is dispersed in urban environments. With the particular conditions we find in the housing estate suburbs, with their functionalist traffic planning and highly ordered functional layouts, we need to use a few words on intelligibility of the spatial structure as a prerequisite for urban orientation.

The correspondence between space and movement that axial analyses have revealed in the traditional urban settings is claimed to arise because people navigate in the structure thanks to its inherent intelligibility. The underlying spatial patterns of configuration tend to make people move according to the spatial 'laws' of integration.

But in light of the suburban peculiarities, we must elaborate the distinctions and recognise that it is not because people understand the configuration that they move in these predictable ways in the urban fabric. Most movement in urban settings is generated by people's day-to-day duties. Since these movements are carried out in well known environments, the choice of route is not primarily about intelligibility but about place knowledge and habit, though still according to the conditions afforded by configuration. The difference to suburban settings is not that the suburban configuration lacks intelligible order, but that it lacks the optional patterns of movement. The configuration of the

[140] Hillier 1996, e.g. pp. 152, 215.

suburban housing estate areas is intelligible in an ordered sense, but it is not apt for the kind of explorative movement that leads to a 'natural' dispersion of moving agents, whether motorists or pedestrians.

When our movement is not habitual, but explorative – as when we are tourists, leisure strollers, or have business to do in unfamiliar areas – we get an idea of how the environment is organised as we move around. If we for example get to a new area and want to go to the centre, we look for signs of environmental communication, such as buildings of different sizes, styles, or functions. We look for signposts, people, neon, outdoor seating, and other features that communicate what sort of environment it is and suggest what direction to take. The exploration continues with a sort of trial and error search I think most of us are familiar with. Sometimes it is a pleasure, other times the search is only aggravating.

In the first case of movement, when we navigate in the landscape by habit, we use our place recognition. In this sense there is not much difference between the traditional grid and suburban environments: by habit people can navigate without problems regardless of configuration. In the other case, when we explore unknown environments, we orientate ourselves if possible with the help of type recognition, and here appears a fundamental difference for intelligibility in the Million Programme suburbs. Even if we recognise the building patterns we may not understand how they are connected, and even if we recognise the typical tree type of movement network, it is difficult to navigate through the environment – often it is not even possible in practice. Whereas a grid has a very shallow configuration, the typical functionalist traffic planning tree has a deep structure. There are usually many topological steps from one peripheral place to another, even if they are close to each other geographically. Furthermore, using another term from space syntax theory, the level of connectivity is generally low: streets are only connected in highly hierarchical orders, because the whole point with the traffic planning of that time was to minimise connections to avoid potential points of conflict. The consequence of networks that allow so little flexibility in the patterns of movement is a loss of potential integration, not foremost seen as figures of integration values, but as the real integration that comes with encounters.

To conclude this section on the spatial configuration of the housing estate areas, we can argue that the combination of the layouts of buildings and movement networks in the Million Programme suburbs makes them less legible, not for the everyday users, but for potential visitors. It may seem a minor problem if strangers who rarely have business to do in the area find their way or not, but for the Million Programme suburbs this should be a matter of great interest. Since urbanity at its roots is about encounters (for economic, social and cultural reasons) and the task of urban planning and design is to provide spatial conditions for these encounters, we do have a spatial problem in many of the housing estate suburbs.

Whereas the configuration of the traditional grid reveals a certain social logic of space, the particular suburban properties we have discussed here seem to be part of an a-social logic of space. In this sense it may be right after all to claim that these areas lack some fundamental 'urban' qualities. The configuration of many Million Programme housing estate areas exclude potential visitors, firstly by spatial isolation and secondly by movement networks that largely obstruct urban navigation. With such spatial properties it is more difficult to sustain varieties of urban activities and a vital urban life.

Study 3. Urban typologies seen through cognitive maps

The investigations of the previous two sections dealt with what I have called 'hidden' conditions for urban navigation. By that I mean structural spatial properties, such as the street-building interface and the configuration of urban space in my studies. In this third investigation I look at Swedish housing estate suburbs from a different point of view. The study is still about spatial features, but this time the spatial structures are made up of the elements people recognise as visual clues for orientation. Whereas the former analyses dealt with relations that are not immediately obvious for the individual user of space, I now take the opposite stance and study what *is* immediately obvious in the built environment.

Urban orientation relies upon what the environment communicates to us as we meet it. Of course we can use written or iconographic signs as a help for navigation, but the built environment is in itself a natural source of information too. We all know from experience that street layouts and building design can help or hamper orientation as we use visual impressions and interpret what we see.

But what do we notice? In the two previous sections I presented studies that were based on concepts and perspectives from the professional discourse of architecture and urban design. For this last empirical investigation an important point of departure was to collect information from a wider context than the field of design professionals' opinions and discussions on the built environment. It is obvious that architects and urban designers talk about and look at the built environment from a different perspective than lay people, and I wanted first-hand information from people who do not look at the environment with professional eyes. Even a small study like this reveals noticeable differences between what design professionals and lay people consider as significant features in the built environment. However, the primary aim of the study was not to highlight differences between architects and others, but to shed light on the urban design of Swedish housing estate suburbs from yet another angle. Still, the outcome naturally gives rise to reflections in both directions.

I decided to use cognitive maps as a way to gather information on what people notice in the urban landscape. In this I follow Lynch, of course, but also research with other perspectives in the fields of environmental and cognitive science. Lynch's use of cognitive maps in the classic 1960 study aimed at understanding how people perceive large-scale environments as whole, coherent structures – their overall 'image of the city'.[141] My perspective has been more narrow, leaving the general view of the city aside and concentrating on the direct impressions of the smaller scale in the urban environment. I wanted to study what points of reference people use for orientation.

A very natural task for map-making seemed to be to ask people to give directions for wayfinding. It is a common event most people occasionally come across, and so the task seemed apt to draw out the sort of information I was seeking. Within cognitive science, route directions for wayfinding have been described as 'readily available, natural protocols reflecting the direction givers' cognitive representations of certain critical aspects of their environment'[142]. My purpose was to find out which these critical aspects of the environment are, and if they differ from one urban setting to another.

Like the space syntax study of the previous section, this study is explorative in character. The material is small, and in addition we know from Chapter Two that the contents of cognitive maps are held to be difficult to interpret and to quantify. Nor is it possible to make any general claims about legibility if we judge the maps by the accuracy of the drawings. I want to emphasise that the interesting information from this method is not whether the drawings – however they turn out – really are useful for orientation, but what features the respondents have chosen to symbolise or depict to help a visitor find her way. The purpose was to highlight properties of the urban environment that in one way or another support conditions for urban orientation.

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[141] Lynch, Kevin 1960, *The Image of the City*. Cambridge, p. 140.

[142] Couclelis, Helen 1996, "Verbal directions for way-finding: space, cognition, and language" in Portugali (ed.) 1996, *The Construction of Cognitive Maps*. Kluwer Academic Publishers, Dordrecht, London, p. 133.

Aim, hypothesis, and conduct of the cognitive map study

My point of departure for this study has been to investigate how people perceive different types of urban environments, that is how they notice, see and structure parts of their everyday surroundings. For example, do people convey more detailed images of their everyday environments if they live in areas with greater architectural and functional variety, and if so, does variety make the areas more legible? The hypothesis was that the points of reference would be different in the allegedly monotonous mass-housing suburbs than in urban typologies with greater variety, for example that different typologies may evoke different categories of references, such as functions versus physical features, or references related to buildings versus references related to movement networks.

Conduct

Apart from Lynch, influential sources for the conduct of my investigation have been Swedish research from different scientific fields with urban space as a common denominator: sociologist Mats Lieberg's work on teenagers' use of public space, environmental psychologist Maria Nordström's studies of children's and adults' conceptions of places, and time geographer Tora Friberg's studies of spatial aspects of women's everyday duties.[143]

For my investigation I decided to use teenagers as informants, basically for two reasons: they form a coherent group that is easy to contact through their schools, and they are old enough to move around their areas by themselves. Yet another reason can be added: normally ninth grade students still have most of their social life in their neighbourhoods and can therefore be expected to know the areas well, because that is where they hang out with friends and visit one another.

[143] Lieberg, Mats 1992, *Att ta staden i besittning. Om ungas rum och rörelser i offentlig miljö*. Lund (*Appropriating the city. Teenagers use of public space*); Nordström, Maria 1990, *Barns boendeföreställningar i ett utvecklingspsykologiskt perspektiv*. Diss., Lund University, Lund (*Children's conceptions of how they would like to live. A developmental psychology study*); from Nordström and Friberg I got highly valued informal advice on how to carry out the investigation.

Four schools were chosen on the basis of their locations in representative areas: the Million Programme housing estate typology is represented by Gårdstenskolan and Tynneredskolan, situated in two different suburbs of Göteborg; Karl Johansskolan, in the old urban area Majorna close to Göteborg centre, represents the mixed-use urban grid typology; and lastly Lessebo, an old paper mill community, 300 kilometres southeast of Göteborg in the province of Småland, represents a mixed-use small town with detached houses. In each school I asked for help to gather a group of ten students from school year nine, five girls and five boys, aged fifteen. All in all two students failed to show up, so there were altogether thirty-eight who carried out the tasks.

The investigation was conducted as follows:

I met the students twice. On the first occasion in each school the whole group of ten was gathered, whereas the second occasion was an individual meeting, normally staged a few days or in some cases a few weeks after the first meeting.

On the first occasion the students were given two blank A4-sized sheets of paper. They were asked to give directions to someone who was not familiar with the area by drawing two maps. I explicitly asked them to *indicate what one notices along the way*, to be sure one is on the right track. In the first map they were to describe the way from a given point of departure to their school. In the three areas of Göteborg the starting points were local tram stops, in the case of Lessebo it was one of the entrance points to the town. To complete this first map they were given five minutes. The second map was to be drawn from the school to their homes, again with the instruction to indicate what one notices along the way. For this map they were given ten minutes. All in all, the first meeting took about an hour (with the most difficult part actually being to make individual appointments for the coming meetings).

On the second occasion I met the students one by one. I had copies of the maps with me and asked the student to comment on them, and to add any sort of information he or she might think was missing. We then went out to follow the second map, the one leading home from school. Along the way I asked about the map and about features we passed that were left out. I also asked more generally about the area and the city,

mainly in a free-flowing conversation[144], to supplement the information derived from the drawings. This second meeting took about forty-five minutes. Directly after each meeting I wrote down my impressions.[145] Altogether, only a few students added any significant information on the maps to the second meeting, whereas I got to know more about the teenagers' overall opinions of their areas.

Since participation was voluntary, each students was willing to contribute according to his or her abilities, but some of them were concerned that their drawings would be insufficient. Naturally the difference in drawing inclinations and abilities is evident in the material, but the second meeting was an opportunity to compensate drawing deficiencies, if any, when the students could clarify what they meant with their different indications on the maps.

Back in time: pilot studies

I undertook some simple pilot studies in the summer before the investigation, and the results of these were interesting but somewhat disturbing from my point of view. I asked people to give directions to someone unfamiliar with the area by drawing a simple map. The question was how to get from point A to point B on foot, a distance of about five hundered meters within the area.

Working within the field of architecture and urban design, I hoped to get at least some references to visible features of the physical environment, but hardly anyone commented on aspects that architects and urban designers normally pay attention to. The foremost feature referred to was the street structure, followed by a few references to fairly conspicuous shops. That the movement networks are the most prominent elements in our environmental cognition was one of the findings of Lynch's study[146], and here it seemed to be confirmed. What conclusions

[144] Anyone who has experience with teenagers understands that there is great variety in both how 'free' and how 'flowing' the conversations were.

[145] I soon noticed this was very important to do, since even the most interesting remarks may slip out of mind. I also think taking notes is a good alternative to recording the conversations on tape, because it gives an immediate opportunity to active reflection.

[146] Lynch 1960, p. 49.

could be drawn from that? There was an enormous gap between the discourse in architecture – as touched upon in Chapter Two – and the way my pilot informants responded to the environment. Surely I needed to be more specific about what I was asking for: I had to recognise the problem to get the category of information I wanted – still without directing my respondents. As a result of the pilot study I decided (a) to specifically ask for significant features that a visitor could notice along the way, and (b) not to rely on the maps alone, but to add a second meeting with the informants[147].

The urban typologies of the study

Housing estate suburbs are in focus in this thesis, but to understand their specifics they need to be compared to other urban typologies. The four areas selected for this study represent three broad typologies, namely the Million Programme housing estate suburb, the mixed-use traditional urban grid, and the mixed-use low density small town. Before we get into the material of the maps, I shall briefly describe the main characteristics of the four areas where the schools are located[148].

[147] The decision to add an individual meeting was supported by for instance Nordström (in conversation), and by Gärling et. al.: 'A plausible assumption is that face-to-face communication is by far the most frequent medium from which knowledge is acquired by lay people. It is unfortunate, therefore, that map sketches drawn by subjects in cognitive mapping studies typically are not solicited in a communication setting' (Gärling, Böök & Lindberg 1985, p. 157).

[148] The population figures from the three Göteborg areas come from the official city home page, <www.goteborg.se>; the population figure from Lessebo comes from verbal information from reliable locals. The numbers of inhabitants in Tynnered and Majorna concern the estimated areas connected to each school, not the population within the whole areas' formal administrative units.

Tynnered: Million Programme housing estate suburb

Tynnered is part of the larger suburb of Frölunda on the southwest side of Göteborg. The estimated sub-area of my study has about 10 000 inhabitants. The building stock consists mainly of distinct groups of housing blocks, three to six storeys high, in open-plan layouts typical of the era (Figure 3.28). There are also parts with single-family houses. The different groups of buildings are spatially separated. The area is divided by feeder roads and the tram, the latter making a particular barrier within the area with fences along the rails. The traffic is highly separated and differentiated; it is basically a tree structure which reaches into the area from different directions. Tunnels and bridges are provided for pedestrians, bicycles and mopeds. The tram stop at the small neighbourhood centre Opaltorget was chosen as the point of departure for the first map, the one to the school.

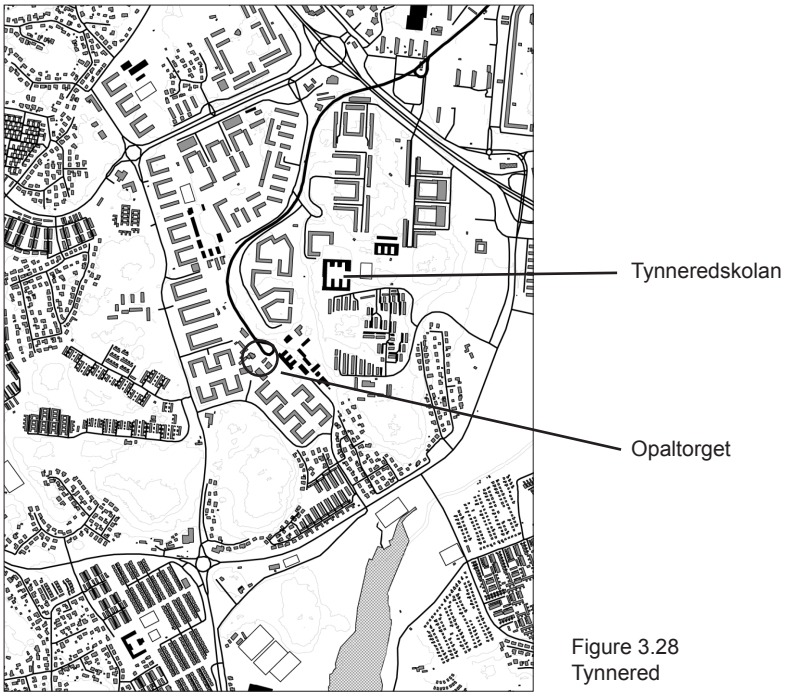


Figure 3.28
Tynnered

Gårdsten: Million Programme housing estate suburb

Gårdsten is a suburb with somewhat fewer than 7 000 inhabitants, situated in the northeast parts of Göteborg. The area is geographically segregated from the neighbouring suburbs and has a clear identity of its own. Gårdsten is mainly built on two parallel ridges separated by a valley. The buildings are of few types, three to five storeys high, and arranged in distinguishable groups (Figure 3.29). Some groups form courtyards, some are placed more or less without spatial differentiation. The school is located in the valley together with sports fields and playgrounds in a setting which is a combination of a park and natural landscape. The traffic scheme has a ring road that circumscribes the area. From the ring road, shallow feeder roads lead to the parking lots, and the interior of the whole suburb is largely free from car traffic. The bus stop at Gårdsten Centrum was the point of departure for the directions to the school.

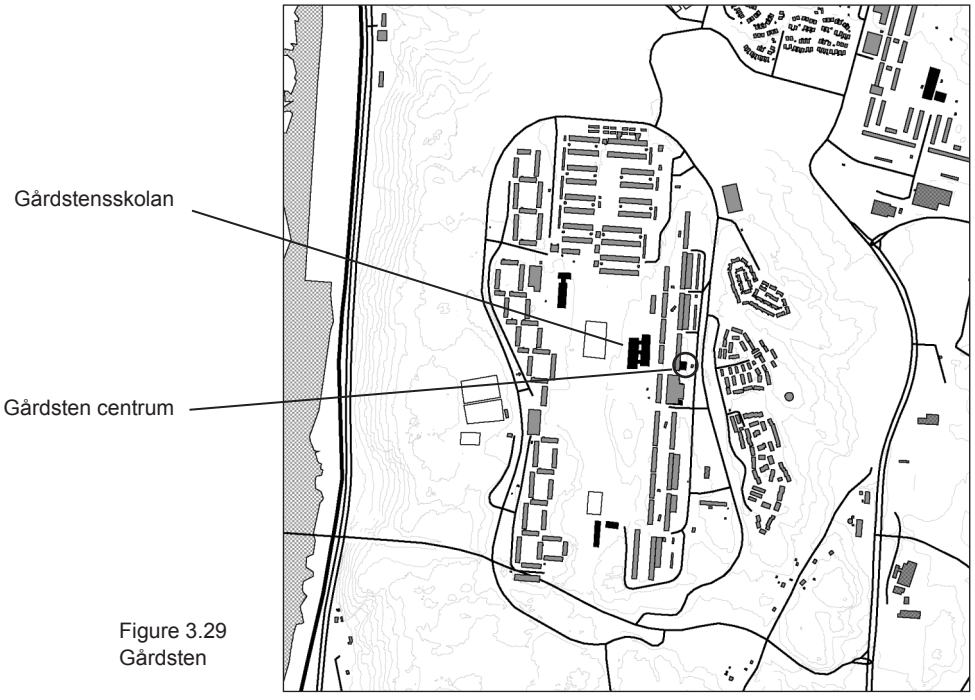


Figure 3.29
Gårdsten

Majorna: mixed-use traditional urban grid

Majorna is an old part of Göteborg, a traditional mixed-use area situated two kilometres west of the city centre. Although the area is closely connected to its surroundings in a continuous urban fabric, Majorna (like the neighbouring areas) has an identity of its own. The population of the area in question here is about 17 000 people. The buildings are mainly traditional urban blocks, three to six storeys high with enclosed or semi-enclosed courtyards (Figure 3.30). The area has a great variety of both functions, including housing, shops and work places, and buildings of different age, style, colour, and building material. There are samples of developments from most style periods of the twentieth century, including Million Programme housing. The street network is an irregular grid which in most parts is quite dense with small block sizes. The tram stop at Stigbergstorget, one of the urban squares of the area, was chosen as the starting point for the first map in Majorna.

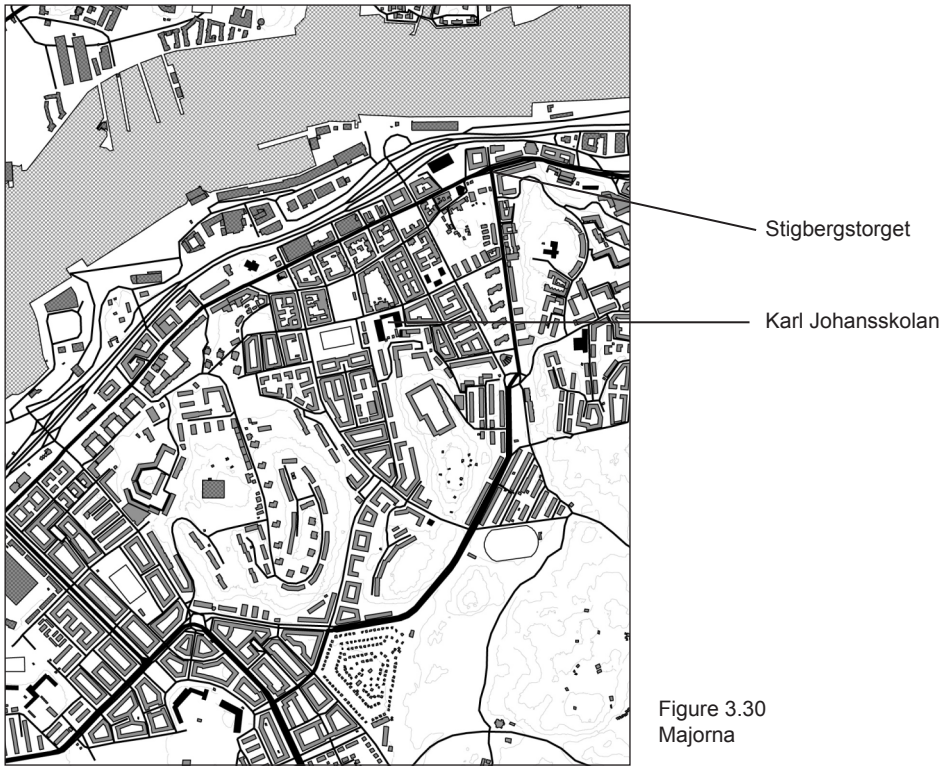


Figure 3.30
Majorna

Lessebo: mixed-use low-density small town

Lessebo is a paper mill community dating back to the seventeenth century. It has a population of 3 000 inhabitants, and is located in the province of Småland, about 300 kilometres southeast of Göteborg. Lessebo is an independent municipality, with the paper factory as the main employer, though there are other types of business enterprises as well. The paper factory is a building agglomeration of dominating scale, but apart from that and a few three to four storey buildings in the centre, Lessebo is characterised by a low density layout with one or two storey houses in large courtyards (Figure 3.31). There is also a small scale Million Programme housing estate. Near the paper factory there are historic environments that are still in use. The street network has a national through road as a spine. It is well integrated in the rest of the street network, which is largely an irregular grid. The starting point for the first map in Lessebo was the southern entrance to the town.

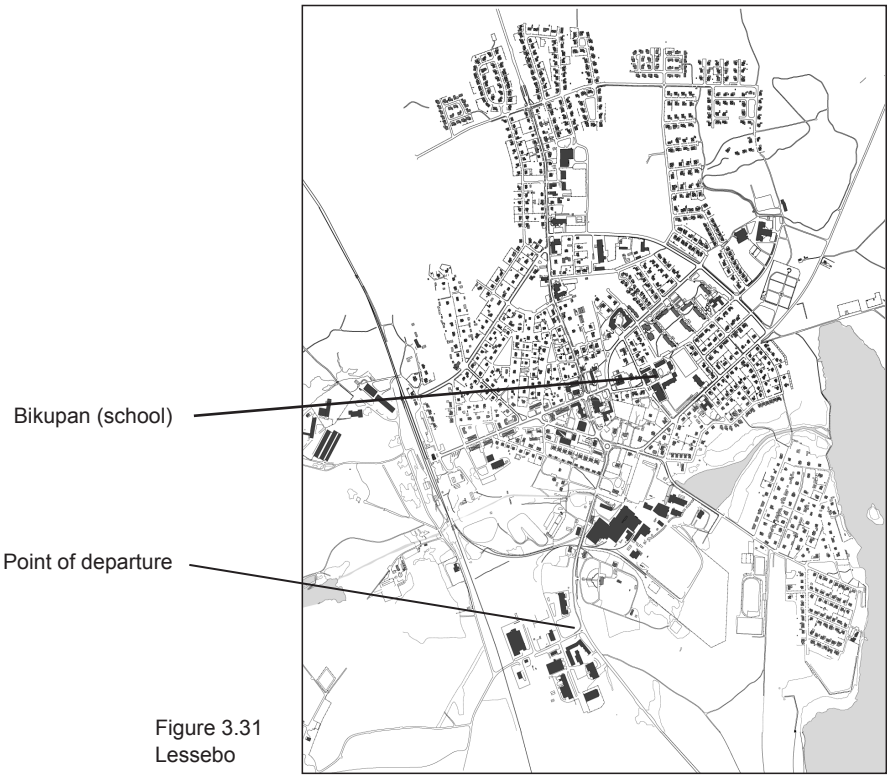


Figure 3.31
Lessebo

The characteristics as seen in the maps

One significant question concerning differences in urban typologies was raised even before the very first students – this was in Tynnered – started drawing. One of them asked if they should give directions to someone on foot or in a car. This question would hardly be asked in Majorna, where the movement networks are more or less the same for pedestrians and motor traffic. Nor would it be asked in Gårdsten, though for a different reason: the area as a whole is surrounded by a ring road, and inside it there are only pedestrian paths, which makes walking the most natural way to get from one place to another in the area. In Tynnered, on the other hand, the tree structure for car traffic reaches into the residential quarters, but as culs-de-sac, which gives totally different patterns of movement for motorists compared to the finer net of footpaths. This was a first indication that the Million Programme areas, even though they have so many features in common, cannot without reservations be seen as belonging to one and the same typology.

One of my assumptions was that the housing estate areas would be related, and that they would stand in contrast to the other two typologies. In fact, the results of the study suggest other divisions. For example, in some respects the maps of Gårdsten bear greater resemblance to the maps of Lessebo and Majorna than to the maps of Tynnered.

How could that be? I will come back to that discussion soon, but first I will explain what sort of information I found in the maps, and how I have categorised different elements. The map indications are also compiled and presented in a table in Appendix 3.

Map information

The foremost feature of the maps is some sort of symbol for the *trail* to follow, often as a line or a set of arrows. The outline of the *movement network* is not always drawn to support it, but in many maps the movement networks – streets, walking paths – are indicated as well. Parking lots can be classified as features belonging to the movement structure, but can rather be seen as open space, or a specific function.

Buildings are common, sometimes just indicated by a rectangle of no specific size, so that a hot dog stand may be as big as a church or a four-storey residential building on the same map. Buildings can also

be marked by a ring. Only rarely are *design characteristics* – such as height, form, colour, material or such – added to help orientation. More often the *functions* of the buildings are mentioned, for example shops, schools, cafés, churches.

The labels for different functions can be separated from the use of *names* of streets, places and buildings, although names are not as frequently indicated. In some of the maps *diverse objects* are marked, for instance street furniture, bars to prevent traffic, mailboxes, statues, or flower pots.

Vegetation is often indicated, sometimes symbolically by trees, sometimes marked by circles or fuzzy lines. Other features of *landscape* are not common; Lessebo is the only place with water (a stream and a lake), and this has been indicated by a few. Green fields, however noticeable in my eyes, are often left out, whereas playgrounds and sport fields of different sizes are quite common, but can be sorted in as functions rather than as a spatial reference to flat ground. *Topography* is otherwise accounted for, in some maps directly by words (for example, 'go uphill') or altitude lines, in others indirectly by stairs, tunnels, bridges and winding pathways.

A characteristic of special interest, because it differs between areas, is if there is an *overall structure* indicated, that is if the indicated elements and the trail relate to each other in a deliberate way. That this feature would appear so clearly in the maps was something I had not anticipated. The way the task was presented, I expected that the most prominent categories of points of reference would be *landmarks* and *paths*, and that these elements possibly would fall out in groups according to different kinds, significance and sizes. To find that the landmarks, paths and edges were *combined* in ways that seem to reflect the legibility of the areas was not explicitly expected. A related feature that appeared was the level of *context* in the maps, that is extra environmental information about the surroundings of the trail. This context information was nothing I had asked for in the task, but it turned out there was a significant difference from one area to another in terms of how much of the surroundings of the trail the students spontaneously indicated.

I will now go on to account for these denotations in the maps and compare the four different areas thematically.

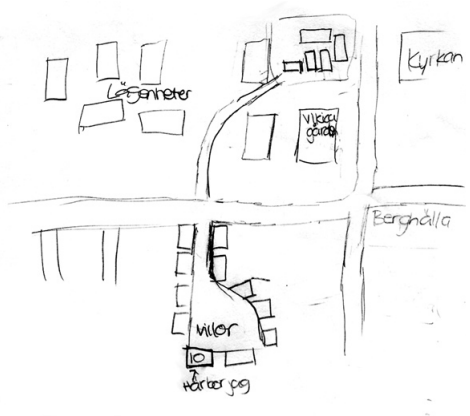
Noticeable design features

It is quite obvious, and important for architects to realise, that people foremost seem to notice features other than the specific design of buildings and environments. As mentioned above, only rarely did the students indicate the size, shape, colour, or material of the buildings they drew on their maps (Figure 3.32). Of course the task given did not require indications of design (only noticeable features), and quite naturally there is no point in referring to design characteristics for buildings which reveal themselves by signs, such as shops, cafés, and fast food vendors. With that in mind it is interesting to discover that the students in Majorna have the most references to design features, even though they also have the greatest number of functions to refer to. As a matter of fact, all but one of the maps of Majorna include references to design in one way or another. In a few cases these are written statements, indicating colour, style, or building height. One boy wrote 'yellow building, old design' on a residential building, which stands out as slightly more prominent than the neighbouring blocks. Most noteworthy is that their drawings, with only one exception, in one way or another indicate forms of buildings, for example recessed corners, a vault over an entrance, a round building (in reality octagonal), or the design of the Karl Johan School, particularly the rounded steps of its entrance.[149]

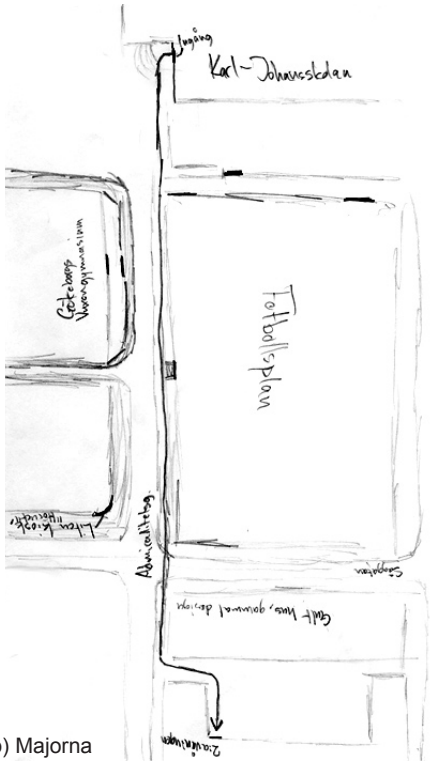
In the maps of Lessebo the indications of design features are few. Four of the students have referred to colours, and a few of them have suggested particular shapes of some buildings or building groups. No other references to design were made, but the selection of buildings show that prominent ones, such as the paper factory, the new four-storey building in the centre, and the church, are commonly suggested as points of reference.

In Gårdsten there are references to architectural design features in half of the cases, similar to Lessebo, but fewer and less deliberate than in Majorna. Apart from the text 'red house' indicated by one girl, the

[149] The Karl Johan school was designed in the 1920s by the famous Swedish architect Erik Gunnar Asplund, and it is possible that the architecture has been highlighted by teachers through the years.



a) Lessebo



b) Majorna

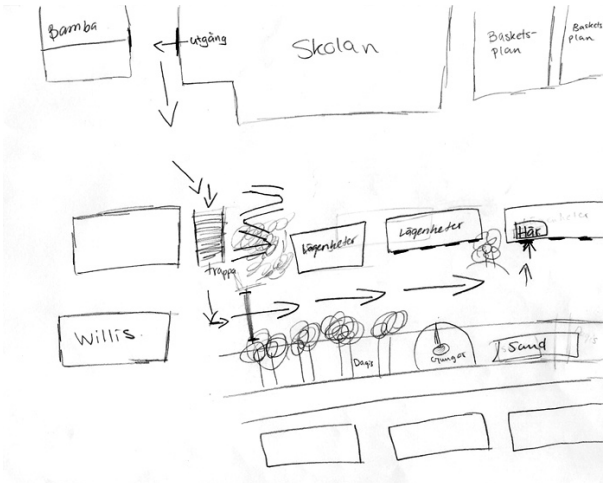
Figures 3.32 a-d
Examples of references to design features

The students in **Majorna** have the most references to design features. On this map you can read 'yellow building, old design' on a residential building. The space in front of Karl Johansskolan is depicted, and so the rounded flight of steps at the entrance.

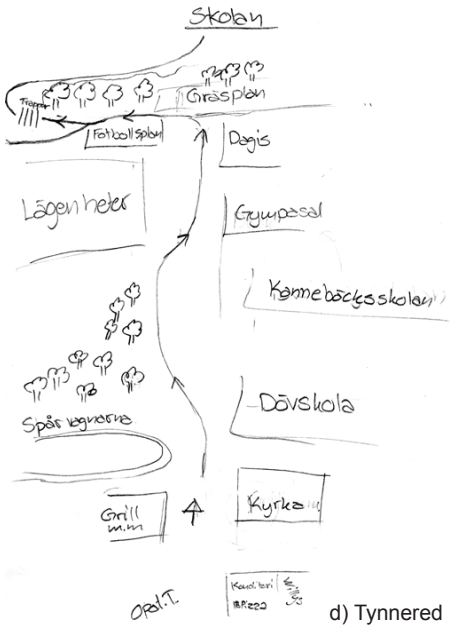
In the maps from **Lessebo** there are references to design in about half of the maps. Four of the students have indicated colours of buildings, and there are notations of building forms or layouts of building groups.

Also in **Gårdsten** there are references to design features in half of the cases. Here the entrance to the residential building is indicated. In this map you can also see an example of details, such as the playground swings and the traffic bar.

In the maps from **Tynnered** references to design features are few. The map below is typically sparse in details, but on the other hand one of few that points out groves of trees and an open field ('gräsplan') as points of reference.



c)Gårdsten



d) Tynnered

others who have indicated design features have specified significant shapes, such as the school entrance, entrances to the residential buildings, shapes of building groups, and an axonometric view of a block of flats.

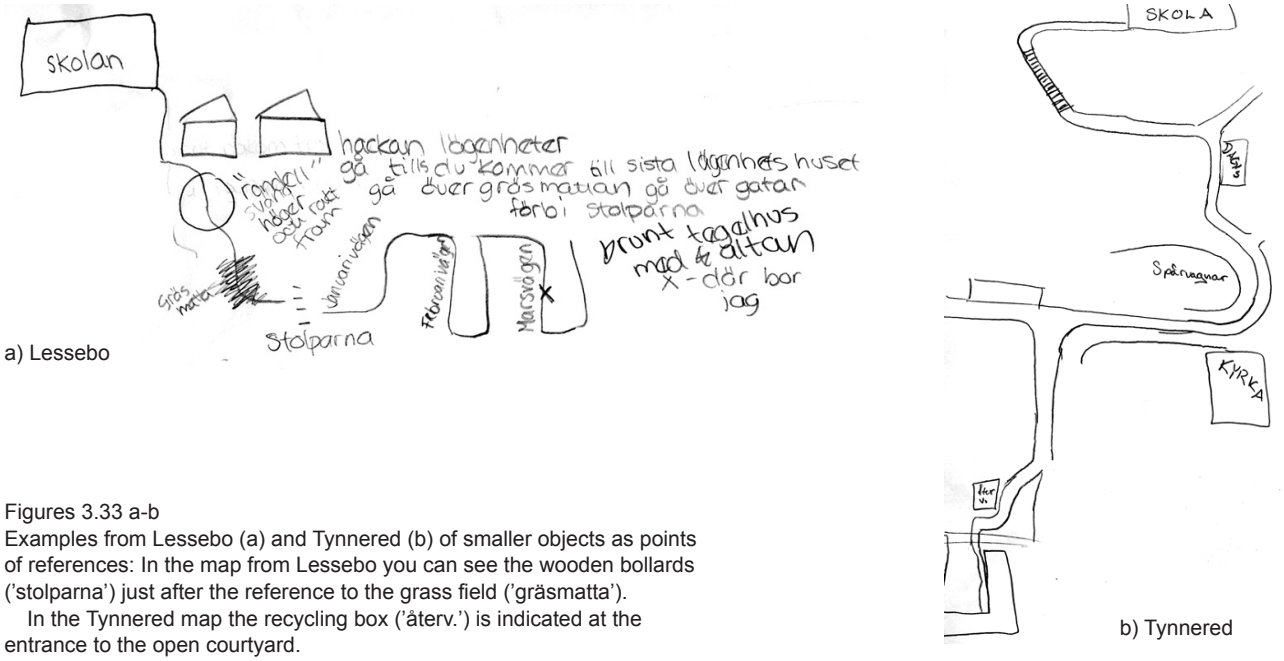
Tynnered stands out in this aspect: references to design features are few indeed. Only two of the students indicated form in their drawings, in the first case a rather accurate plan of the school and a suggested form of a hot dog stand, and in the other the school façade is elaborated. Two indicated colours of buildings, one of them only in response to a question from me on the walk.

Concerning design features it is apparent that the maps of Majorna convey by far the most information, followed by the maps of Gårdsten and Lessebo, with the maps of Tynnered as the least informative in this sense. That the students in Majorna and Lessebo indicate design seems to support the notion that in an area where the architectural styles offer a greater variety, design features evoke more points of reference. But the explanation of architectural variety does not apply as strongly to the Gårdsten case. It may therefore also be a question of distance. In Majorna, with the most detailed accounts of building design, and in certain parts of Gårdsten, you move close to the buildings; in Tynnered the buildings are farther away from the trail than in the other areas, and features other than building design seem to dominate the visual field. This relationship between the trail and the adjacent objects is a significant feature that we come back to below.

Diverse objects and details

The maps from the four areas differ, although only slightly, in indications of smaller points of reference, that is objects and details that are not part of the architecture. With some exceptions, the maps of Tynnered are rather sparse in details – the sum of smaller objects indicated as points of reference are a bench, a recycling station and a low wall.

In the Lessebo maps the case is similar. Three students indicated fences, and two others marked a set of wooden bollards which cut off a residential street from car traffic. In one case the map is on the whole rich with information. In the other case these bollards stand out on a map that otherwise presents very little information. On the walk this



a) Lessebo

b) Tynnered

Figures 3.33 a-b
Examples from Lessebo (a) and Tynnered (b) of smaller objects as points of references: In the map from Lessebo you can see the wooden bollards ('stolparna') just after the reference to the grass field ('gräsmatta').

In the Tynnered map the recycling box ('återv.') is indicated at the entrance to the open courtyard.

girl considered for a while putting the big sports hall up on a hill as a point of reference for direction, but on second thought she regarded the bollards as the better alternative. Several of the Lessebo students made surprisingly detailed drawings of traffic islands in the streets, and without exception they all indicated the new roundabout in the centre. One boy added an apple tree as a significant point of reference, as he revised his map on the walk, but on the whole the number of smaller details is still low in the Lessebo maps.

This can be compared to the maps of both Gårdsten and Majorna, which include more small objects along the trails. In Gårdsten the students indicated things like traffic bars to prevent cars entering pedestrian paths, fences, a bench, a dot on the map explained as a 'thing' (possibly a sculpture or flower pot). In the maps of Majorna you find objects and details such as sculptures, benches, tree rows, low walls, pedestrian fences, pavements, and mailboxes. The mailboxes in question were in reality of the discreet type used by postmen only, and they were located by the fence to a popular playground. It is interesting that these mail-

boxes were considered more noteworthy than the playground, which to me stands out as a green void in the dense grid.

Functions in the maps

By functions I mean all uses of buildings other than housing, such as commercial and non-commercial service, and functions without buildings, that is land use such as playgrounds and sport fields. Diverse functions are indicated as points of reference in all areas, but more so in Majorna and Lessebo – quite naturally because they are more frequent there than in the housing suburbs. The difference is obvious, and confirms the image of both Majorna and Lessebo as multifunctional areas, and the role functional differentiation plays in legibility.

The indicated shops and so forth are not always needed for orientation, but seem to be put in as points of reference because the students take pride in knowing them, or because they are part of their personal experience (for example a small tobacconist off the trail in Tynnered, which was indicated because the under-aged student in question could buy cigarettes there).

Names of places

Names of places and buildings is one important aspect of orientation and legibility. If a street, a place, or a building has a known name we can ask for it, for example. In Tynnered and Gårdsten some students mentioned residential building groups by their names. Although the buildings or building groups do not relate directly to the streets in the Million Programme areas, in Tynnered they are called Briljant (leaving out *gatan*/street), Turkos, and so on, according to the postal addresses. In Gårdsten, too, the students used street names, such as Peppar(*-gatan*), Muskot, and Salvia, and in some cases also the specific names for the building groups that form a courtyard, such as Poppelgården. To many of the students in Gårdsten these courtyards and separate building groups seemed to carry a specific identity, and the youngsters living there referred to themselves as, for example, the ‘Pepper kids’ (*Pepparbarnen*).

In Majorna the blocks are not named, with one exception: a housing estate from the Million Programme period is called 'Vita Björn', which has been indicated by one boy. Most of the maps from Majorna indicate street names and/or names of public places such as squares and small parks in the area. Only two of the students have indicated neither, but on the other hand, one of them, a boy, had put several functions along his trail. He considered this fully sufficient – in fact I would say he was delighted when he saw his own map on the second occasion.

In Lessebo, less than half of the students used street names in the directions they gave, even though the streets in most cases are carefully drawn. On the whole the small town has few areas which are called by specific names, but these few names are well established. Two girls called the Million Programme housing estate by its estate name 'Hackan', and two others have used the name 'Djurhult' for the area by the lake. One girl has referred to the park in the historic environment by the paper factory by its name, 'Intaget'.

One thought that comes to mind in this matter is that there are numerous places without names in the open-plan layouts of the suburbs. In the continuous park-like landscape in Tynnered you move through many such nameless places, at least not with names known to outsiders. There are also plenty of places in the traffic landscape without names. In Gårdsten on the other hand there is the Valley, which is an open and still defined place, possibly not officially named, but well known and easily understood by visitors. Lessebo, with its open building structure and street-oriented layout, is comparable to Majorna. In both Majorna and Lessebo a place can always be directly connected to its street address if it does not have a name of its own. In this aspect the division is more as I expected – the suburban plans organised on estates differ from the grids with defined plots.

For Lessebo and Majorna, though, it is notable that the housing estates have been called by their block names. They are apparantly perceived as separate enclaves, even though they are situated in the grids and surrounded by streets. I propose this is an issue of differentiation. In Lessebo as well as in Majorna, the housing estates differ from their surroundings. In Lessebo the housing estate stands out by building type and by the open space that surrounds the buildings, which is totally

different from the clearly delineated private plots of the single-family houses. In Majorna the housing estate is marked by building height, and by the estate borders: whereas the traditional perimeter blocks in Majorna have entrances facing the streets, the housing estate Vita Björn is mainly secluded and faces inwards.

Landscape: topography and vegetation

From the material at hand it is quite clear that topographical features are considered noteworthy as points of reference. There are topographical indications in all the areas, not primarily as visual signals but more often as height differences to be experienced. This is understandable – going below or above something gives more than a visual impression, just as moving up or down is felt in the body in a very palpable way. One example from Gårdsten is a winding path next to a flight of stairs on the way from the bus stop to the school. On all the maps the stairs are drawn, and on most maps the path is also indicated as a distinct element beside the stairs. Most Tynnered students indicate the steep hill up to their school by words or by drawing the stairs.

The significance of the bodily experience of the environment was highlighted in a little pre-pilot test with my mother. When asked to give directions she said at one point – where I expected a reference to 'the last house on the right hand side' or 'the green field' – 'turn right *after the road bump*'.

Areas of flat ground are consequently topographical features that few have mentioned, even though it could have been useful information in some of the maps. Altogether only three students indicated 'grass field' on their maps. This was in Gårdsten, Tynnered, and Lessebo; in Majorna there was really no such place to indicate. A notable finding is that despite the fact that there are cars parked all along most streets in Majorna, just one of the students indicated curb parking. Since parking lots are commonly indicated and distinct elements in maps from the other three areas, this leads to two conclusions: that parked cars are less noticeable when they are evenly spread out, and that parking lots are noticeable also as voids, or flat open ground, when they are empty.

Lessebo is the only place with a body of water in the study, but although the first map passed the stream only one of ten students indicated it[150]. On the other hand, in the few cases where the directions passed water in the second map, it was clearly indicated as a significant element.

The references to vegetation reveal interesting differences between the typologies. Whereas most students in Gårdsten and Lessebo refer to vegetation of different kinds, only two of the students in Majorna have indicated vegetation. As more than half of the maps from Tynnered also include vegetation, the result seems to reflect the environmental characteristics of the dense grid on the one hand, and the green layouts of the suburbs and the small town on the other.

Thus far I have accounted for the sorts of objects that were presented in the maps, and pointed out a clear tendency that the selections of references in the maps differ between the three typologies. Now I will summarise the study in relation to legibility and the conditions for urban orientation and navigation in the different types of urban design.

Cognitive maps and the legibility of environments

What can be said about the different typologies and the conditions for urban orientation in each setting? Bearing in mind the small volume of material, and that all interpretation must be done with caution, I would argue that the maps do reflect variations in how different environments are perceived, and that this perception is connected to the legibility of the environments.

The most interesting findings in the maps were characteristics that I admittedly had not thought about when I started the study. The apparent differences between areas concerning how the overall structure of the trail was presented, along with the degree of context the trail was put in, was striking, but it was not until the material was in front of me that I could see these patterns emerge. I will now conclude this third empirical study by making some propositions about the findings.

[150] The stream is the historic cause for the location of the old paper mill and thus the origin of the town altogether. As such it could possibly be expected to be held as a significant element of the environment.

Overall structure, spatial relations, context

The maps of the four areas of the study turned out to differ significantly in how they suggest an overall structure, that is how the different elements related to each other and/or to the trail. In this respect the division of the typologies is not, as I expected, clearly between the housing estate suburbs on the one hand and the two reference areas on the other. The area that stands out in most aspects in the material is Tynnered.

My very personal impression of Tynnered, where I more or less got lost on my first visit, was reinforced by the maps drawn by the students there. It is hard to trace any general structure in the maps. This is noteworthy since the residential building blocks are grouped in firm and clear plan figures. In reality, however, the patterns of the pedestrian movement networks make it hard at ground level to get an idea of how the overall structure is composed: the main walking paths do not go through the groups of buildings, but rather between them in the park-like landscape. Most of the maps from Tynnered depict a fragmented assembly of elements, and the indicated trails do not relate clearly to adjacent buildings or other elements on the maps. It is noteworthy that only one of the students suggested any context for the proposed way. In the maps of Tynnered you move in a vague and disintegrated urban landscape.

The difference to the maps of Majorna and Lessebo is striking. All the maps by the students in Majorna are characterised by the mainly orthogonal grid of the area, and this feature gives the maps a legible structure that is missing in most maps from Tynnered. Furthermore the maps of Majorna on the whole cover more of the context: many of the students have drawn building blocks beyond the ones needed to describe the way. One of the boys even said: ‘Oh shit, I’ve drawn these [blocks] needlessly. You don’t need them for the directions!’ In the maps of Majorna there is also a more obvious relationship between the trail and the elements that are meant to define it. The streets are without exception drawn as defined elements, and along them the noticeable features are included, which makes their relationship clear. In some maps even the pavements are carefully indicated.

In spite of their fundamental differences as habitats, the maps of Lessebo are in many ways similar to those of Majorna. This applies particularly to these structural properties. Eight of ten Lessebo maps show an overall structure, with the irregular grid of streets as a firm basis and buildings that relate to this movement network. In some maps buildings are more or less left out, and the maps emphasise instead the pattern of streets. And just as in Majorna a great majority of the students in Lessebo cover a larger context of surrounding streets and buildings than was needed for direction. More than elsewhere the students in Lessebo have suggested alternative routes.

It is interesting that for the presentation of an overall structure, the Gårdsten maps fall somewhere between on the one hand the other housing estate suburb of Tynnered and on the other the grid typologies of Majorna and Lessebo. The urban plan of Gårdsten may explain why the maps by the Gårdsten students resemble the ones from Majorna: there is an emphasis on the orthogonal structure of the housing layout, and the pedestrian movement network is in some maps treated like the grid in the maps from Majorna. In Gårdsten you can also observe (like Majorna and Lessebo, and unlike Tynnered) a relationship between the trail and the surrounding elements. Many of the maps from Gårdsten clearly indicate that you are to move *in relation* to buildings and objects – you pass them, turn around corners, zigzag through them. The clear structure is lost of course when the trail goes diagonally across the valley, but only temporarily – once over on the other side, the students draw open-plan courtyards well defined by buildings at right angles.

The varied treatment of these aspects – the overall structure, the relationship between the path and other elements, and the extension of the maps to cover more of the context – suggest that the students differ in their perceptions of their areas.

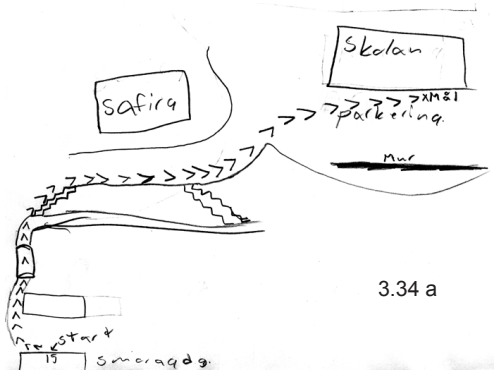
Traffic planning and its influence on urban navigation

From an urban planning point of view, an immediate impression is that the traffic schemes of the Million Programme period have a great impact on our perception of the environment as a whole – even more so than the building design of that time. In about half of the maps from Tynnered the traffic schemes are quite noticeable, with tunnels, bridges

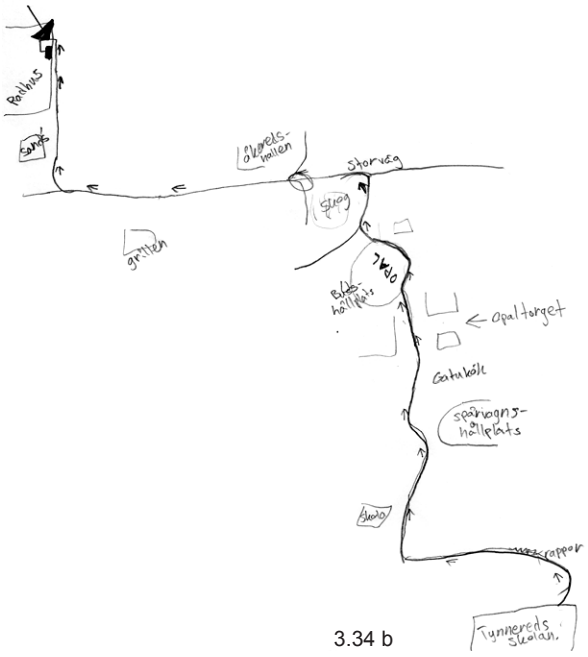
Figure 3.34 a-d
Examples from **Tynnered**

In most of the Tynnered maps an overall structure is hard to detect. The maps depict a fragmented assembly of elements, where the trail does not relate clearly to adjacent buildings or other elements on the maps. You seem to move in a very vague urban landscape.

A possible interpretation of the maps is that the traffic paradigm of the functionalist era has a great impact on the perception of the environment as a whole. Tunnels, bridges, and large parking lots are frequent references.



3.34 a



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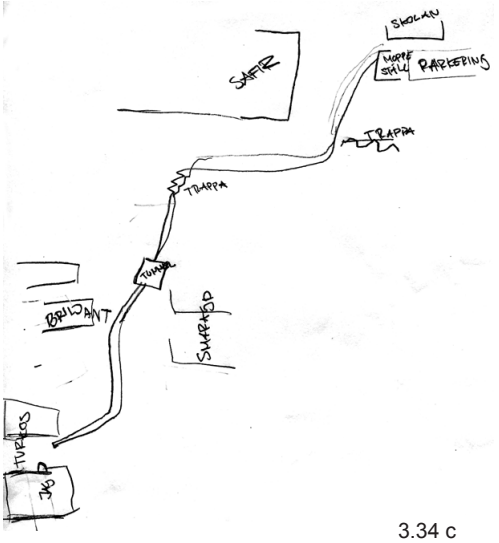

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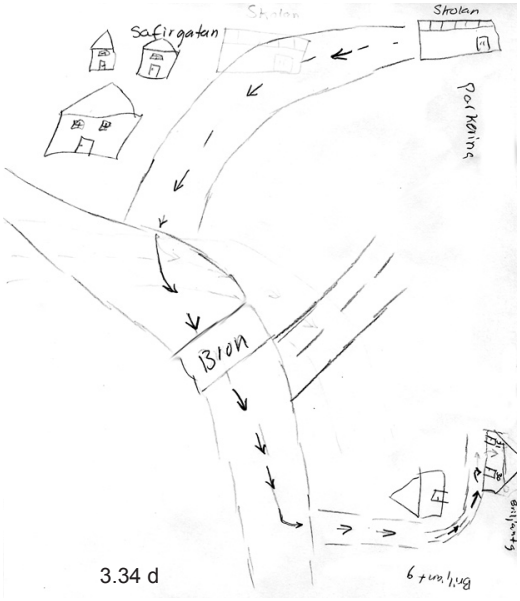


3.34 d

and large parking lots indicated as important features of the trails.[151] The idea of separating pedestrians and vehicles, and differentiating the traffic flows according to speed, has led to some poorly integrated urban settings. The fragmented maps of Tynnered reflect this reality in an interesting way. And, as I said before, in almost all the Tynnered maps an overall structure is missing, which may well be a result of the divided layout.

But why then do the maps from Gårdsten, an area of the same planning paradigm, turn out differently? The fact is that the barriers created by the traffic in Gårdsten are largely on the outside of the residential area. Even if Gårdsten is also divided into separate building groups, the interior parts of the area are connected in more comprehensible ways (though still largely examples of the simplified logic of origin-destination planning). Furthermore, the exterior ring for traffic around Gårdsten is a shallow structure, which is easier for orientation than the deep tree structure of Tynnered.

The grids of both Majorna and Lessebo are shared by pedestrians and vehicles alike and, however deformed or irregular, the movement networks in both areas seem to support legibility. This was evident in the many maps that presented the trail in context and with alternative routes.

Interfaces of urban elements

Taken from the maps, we can also see how the different combinations of patterns of building and movement structures have a critical influence on the general urban legibility. Again Tynnered seemed to be the least legible area of the four: the patterns of buildings there is not coherent with the pattern of movement networks, and the interface between buildings and movement networks is largely missing. Taken from the maps, not even the walking paths seem to have a close relationship with the buildings.

[151] When asked about the tunnels they did not see them as a problem, not even the girls found them frightening or reflected on them as something unpleasant.

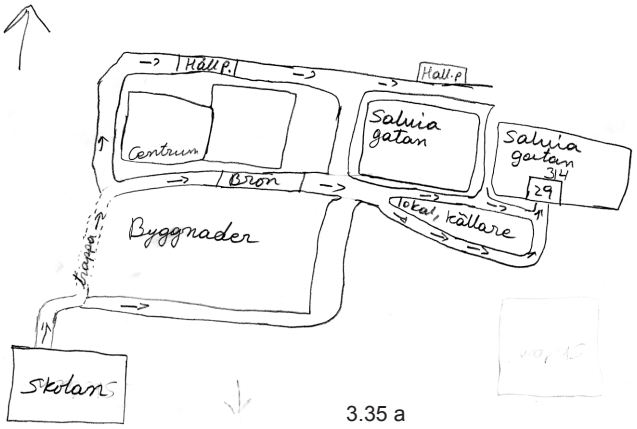
Figures 3.35 a-e
Examples from **Gårdsten**

Many of the maps over Gårdsten indicate the orthogonal structure of the housing layout, and the patterns of pedestrian movement networks is treated like the streets in the maps from both Majorna and Lessebo.

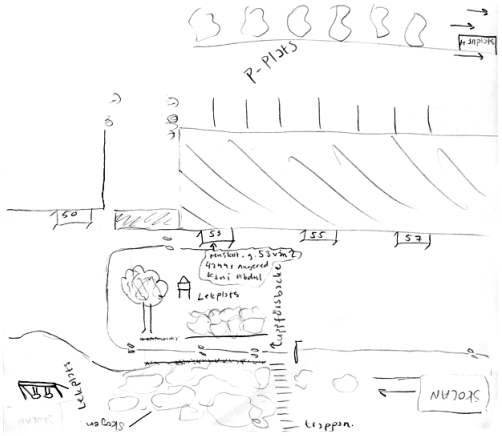
Many of the Gårdsten students draw their open plan courtyards well defined by buildings.

There is a fairly clear relationship between the path and the surrounding elements. Many maps suggest that you are to move in relation to buildings and objects – pass them, turn around corners, zigzag through them.

The map (c) shows the path where you have to climb the fence to the courtyard, mentioned in the text.



3.35 a



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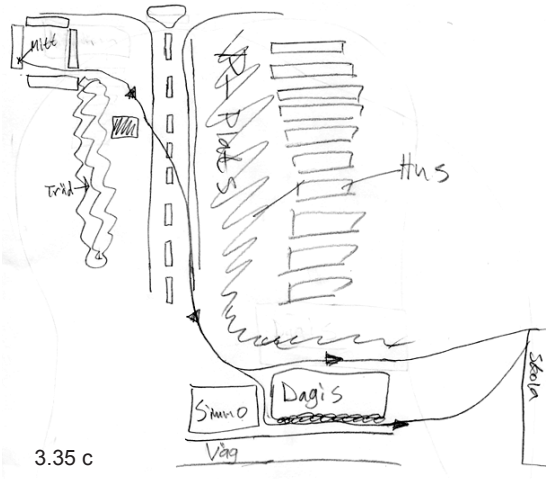

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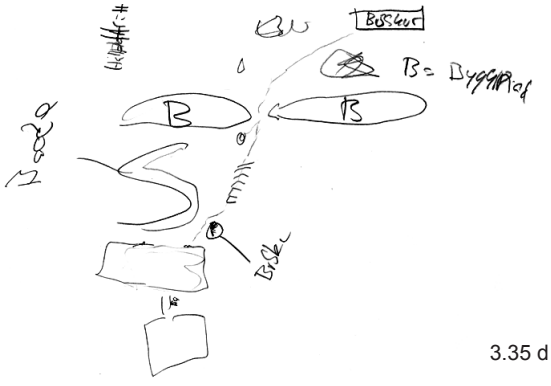

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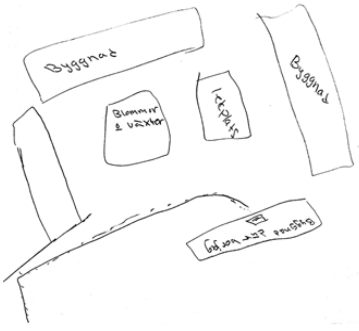


3.35 e

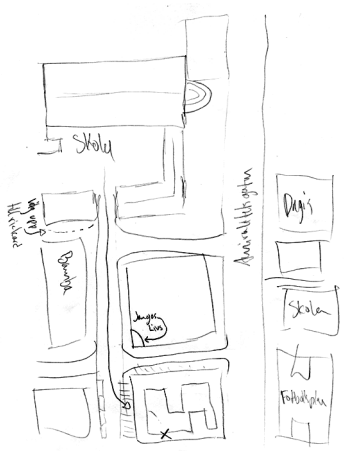
The spatial properties of Gårdsten are comparable, but there are interesting exceptions, such as the pedestrian path leading to Gårdsten Centre between long rows of slab buildings. This walkway has a building interface that is similar to the close, traditional urban one. Some of the students in Gårdsten indicated alternatives of parallel walkways in this part of the area. When asked about which of the walkways they prefer themselves, I was told that they alternate between them according to the mood they are in: if they want to meet people they choose the path between the residential blocks, where buildings on both sides have their entrances facing the walkway. This makes sense because here we find a pedestrian path which is quite busy, presenting if you like a residential type of street life, and leading to the small indoor centre of the area.

After having written this, I read an interview with the responsible architect Rune Falk. He said that the aim of the architects and planners had been to create not a courtyard but a street, free from vehicles, and open for play – an 'entrance and play street'[152]. The similarity to my immediate impression of that urban space is notable. This active urban space is created by the close building–street interface, in combination with a configuration that connects the pedestrian street directly to the centre.

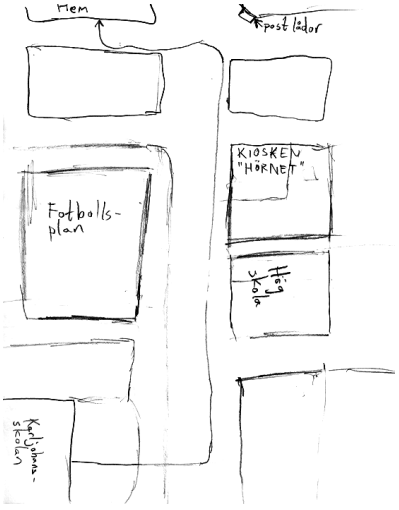
In the case of Majorna the building–street interface is as close as it can be, and the two structures of elements on the whole mutually define each other, which was evident in the maps of the area. The physically defined edges, such as the fences, walls, and tree rows, were indicated as help for orientation.

The typology of Lessebo, lastly, is a combination of the suburb and the city. Apart from the obvious difference in scale, Lessebo has an open and scattered building structure like the suburbs, and a continuous street network like the traditional grid. The streets in Lessebo are not defined by buildings, but since they are lined by individual plots with clear demarcations, the relationship between the public (street) and the private (courtyards) resemble the interface in Majorna, with the exception that

[152] Architect Rune Falk, quoted in Larberg, Vanja 2003, *Synvända*. Master's thesis, Chalmers School of Architecture, Göteborg, p. 29 (*Changing perspectives*).



3.36 a



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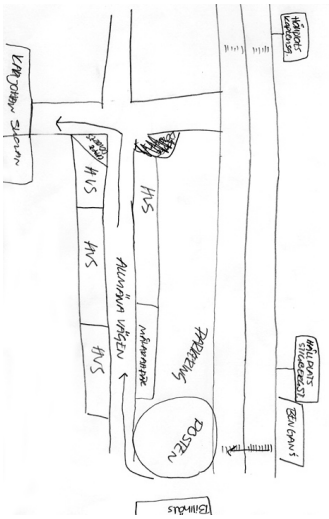


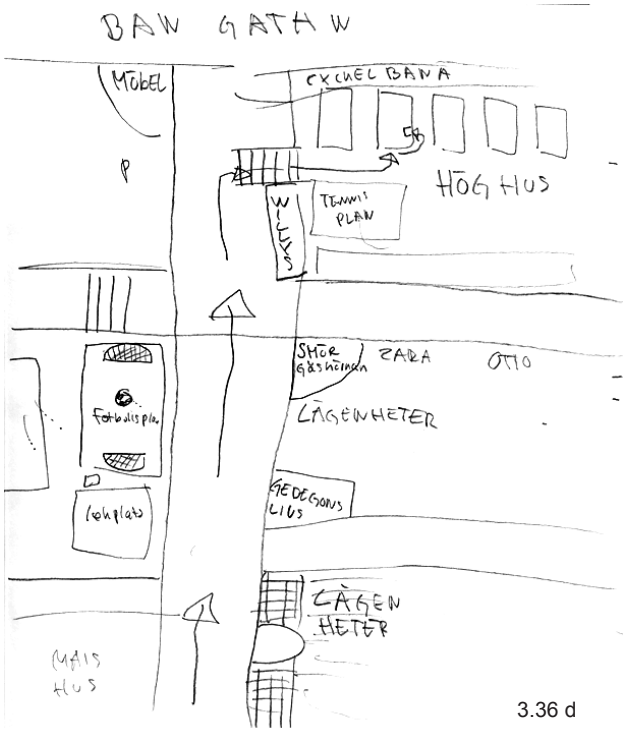
3.36 c

Figures 3.36 a-d
Examples from **Majorna**

All the maps by the students in Majorna are characterised by the orthogonal grid of the area.

On the whole, the maps over Majorna cover more of the context than the Million Programme maps. Many of the students have drawn building blocks beyond the ones needed to define the trail.

In the Majorna maps a relationship between the elements is evident. The streets are without exception drawn as defined elements. Even though there are cars parked along almost every street in Majorna, just one of the students (a) has indicated curb parking.



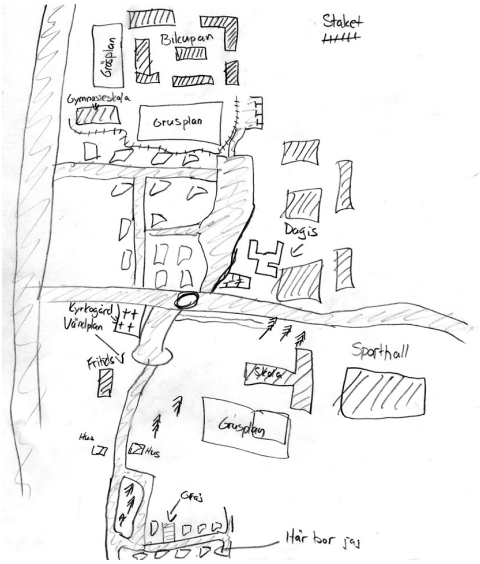
3.36 d

the urban structure is predominantly enclosed in Majorna and open in Lessebo. Since most maps by Lessebo students revealed a legible environment, we can conclude that an open building structure as such does not decrease legibility, as long as there is an intelligible interface with the surrounding buildings or, as in this case, defined plots or functions. The micro-scale edges seem to support environmental cognition.

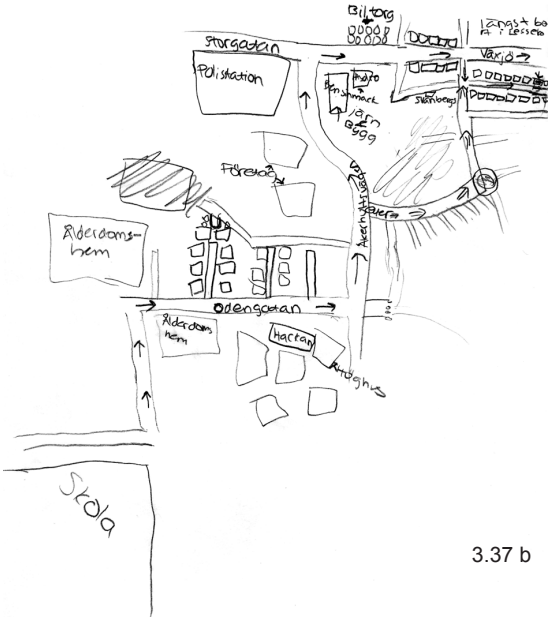
Differentiation and articulation

Differentiation in architectural expressions and functional variety was something I thought would be revealed in the maps, and that it possibly would differ among the areas. Most design notations came from Majorna, but when it comes to what sorts of buildings have been recognised as noteworthy the students show a similar approach in the four areas. The salient buildings that have been indicated are not only prominent ones, like the churches in Lessebo and Tynnered, the indoor centre in Gårdsten, or the post office (that originally was a cinema, hence the notable design) in Majorna, but also more ordinary building types, such as small shops and fast food vendors, the typical one-storey kindergartens, or the standard one-storey supermarket box. These buildings stand out not because of architectural qualities but because they are different from their surroundings in all the areas. In some cases these inconspicuous buildings seem to have personal significance: they are indicated even when they are a bit off the track, like the newsstand in Lessebo, which is a lively node in the centre. In other cases these buildings are quite simply strategically located by the paths and so they make good points of reference. That structural properties of the elements influence what is included in the sketch maps agrees with recent research that applies space syntax analyses to the Boston maps from Lynch's 1960 study[153].

[153] Conroy Dalton, Ruth & Sonit Bafna 2003, "The syntactical image of the city: A reciprocal definition of spatial elements and spatial syntaxes", in Hanson (ed.) 2003. This approach could well be used in further studies of my typologies.



3.37 a

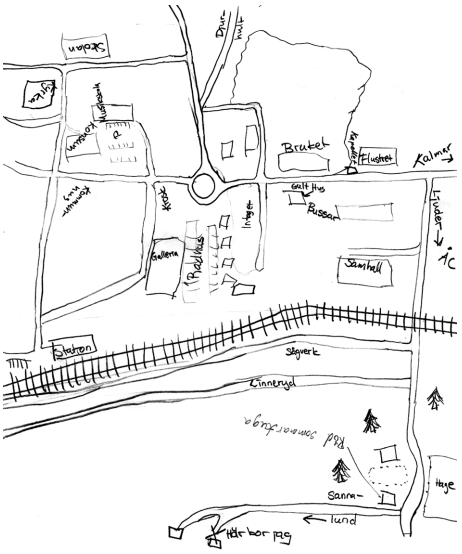


3.37 b

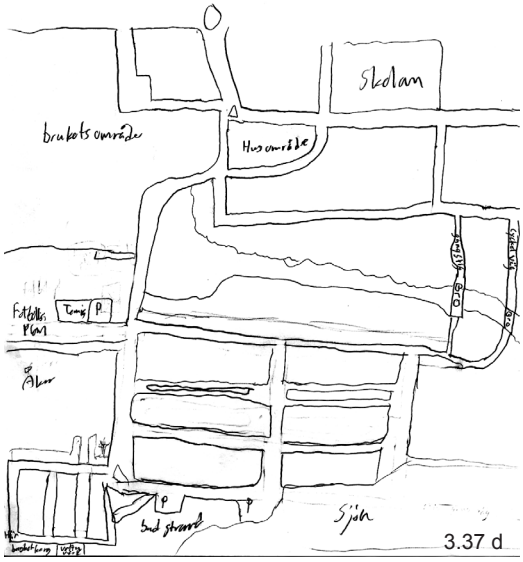
Figures 3.37 a-d
Examples from Lessebo

Eight of ten Lessebo maps show an overall structure, with the irregular grid combined with the buildings. In some, where the buildings are left out the maps emphasise instead the pattern of the movement network. In these cases the streets are defined by the micro-scale edges of garden fences.

Just as in Majorna, the students in Lessebo cover more of the context than needed for direction. More than elsewhere the Lessebo maps suggest alternative routes.



3.37 c



3.37 d

Paths, landmarks, districts, nodes, and edges

With Kevin Lynch's five elements in mind – paths, nodes, districts, landmarks and edges – I essentially asked for two in the task I gave the students: paths and landmarks. As a by-product, the other three elements appeared with varying clarity. Starting with *districts*: they were hardly traceable in Tynnered, where almost no context is accounted for, but evident in Majorna as well as in Lessebo and Gårdsten. In Lessebo, for instance, the fenced ground of the paper factory makes one district, and there are also maps where groups of buildings are indicated as distinguishable units, for instance the housing estate 'Hackan'. In Gårdsten the groups of residential buildings that form courtyards seem to be perceived as districts in this sense, and in Majorna the housing estate 'Vita Björn' was regarded as one.

Nodes, in the sense of strategic points in urban life, were not clearly indicated as elements in their own right, but the indications of the local squares and small centres in the four areas suggest they are nodes. However, if we see nodes as strategic points in the structures of movement, there are numerous crossings and roundabouts in the maps. The crossroads on the maps are surprisingly often incomplete, which makes the information quite confusing in reality. Considering how significant paths are for our knowledge of the environment, it is notable that the crossings, which could be expected to be seen as strategic points of decision, leave comparatively few traces in the maps.

Different sorts of *edges* can be found in the maps, indicated as natural ridges, edges of vegetation, or borders of specific functions, such as fences around school yards, playgrounds, or football fields. As pointed out above, even the micro-scale edges seem to contribute to the legibility of the environment. One interesting example of an edge was presented by a boy who on the walk told me about the importance of a long, low wall along the street in front of his house. I asked if it was yet another place where he and his friends would sit and watch people. He said no, but that he remembered this wall as an important border when he was very small, and reinforced the line of the wall on his map. This was in Majorna, where most edges are clear and define borders between urban functions, such as a fence between the football field and the street, or a row of trees between the street and the square.

Edges can in reality also be barriers. As a visitor to the areas I could not avoid reflecting on the barrier effect that comes from functionalist traffic planning, in Tynnered particularly. We can for instance compare the situation of the tram, which is a fully integrated part of the street life in Majorna, but a major barrier running through the area in Tynnered.

All in all, the maps of the four areas differ in several ways. The grids in Lessebo and Majorna seem to make these two areas related, in spite the obvious difference between Lessebo's open-plan layout and the dense urban fabric of Majorna. In this sense, the Million Programme areas Gårdsten and Tynnered differ from the other areas. The maps from Tynnered present the least coherent images, and I propose that can be taken as an indication of a less legible and less navigable urban layout. As mentioned before, the small sample does not allow any certain statements about legibility in the different typologies, but the tendencies concerning movement network layouts, urban element interfaces, and functional and architectural differentiation are worthwhile to take to further studies.

Typologies and (sub)urban navigation

Looking back at the material of the thesis, we can see that the empirical investigations by and large have addressed the three different fields in my tentative model of basic components in spatial design. The field of *spatial and functional relations* was addressed in the space syntax study of the suburban local centres. The field of *spatial interfaces* was studied in the history of neighbourhood unit design. The field of *architectural and urban articulation*, lastly, was explored through the cognitive map study, although the sketch maps in a crucial way brought the issues of legibility and urban orientation and navigation back to the fields of spatial interfaces and spatial relations.

The theories and empirical investigations have helped to distinguish both characteristics that influence conditions for urban orientation and navigation in general and characteristics that make the housing estate suburbs fall out as an urban type of their own. With the morphologic differences within the group of Million Programme suburbs, we start to distinguish subclasses of that typology as well.

This chapter starts with a reflection on legibility in connection to the often used but seldom defined concept *urbanity*. Then I continue the discussions on urban typologies: the usefulness of typological classification and properties that typologies build upon, the deficits of spatial concepts for open-plan layouts, and the connection between environmental properties and use. Finally, I conclude and propose directions for further reseach.

Urbanity as a spatial quality

My thesis builds upon the notion that legibility is a prerequisite for the activities we call wayfinding, urban orientation, and urban navigation. As such, the issue of urban legibility is connected to the use of public space and thus in a broad sense also to the spatial qualities of *urbanity*.

The term urbanity is inevitably broad, and it has different meanings in different professions and discourses. In the architectural discourse, the spatial aspects of urbanity are often connected to the physical characteristics of individual spaces. Urbanity is then a property ascribed to certain forms and dimensions of space. Enclosed or well defined spaces are commonly considered more urban than open or spatially vague ones, as touched upon in Chapter Two with Trancik and Krier as examples.

The approach of space syntax theory draws attention to another spatial aspect of urbanity, that of spatial relations, and more importantly that spatial configuration influences the potential for human encounters. This perspective is useful in housing estate suburbs, because from an urban design point of view the problems of suburban space have been more about functional and spatial segregation, than of spatial openness or 'lost space'. The weak correlations between space-use and integration values in the large housing estate areas, as discussed in Chapter Three, confirm that the spatial and functional properties of these environments generate a specific suburban logic of space. I put forward the tentative proposition that the broken interface between the patterns of movement networks and the patterns of buildings leads to urban inertia – a state in which the environments are both less adaptable to changing needs and less receptive to changing conditions.

The results of the three studies presented in the previous chapter tell us that neither architectural style, concrete façades, nor open space as such are counteracting factors of the – much sought-after – urban qualities of the built environment. It is hardly controversial to claim that, for instance, the post-modern attempts to urbanise the suburbs with a battery of symbolic references to popular traditional urban

places (such as Italian piazzas) were shallow, but I think that still today we have problems addressing the underlying, structural conditions of urbanity.

Today there is an officially stated planning aim in Sweden to make cities 'more attractive, more multi-functional and more varied'[154]. The Urban Environment Council, whose members are appointed by the Swedish government, promotes a fine-grained mix of everything to create more attractive urban environments and the large housing estate suburbs are obvious objects of interest. The aim is to 'get away from the enormous scale, the unbalanced make-up of the population, and the monotony'[155]. What we see is the deep-rooted functionalist planning paradigm now being officially challenged.

Hillier has pointed out critical features of the housing estate typology as being typical for what he calls 'disurbanism':

> the breaking of the relation between buildings and public space; the breaking of the relation between scales of movement; and the breaking of the interface between inhabitant and stranger.[156]

His description agrees wholly with the late phases of neighbourhood planning but, as we have seen in the account of the design history, not with the earliest one. This difference in degrees of 'disurbanism' between housing estate areas supports the proposal of this thesis that open-plan layouts and housing blocks belong to different typologies depending on how the patterns of buildings are combined with the structure of the movement networks of the areas.

Promoting urban qualities should thus not be seen as striving for the traditional busy street life of inner cities. Urban areas are by necessity mixed, and so there is a need for busy places as well as quiet ones. The openness, the green spaces and the close relationship to the surrounding natural landscape are features of the concrete suburbs that many people like. If we look at the structural properties of urban design, we notice that these seemingly 'anti-urban' features can be combined

[154] *The Urban Agenda*. Swedish Urban Environment Council 2003, Karlskrona, p. 4.
[155] *The Urban Agenda* 2003, p. 11.
[156] Hillier 1996, p. 175.

with ‘urbanity’ if we understand the concept to mean, for instance, a clearly defined public space and spatial potential for encounters and interaction.

Urban typologies

Let us go back to the pair of concepts I have called place recognition and type recognition. *Place recognition* is when we know an environment from personal experience. We know the buildings and the streets and, whatever the conditions for urban orientation, we know where to go and how to get there simply because we are familiar with the place. With *type recognition* we use our knowledge from one environment in another, and can do so because they belong to the same type – they carry similar crucial characteristics, even if they do not look exactly the same. In this sense types are useful, because they help us to understand our world.

Julia Robinson puts forward two different kinds of types in architecture, which I find relevant for this discussion on urban design. She calls the first kind *basic types*. According to Robinson’s distinction, basic types are used in everyday language by all members of a culture. The second kind is called *classificatory types*. The classificatory types are used in the professional discourse to describe formal and other differences.[157]

In the Swedish context the Million Programme concrete suburb (*betongförorten*) is one example of a basic type. Likewise the traditional grid (*kvartersstaden*), and the area with detached houses (*villaområdet*) are commonly known types, with labels that are used in everyday language. Seen as a basic type, the concrete suburb is roughly characterised by features such as housing in large and spread-out buildings, large parking lots, monotonous façades, open fields, and social segregation. I would say that this is a widespread picture of the Million Programme suburbs (although probably not as recognised by people who live in

[157] Robinson, Julia W. 1994, ”The Question of Type”, in Frank & Schneekloth (eds.) 1994, *Ordering Space. Types in Architecture and Design*. New York, p. 180.

these areas as by those who read about them in the papers and see them on television).

However, if we look at the concrete suburb and its predecessors in the neighbourhood unit planning paradigm as design professionals, we can acknowledge that the discourse by and large still has to elaborate *classificatory types* for these urban environments. Aldo Rossi's words from the 1960s seem applicable:

> in a very general way, we can establish a logical geography of any city; this logical geography will be applied essentially to the problems of language, description, and classification. Thus, we can address such fundamental questions as those of typology, which have not yet been the object of serious systematic work in the domain of the urban sciences.[158]

Since then systematic work has after all begun. Initial attempts to classify Swedish urban types have been presented by Johan Rådberg, who bases his typologies on building density and building form.[159] Rådberg points at the critical difference between the traditional urban pattern, with small individual building plots along streets, and the modernist urban pattern, made up of large elements in open layouts[160]. Rådberg groups the housing estate areas of the modernist pattern of building into two broad classes: the first is made up of medium-density blocks of flats, three to four storey linear buildings; the other class comprises high-rise residential towers or slab blocks, of six to twelve storeys.[161] The emphasis lies clearly on the morphology of buildings, but Rådberg touches upon the importance of street patterns as well.

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[158] Rossi, Aldo 1982 [1966, *L'architettura della citta*], *The Architecture of the City*. The MIT Press, Cambridge, Massachusetts/London, England, p. 33.

[159] Rådberg, Johan 1997, "Towards a Theory of Sustainability and Urban Quality. A New Method for Typological Urban Classification", in Gray, Madi (ed.) 1997, *Evolving Environmental Ideals. Changing Ways of Life, Values and Design Practices*. Proceedings, 14th Conference of the International Association for People-Environment Studies, Stockholm, pp. 384-392; and Rådberg & Friberg 1996.

[160] Cf. Marcus 2000, who compares plot sizes of inner city areas, with regard to their influence on land use.

[161] Rådberg 1997, pp. 387-390. Rådberg uses the terms 'walk-up' or 'lamella' buildings, for the typical functionalist 3-4 floor linear apartment buildings.

The housing estate areas can well be sorted into further sub-categories, according to the configuration of the movement networks and the interfaces of urban elements. There are, for instance, areas with the category '3-4 storey linear buildings' both in neighbourhoods from the 1940s and in the Million Programme suburbs. As we could notice in the first empirical study, the buildings in the 1940s' areas have a close relationship with the streets, the streets are used by pedestrians as well as motorists, and the street network is mainly a continuous grid. In the Million Programme areas with three to four storey buildings, the street–building interface is almost non-existent and the buildings are directly accessible only to pedestrians. As discussed in previous chapters, this difference between the two sub-types is fundamental for how we perceive and orientate ourselves in an urban environment. But this crucial difference in morphology becomes evident only when we combine the buildings with other urban elements, such as the street, and the configuration of the street patterns. Karen Franck and Lynda Schneekloth argue that:

> [Types] guide and constrain much of what we think and do, yet they remain implicit and largely invisible.[162]

I believe this is an important reminder. It seems that architects and urban designers too easily have embraced the general picture of the concrete suburbs, and based their analyses on the basic type's properties. If this assumption is right, it explains why so much attention has been paid to the easily noticed characteristics – such as open space (in general), building height, concrete, and straight lines – at the expense of the 'hidden' properties, that is the structural spatial conditions which I have tried to highlight in my studies.

[162] Frank, Karen A. & Lynda H. Schneekloth (eds.) 1994, *Ordering Space. Types in Architecture and Design*. New York, p. 9.

Legibility: general and cultural

It seems clear that we all need legible order, but there is an interesting difference between legibility in general and culturally bound legibility. The most general legibility will come out of unambiguous environmental cues, like a stair or a door, of which almost all people understand the meaning.[163] These design elements can hardly be misunderstood (as long as they are used for normal purposes, and not to question the foundations of architecture, as some post-modernist architects set out to do).

There are not many features of the built environment that are totally unambiguous, but luckily the environment works very much like languages (although far from the book-reading parallel). There is a great variety in how the parts can be put together and still convey the essential (*behavioural*) meaning. In this sense, the analogy between spatial relations and language that space syntax founders Hillier and Hanson propose is well grounded[164]; people in general use spatial configurations without knowing what to call them, just as many of us can speak languages fluently without being able to account for the grammar.

The cultural level of legibility represents all sub-groups with similar experience of built environments. The 'Swedish town', for instance, is a distinct type (or at least it used to be), with an order that supports legibility for those who are familiar with that kind of environment. Here Uppsala, looking back to the 1950s, is described by architecture critic Eva Eriksson in a nostalgic way that could apply to many other towns, of various size, in Sweden (except for the mention of a castle):

> It was a clear and comprehensible environment. The church had a tower, and so had the castle. The school was an impressive building […]. The town hall was even more monumental.[---]

[163] Cf. Passini et al 2000.

[164] Hillier & Hanson 1984; Hillier 1996.

> The square was the given central point of the town. That was where all the bus lines met, the most important civic buildings were located there as well as the biggest department stores. It was a logical organisation, a legible and clear structure, which you easily could comprehend and store like a map in your own head.[165]

Many of us will certainly recognise this type of town and we can notice that the description of the environment differs on central points from the housing estate areas. Interestingly enough, several typical features that help orientation are mentioned: functional differentiation and architectural articulation, a configuration that made the square the central point of the town, and the legible and clear structure of the urban layout. In a Million Programme concrete suburb the environmental cues for orientation will naturally be different. The spatial and architectural characteristics of the housing estate areas can make them difficult to understand intuitively for someone who is brought up with the traditional urban type, but will be less problematic for people who have the suburban environment as their natural reference.

Research on this subject has been carried out in a housing estate area in Tychy in Poland.[166] Tychy is a post-war New Town, with the spatial characteristics of modernist urban planning. In an investigation concerning urban legibility in relation to personal references, Magdalena Zmudzinska-Nowak found clear differences between two groups of inhabitants of Tychy: the young people who were born in Tychy thought the urban environment legible, while the generation of parents, who moved there from traditional urban environments, mainly found it illegible. The 'parent' generation said they missed traditional characteristics (similar to those described in Uppsala above), whereas the 'children' generation found the area not only legible, but also pleasant.

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[165] Eriksson, Eva 1991, "Svenska städer 1950-90. Några lärdomar", *Tidskriften 90tal*, 4/1991, p. 8, my translation ["Swedish towns 1950-90. Some learning"].

[166] Zmudzinska-Nowak, Magdalena 2003, "Searching for Good City Form – Kevin Lynch's theory in contemporary perspective". Unpublished conference paper, *Legibilities: place identity and design in the 21st century*. Bristol, GB, 3 April 2003.

The opinions of the young generation of Tychy match quite well the statements made by teenagers in Gårdsten and Tynnered in my study. Generally speaking, they claimed to find their areas easy for wayfinding (although they had various difficulties in giving directions to others). One of the girls from Gårdsten mentioned that she thought wayfinding was worse in the centre of Göteborg, where she often went with friends, because of the density, and that everything there looked the same. It is noteworthy that someone brought up in a concrete suburb speaks of the traditional, mixed-use dense grid as being illegible and difficult for orientation.

An issue that has been touched upon earlier in the thesis is how architects differ from lay people in their conceptions of the built environment. That there is a difference between what design professionals and lay people find significant in the built environment is commonly known and often commented upon. Gary Moore, for one, states that:

> gross characteristics or dominance of form influence what we recall, but very importantly (especially as it contradicts a lot of fervently held architectural and urban design notions) use significance, the environment as a setting for personally meaningful activities, siting consideration, and ease of linguistic labels may be much more important for cognitive representation and memory than subtle design factors.[167]

For the understanding of people's relationship to their own everyday places, this is a vital remark. Where the environments fulfil the practical needs of people, and where the inhabitants with time create their own history and for instance name significant places, these features of the built environment compensate what outsiders may see as shortages in the architectural or urban design.

This is, however, a deviation from our main track here, that of legibility as a condition for urban navigation. Needless to say, that people manage to find meaning in their everyday environment is important, but it is part of what I have called place recognition. The same applies to the fact that the teenagers of the housing estate suburbs find their own areas legible and easy for orientation. To make the environments legible to

[167] Moore 1983, p. 24.

more than the locals, urban design needs to strive for sturctural coherence: configurations of movement networks that support urban navigation and articulation of space that supports general legibility. And again, even if we learn to recognise and distinguish types, it does not imply that the types are good for navigation. This is evident in the cases of Tynnered and Gårdsten. The building typologies are quite clear and in themselves legible in both areas but, combined with the movement networks, the differences appear: the overall urban structure of Tynnered is more difficult for navigation than that of Gårdsten.

Housing estates and urban elements

In the Levy matrix presented in Chapter Two, we find the basic relationships among the urban elements *street – building – open space* in different combinations.[168] If we see the hyphen as the interface, this is where the exchange takes place. This is also where one element defines the other.

Although I find the matrix very useful as a tool for thinking, I see the problem with these simplified categories of urban elements. 'Street', for instance, is a problematic concept in the housing estate suburbs. The mere use of the word tends to be normative, in favour of the traditional urban street. In the modernist urban settings, the street as an urban element has been split up in several sub-categories with different functions and different spatial properties. The question is what the element 'street' stands for in these environments. Does the pedestrian path represent the same element as the feeder roads and the arterials? I say yes: the basic function of the urban element 'street' is to be the carrier of movement, and with such a definition all movement networks qualify into the 'street' category – pedestrian paths as well as the roads for vehicular traffic.

[168] I leave out the element plot here, because of its administrative character, and use the perceptible elements only.

Figure 4.1
Movement networks in Tynnered. Compare to the map in figure 3.34 d on page 133, which depicts this street with the bridge as a point of reference.

Still, with the traffic differentiation and the transformation of the street–building interface outlined in the neighbourhood unit history, the new urban settings gradually lost the integrated mixed-use street, which was a natural (if only *potential*) generator of the urban qualities that are cherished today – a public space that is naturally used for work and for leisure, that is open for all, and can be shared by inhabitants and strangers on equal terms.

Apart from the obvious difference in the restrictions concerning users (pedestrians and/or vehicles), further qualitative variations come with how the different 'streets' are combined with other urban elements. Conditions like speed and use frequency will often follow as a consequence of the combinations and of the design of the interfaces. We could, for instance, see a pedestrian version of the 'street' element in Gårdsten.

It is clear that the close street–building interface contributes to the rather lively atmosphere between the buildings there: the pedestrian path has a close and direct relationship to the buildings and the building entrances face the path. Furthermore, the path leads straight to the centre, which means that configuration and interface design here interact to make this residential street an attractive route in local navigation.

The residential street can be compared to Gårdsten Centre, the area's small indoor centre, which reveals itself through a signpost by the feeder road (Figure 4.2). For visitors to the area, the centre appears as an inconspicuous building by the parking lot and the bus stop. It is a typical dead end point of destination in the hierarchic movement network, and the vehicular street that leads there is not related to any buildings at all along the way. The parking lot is the open space that mediates between the street and building.

When streets, of any kind, relate to open space instead of buildings, we come across the next problematic category: 'open space', which is even more difficult to handle than the 'street' element.

Figure 4.2
Gårdsten Centre

Open space, use, and movement

The open spaces of the football ground in the middle of the urban grid in Majorna (Figure 4.3), of the valley in Gårdsten, and around the suburban feeder roads are all extremely different, in both character and use. The wide range of open spaces between residential buildings in the housing estates represents an almost similar variety.

Just as with the other urban elements, the morphological qualities of 'open space' vary with how it is combined with other urban elements. The most interesting aspect for the housing estate suburbs is the matrix's relationship of open space–open space. This combination points towards the need to analyse the abundance of sub-categories of open space that we find in these urban environments: their forms, their functions, and the ways that they are used.

The lack of spatial differentiation and spatial hierarchy in housing estate areas has been shown to influence both perception of space and space use. In the Polish study I referred to above, it was found that

Figure 4.3
Majorna, with the open space of the football ground in the void between urban blocks.

the 'children' generation of Tychy did not fully grasp the meaning of traditional urban spatial categories like courtyard, street, alley, quarter, avenue, and square. That seems reasonable, provided the persons in question have little personal experience of these traditional spatial categories. What is interesting here, though, is that they also seemed to lack adequate expressions for their own spatial environment. Zmudzinska-

Nowak states that: 'the language and range of notions that they use […] is as poor as the described space that surrounds them'[169]. The Tychy study confirms the notion that the new (or at least relatively new) spatial categories of modernist urban space are difficult to label. The reason for this is of course that many of the open spaces are hard to identify, since they are both spatially and functionally vague.

Returning to the Swedish housing estate areas, we can once again notice that there is a difference between the early neighbourhood units and the concrete suburbs of the Million Programme. In the early neighbourhood areas, the spatial interfaces – although in open-plan layouts – define distinguishable elements such as street, courtyard, and landscape. In the concrete suburbs, on the other hand, there is an abundance of space that is neither street, courtyard, landscape, nor any other known spatial or functional category, but merely (superfluous) distance.

This does not go to say that all urban space must be ordered, defined, and labelled. Cities need the odd spaces that are not programmed for certain ends, but there is a great difference between the sorts of urban space that invite creative use, such as the 'off-stage' places youngsters often seek for their gatherings[170], and poorly maintained and desolate voids between residential buildings. This phenomenon of *no man's land* between buildings in housing estates has been observed by, among others, Rosane Bauer in studies of modernist space in Brasilia[171]. Many of these spatially and functionally vaguely defined spaces seem resistant to people's appropriation, a notion that can be confirmed in almost any Million Programme housing estate suburb.

In another Brazilian study, carried out to compare two housing estate areas in the city of Porto Alegre, Maria Cristina Lay discovered interesting differences in how spatial use related to urban design.[172] The two areas of the study were both built according to the modern-

[169] Zmudzinska-Nowak 2003, p. 12.
[170] Cf. Lieberg 1992.
[171] Cf Bauer, Rosane 1997, *Living with Brasilia*. Lic., Chalmers University of Technology, Göteborg.
[172] Lay, Maria Cristina D. 1997, "Relationships Between Site Layout and Spatial Behaviour in Low Income Housing Schemes", in Gray (ed.) 1997, pp. 159-168.

ist open plan principle, and comparable in terms of building age and size, ownership, and population (regarding ethnic mix, socio-economic level, and length of residence). The crucial difference between the areas belonged to features of design, and concerned exactly the issues we have discussed here: the spatial interfaces and the patterns of movement networks. Lay found that a non-systematic orientation of entrances together with a chaotic variety of outdoor spaces between the residential buildings in one of the areas had a negative effect on the way people used and maintained their environment. In the other area, where the spatial interfaces were clear – so that the inhabitants could distinguish open space in terms of public, semi-public, and semi-private categories – the open spaces were appropriated, used, and maintained to a greater extent than in the first area, where the spatial design was less legible.

However limited in size, the investigation points out important clues to the impact of design. According to Lay, the *legibility* of the different layouts affected the *use* of each area, which led to different behaviour of *territorial* responsibility. Lay found that the following aspects had a positive effect on the user's perceptions of space:

1) perceivable front and back relationship between buildings;
2) the good placement of buildings in relation to the pedestrian routes;
3) clear indication of space hierarchy;
4) adequate size and location of spaces;
5) good visual and functional accessibility of spaces
6) terrritorial control.[173]

These findings support the propositions about the transformation of the Swedish neighbourhood unit design from the 1940s through the Million Programme period. The clear interfaces between the urban elements street–building–open space of the early neighbourhood units agree well with most points on Lay's list, while many of the concrete suburbs lack these spatial properties.

[173] Lay 1997, p. 166.

We can also compare with the sketch maps from the different typologies in the previous chapter. I proposed that micro-scale edges, such as the fences of the private courtyards and the demarcations of specific functions in open space (parking included), contribute to a better legibility of the environment. These micro-scale edges were found in all the four areas of that study. However, since the edges were accompanied by a more comprehensible structure of movement networks in both Lessebo and Majorna, these areas seem on the whole to be more legible than the Million Programme areas Gårdsten and Tynnered.

This discussion implies that it would be a good idea to propose demarcations, such as fences and walls, to create hierarchical differentiations of space. Distinguishing private and semi-private space from space that is semi-public and public has been found to have a positive effect on space use.

But things are more complicated than that. From Gårdsten we get an example of a micro-scale edge conflict, which concerns legibility and urban navigation. To demarcate the semi-private areas of the open courtyards, the responsible housing company has recently put up fences. Seen in the light of both the Brasilia and the Porto Alegre studies above, this may be an important measure to support the tenants appropriation of the semi-private space between their buildings. But the effect is also that the housing company has cut off some of the informal trails through the area, and people who now to try follow the paths reach dead ends. I came across the problem on a sketch map walk with one of the Gårdsten students. We decided[174] not to climb the fence to his block, but to walk around the estate instead. This particular fence was actually brought up for discussion in a recent master's thesis at Chalmers School of Architecture. When asked about the fence and the cut-off trail in an interview, the housing company representative stated that there is no reason for people to walk through there.[175] Still, with the obvious marks of the trail on the ground, it seems quite clear that people have found

[174] Or, possibly, I did.
[175] Larberg 2003, p. 26.

reasons to do just that. Now, there is not even a gate in the fence, which otherwise would have been a simple way to keep the trail open and still indicate to visitors that they are entering into a semi-private space.

The problem here is not on the very local level of this particular courtyard. Perhaps the problems of unknown people passing the courtyard in this case were bigger than the detours people now have to take. The larger problem that was revealed, though, is the attitude of planners: suburban movement is thought of in terms of programmed routes for the inhabitants. The simple and fixed patterns of movement that are typical for the 'origin-destination systems' of the monofunctional housing estate areas seem to be a prevailing figure of thought at all scale levels. To facilitate better conditions for legibility and navigation in general, the inflexibility of the movement networks should rather be a notion to challenge.

Conclusions

The objective of this thesis has been to investigate the morphology of the Swedish housing estate suburbs, with particular focus on legibility and the conditions for urban orientation and navigation. I have based my discussions on theories that show that legibility influences environmental cognition and spatial use in significant ways, and on three empirical studies with the common approach of investigating legibility and conditions for urban navigation. Now it is time to conclude.

To start with, we must acknowledge that the physical structure of any urban environment can be learned and recognised. For most people living in a given environment, everyday urban navigation does not require any particular properties in the environment, as soon as the inhabitants have acquired what I call place recognition. Legibility is not really an issue for orientation in well-known environments. But for the experience and performance of the urban visitor or explorer, both structural coherence and visual appearance are important aspects for wayfinding. The visual appearance of buildings and places give clues for orientation, whereas the underlying spatial structures facilitate navigation. When we judge visual clues, we employ what I call type recognition.

The first study highlighted how the urban elements 'street' and 'building' became increasingly disintegrated during the neighbourhood unit paradigm. This shift in urban design resulted in new urban typologies in which the urban element 'open space' came to be the mediating element between the others. These new typologies are not necessarily less legible, but we can say that the conditions for urban orientation and navigation are different from traditional urban settings: many Million Programme housing areas are parts of a disintegrated urban landscape, which also largely lacks coherent relationships between the patterns of movement networks and the patterns of buildings.

The second study illuminated the particular spatial configuration and functional layouts of the housing estate suburbs and how they condition urban orientation and navigation in ways that make these areas less flexible, and possibly also less adaptable to changing circumstances. I propose that we pay close attention to these issues henceforth to see if the housing estate typologies suffer from what I tentatively call urban inertia.

Lastly, the cognitive maps of the third study suggest that typologies with continuous movement networks and a clear interface between urban elements afford better conditions for urban orientation and navigation. The study confirmed that traffic planning and the design of movement networks have a significant influence on our perception of urban space. It was also obvious from the maps that what I call micro-scale edges make the structures more coherent and thus support legibility.

Hence, the three studies present research support for what to a large extent already is common (professional) knowledge. The housing estate suburbs have their own urban logic, which in many cases fails to support a comfortable urban life, public as well a private.

In addition, I argue that it is not foremost the visual appearance of the concrete suburbs that distinguishes them as urban typologies. A more significant property is the lack of structural coherence. Concerning legibility and the conditions for urban orientation and navigation, we can say that the concrete suburbs are a-typical: even if we recognise them as basic types, the lack of coherence in how the typical elements are assembled means that we have little use of type recognition for our navigation in these types of environment.

Further research issues: mediating open space and active or passive interfaces

A continuous challenge for research within the field of urban design is to identify what properties to study to understand how the built environment can support both public and private everyday life in modernist suburban settings.

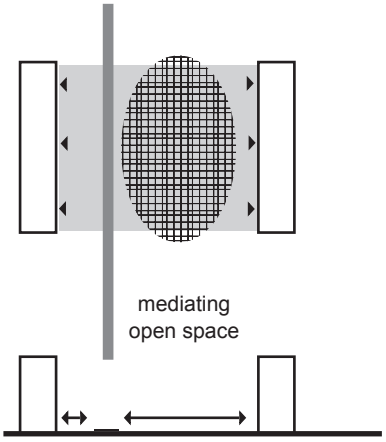
In my account of the morphological transformation of neighbourhood units, it was evident that one aspect of the differences between the typologies of the 1940s, 50s, 60s, and 70s derives from the changes in the relationship between buildings and streets. The tight and active street–building interface of the early neighbourhood units gradually evolved into the wider and more passive street–building interface of the 1950s and beyond. The scope of this thesis has not been to investigate use, but to distinguish spatial properties which can be employed in coming analyses of urban environments.

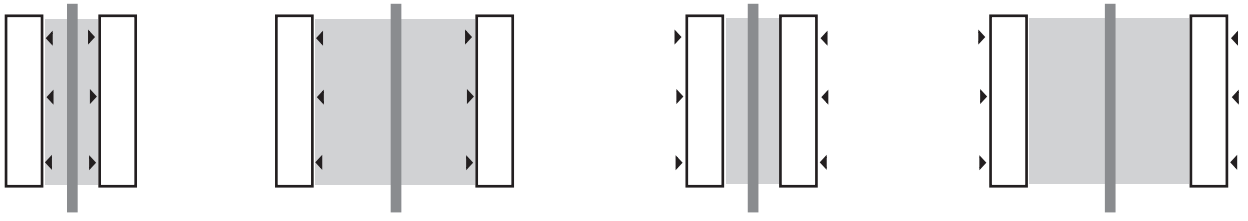
Looking ahead, the outlined aspects of urban morphology seem well qualified for research, to see what impact they may have on spatial use. In Sweden, there is a lack of these sorts of empirical studies that address correlations of morphology and use, and more knowledge is needed about how different typologies are appropriated by different groups of users. With the typological traits brought to light in this thesis,

Figure 4.4
One sort of mixed-use urban space: open and public, with a passive street–building interface.

Figure 4.5
A tight 'street'–building interface, and also a close relationship between public and private space. In the urban grid, this is the common relationship. In many housing estates, this border zone seems problematic.

Figure 4.6
Examples of a simple conceptual framework: tight and wide street–building interfaces, active and passive interfaces, mediating open space.





it should be possible to search for systematic covariance between structural properties of the environment and spatial use of different kinds.

All in all, further detailed studies of specific environments are now needed to highlight the particular assets and possibilities of the housing estate typologies, and how to develop the suburbs as urban environments in their own tradition.

A final remark

Legibility relies on the visual appearance as well as the structural coherence of the built environments. To address this central theme of this thesis in planning is one of many keys to creating good urban environments. Areas that are designed to support orientation and navigation are also well suited to sustain everyday encounters and different sorts of social, cultural, and economic exchange. This is essentially what urbanity is about, and the challenge for architects and urban designers is to facilitate the best spatial conditions for it also in the suburbs.

Sammanfattning

Förortens former

Om dolda och synliga förutsättningar för orienterbarhet i stadsmiljö

1. Inledning

Betongförorternas skenbart enkla uppbyggnad

Denna avhandling är en morfologisk studie av miljonprogrammets stora bostadsförorter och deras föregångare inom grannskapsplaneringen. Områdena som studeras är i regel byggda som isolerade enklaver i form av trafikseparerade grannskap med hus i park och ett centrum med service och hållplats för kollektivtrafiken. Boende är den helt dominerande funktionen i dessa stadsdelar. Dessa karakteristika är gemensamma för de flesta grannskapsenheter som byggdes från 1940-talet och framåt, men medan de tidiga grannskapsenheterna idag ses som idylliska stadsmiljöer framställs bebyggelsen i betongförorterna ofta som problematisk. För att förstå vari problemen ligger syftar avhandlingen på att identifiera både vilka egenskaper i de olika miljöerna som är lika och på vilka kritiska sätt de skiljer sig åt. I avhandlingen konstateras att arkitektur- och stadsbyggnadsforskningen till stor del saknar adekvata begrepp för de rumsliga ordningar som finns i denna stadsbyggnadstypologi.

Avhandlingen belyser förortstypologierna genom att studera de förutsättningar gestaltningen ger för orienterbarheten i stadsdelarna. Perspektivet är valt av flera skäl: orienterbarhet är nära besläktat med begreppet läsbarhet som ofta förekommer inom den allmänna arkitekturdiskussionen, orienterbarhet och läsbarhet i stadsmiljöer är också forskningsfält inom flera discipliner med stadsmiljö som minsta gemensamma nämnare, och slutligen är förutsättningarna för hur människor kan förstå och ta sig runt i städer avgörande för hur städer och stadsdelar fungerar. Här skiljer avhandlingen på den förståelse och den kunskap vi har om platser vi känner av egen erfarenhet, respektive den förståelse och den kunskap vi orienterar oss med på platser vi inte tidigare har varit, men som vi känner igen som typer. Begreppen som introduceras är platskännedom respektive typkännedom.

Orientering i stadsmiljöer baseras huvudsakligen på två sorters egenskaper i miljön: de underliggande strukturella och de öppet visuella. De strukturella egenskaperna i den byggda miljön är inte omedelbart överblickbara eller uppenbara för oss när vi rör oss genom stadsrummen. Dessa underliggande rumsliga relationer lyfts därför i avhandlingen fram som de dolda förutsättningarna för orientering. De diskuteras med utgångspunkt i rumslig syntax teori (space syntax theory). De underliggande, dolda förutsättningarna måste också kombineras med de öppet synliga för att få en helhetsbild av hur vi orienterar oss i städer. De visuella förutsättningarna ägnas vanligtvis stor uppmärksamhet inom arkitektur och stadsgestaltning, och diskuteras ofta i termer av estetik. Denna avhandling avstår diskussionen om det estetiska, för att koncentrera uppmärksamheten på vad – över huvud taget – som människor uppfattar som synliga orienteringspunkter i den byggda miljön.

Eftersom avhandlingen är en morfologisk undersökning är det viktigt att skilja på vad som ses som betydelsefulla signaler för orientering, och vilka inslag i miljön som är betydelsefulla för människor därför att de bär på en mening i existentiella termer. Här finns endast anspråk på att identifiera fysiska och strukturella egenskaper som stödjer orienterbarheten i den byggda miljön.

Avhandlingen presenterar en enkel modell för sambandet mellan rumslig organisation, rumsliga gränssnitt och rumslig artikulation, med tankar om hur gestaltningen av de tre komponenterna hänger samman med bättre eller sämre orienterbarhet.

2. Teori

Om att beskriva stadslandskapet och att orientera sig i det

Vilka egenskaper i gestaltningen gör stadsmiljön mer eller mindre begriplig för dess användare? Vilken slags information tar våra sinnen över huvud taget emot från den fysiska miljön? Utgångspunkten för avhandlingen är att orienterbarhet i stadsmiljö beror på hur det öppna och kontinuerliga offentliga rummet är sammansatt till en helhet: vilka delar som ingår, hur dessa delar kan identifieras och hur de är kopplade till varandra.

De teoretiska resonemangen i avhandlingen bygger dels på arkitekturdiskursen i en vid bemärkelse, dels på kognitionsforskning med rumslig inriktning. Den teoretiska genomgången är uppdelad i två delar. Den första behandlar begrepp och teorier som rör rumslig organisation, alltså hur den fysiska miljön klassificeras, dels i dess enskilda delar, dels som sammansatta strukturer. Redogörelsen baseras utöver arkitekturdiskursen på syntaxteori och miljöpsykologi. Den andra delen behandlar teorier om vad den byggda miljön kommunicerar i sig. Resonemangen här bygger dels på traditionen från Kevin Lynch och hur vår uppfattning om den byggda miljön kommer fram i kognitiva kartor, dels på anslutande miljöpsykologisk forskning om hur människor orienterar (sig) i stadsmiljö.

3. Metod och empiri

Gränssnitt, konfigurationer och kognitiva kartor

Det empiriska materialet består av tre separata studier. Gemensamt är att de utgår från teorier som uttryckligen diskuterar den byggda miljöns läsbarhet eller ’begriplighet’ (legibility/intelligibility).

Den första studien är en genomgång av grannskapsförorternas formmässiga utveckling med exempel främst från Göteborg. Den teoretiska utgångspunkten är Björn Linns morfologiska studier av bebyggelsemönster, som han menar kan vara mer eller mindre läsbara. Linns synsätt kombineras här med urbanmorfologen Albert Levys kategorisering av de grundläggande urbana elementen gata-byggnad-öppet rum, samt syntaxteorier om rumsliga relationer. Avhandlingens bidrag blir en metodisk studie i urbana gränssnitt, och historiken visar hur samma urbana element, genom en stegvis förändring i gestaltningen av deras inbördes relationer, till slut skapar fundamentalt nya förutsättningar för stadslivet.

Den andra studien undersöker förortens konfigurativa egenskaper, med utgångspunkt i syntaxteorins axialanalys. Kopplingen till avhandlingens tema om orienterbarhet finns i att Hillier beskriver rumsliga konfigurationer som mer eller mindre begripliga (intelligible), och att axialanalyser påvisat överensstämmelser mellan rumslig konfiguration och människors rörelsemönster. Studien omfattar 14 lokala förortstorg i Göteborg, och de stadsdelar de tillhör.

Avsikten var att undersöka om besöksfrekvensen på de lokala torgen korrelerade till stadsdelarnas övergripande rumsliga struktur. Inga sådana samband kunde säkert påvisas, och resultatet av studien kom att lyfta fram viktiga skillnader mellan den funktionsblandade staden och den huvudsakligen monofunktionella förorten. Begreppet trög stadsstruktur (urban inertia) introduceras på försök som beskrivning av miljöer som är mindre anpassningsbara till förändrade behov och mindre mottagliga för ändrade förhållanden. Karakteristiskt för trög stadsstruktur skulle då vara en gestaltning som kombinerar gles bebyggelse med otydlig koppling mellan rörelsestrukturer och byggnader (gränssnittet gata-byggnad), och en djup konfiguration.

Den tredje studien ägnas åt de visuella aspekterna på orienterbarhet, utifrån Kevin Lynchs analyser av kognitiva kartor och hans klassificering av de urbana elementen stråk, nod, distrikt, gräns och landmärke. I denna tredje studie fick niondeklassare från fyra olika områden i uppgift att rita kartor som vägbeskrivning genom deras hemorter. Avsikten var att undersöka vilka element i den byggda miljön som ses som orienteringspunkter, och om de morfologiska skillnaderna mellan de olika typologierna skulle speglas i vägbeskrivningarna. Av de fyra områdena var två miljonprogramsförorter, ett var funktionsblandad kvartersstad och ett var ett mindre brukssamhälle. Studien visar att elevernas vägbeskrivningar i de olika typologierna skiljer sig åt på flera områden. Den främsta skillnaden fanns i hur det angivna stråket förhöll sig till omgivande element. Det trafikseparerade miljonprogramsområdet med djup konfiguration och otydliga gränssnitt mellan stråk och bebyggelse beskrevs med de minst strukturerade vägbeskrivningarna. De två referensområdena med kontinuerligt, funktionsintegrerat gatunät presenterades i mer sammanhängande vägbeskrivningar. Studien antyder vidare att orienterbarheten i en öppen planstruktur stöds av tydliga gränssnitt.

4. Diskussion

Typologiska drag och urbana kvaliteter

Hur begripliga och orienterbara olika typologier är beror på vår tidigare erfarenhet av dem. Platskännedom kan uppväga dålig orienterbarhet i miljön, medan typkännedom kan hjälpa oss att hitta i miljöer vi aldrig tidigare har besökt. En förutsättning är då att typologins egenskaper i sig inte hindrar orientering.

Diskussionen knyter avhandlingens undersökningar till forskning som visar hur en mer begriplig utformning av gränssnitt och gatunät visat sig påverka människors användning av stadsmiljön. Behovet av adekvata begrepp för de speciella rumsliga ordningar som finns i miljonprogrammets öppna planformer understryks i avhandlingen, ett behov som bekräftas av både avhandlingens egen empiri och annan forskning som refereras.

Definitionerna av de urbana elementen gata och öppet rum diskuteras i förhållande till förortens rumsliga karakteristika. Såväl ’gata’ som ’öppet rum’ är betydligt mer komplexa element i modernismens öppna stadsstrukturer än traditionell stadsmiljö. I avhandlingen argumenteras för att miljonprogrammets så kallade betongförorter i fråga om gränssnitt och konfigurationer kan sägas tillhöra olika underklasser av samma typologi. Skillnader i rörelsestrukturens djup och skillnaden i gränssnitt mellan de urbana elementen gata–byggnad–öppet rum innebär att de rumsliga förutsättningarna för exempelvis orientering och rörelser till och inom stadsdelarna skiljer sig åt. Detta kopplar avhandlingens tema om orienterbarhet till mer allmänna urbana kvaliteter. Med stöd i annan forskning hävdas att goda förutsättningar för orientering är betydelsefullt för ett vitalt och varierat stadsliv, därför att god orienterbarhet underlättar ekonomisk, social och kulturell integration i städer.

Slutsatser: Förorternas gränssnitt och kopplingar

Att undersöka egenskaper som har med orienterbarhet att göra gjorde det möjligt att samtidigt belysa frågor som rör generella urbana kvaliteter, liksom den eventuella bristen på dem, i miljonprogrammets förorter. Den centrala slutsatsen är att där bebyggelsens struktur

samverkar med strukturerna för rörelse ökar ’begripligheten’ och orienterbarheten i den byggda miljön. Vidare hävdas att ett gatunät som är sammanhängande och kontinuerligt bättre stöder grundläggande urbana kvaliteter än ett uppbrutet gatunät med starkt styrd start-mål orientering. En mer precis klassificering av den rumsliga strukturen i öppna planformer behövs fortfarande. Hur utformningen av gränssnitt och kopplingar sedan verkligen påverkar användningen av den byggda miljön är angelägna frågor som kräver vidare empiriska studier inom stadsbyggnadsforskningen.

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Note: brackets mean (English titles), braces mean [my translation]

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Appendices

Appendix 1: Space syntax study table

integration values vehicular movement networks	steps from c-line to most integrated line	average number of visits/respondant and weeek	number of functions	mean integration value for the area	integration value for c-line	mean integration (3) for the area	integration (3) value for c-line	loyalty	% of car owners in the area	pharmacy	bank	post office	library	liquor store	tram	bus	inhabitants (31-12-98)	households (31-12-98)
Wieselgrensplatsen	0	3.6	44	0.7316	1.2436	1.6359	3.25	84	31	o	o	o		o	o	o	12500	7745
Kortedala torg	1	2.3	40	0.4066	0.5439	1.3537	1.2737	46	39	o	o	o	o	o	o		20433	11939
Vårväderstorget	1	3.3	30	0.44	0.6993	1.1386	1.1386	53	39	o	o	o	o	o	o		6560	3631
Länsmanstorget	2	2.7	9	0.616	0.8242	1.3029	1.7741	52	52	o		o			o		7999	4165
Rannebergen centrum	2	2.9	9	0.4025	0.4737	1.1961	1,0000	33	48							o	4352	2008
Bergsjön centrum	3	3.8	11	0.4187	0.5158	1.1185	1.1634	56	32	o			o		o	o	6702	3574
Kyrkbytorget	3	3.5	18	0.7012	0.8347	1.764	1.3792	34	49	o	o	o	o			o	7321	4475
Radiotorget	4	2.2	18	0.4669	0.6321	1.3925	1.3791	24	56							o	3310	1925
Hammarkulletorget	5	4.2	8	0.4067	0.4771	1.1504	0.7047	40	29	o		o	o		o		7085	2816
Hjällbo centrum	5	3.4	13	0.3861	0.4321	1.2210	1.1634	46	36	o	o	o	o		o	o	4948	1813
Selma Lagerlöfs torg	5	2.9	30	0.4370	0.5815	1.3096	1.1634	56	45	o	o	o	o	o		o	15899	7629
Axel Dahlströms torg	6	2.6	18	0.5185	0.5387	1.5028	3.1338	45	41	o	o		o			o	19034	11981
Brunnsbo torg	6	4.4	11	0.4643	0.5392	1.3948	1.7741	78	52	o		o				o	5991	2875
Tuve torg	8	4.4	17	0.4032	0.4907	1.3143	1.1634	84	45	o	o	o	o			o	8934	3922
pedestrian network values																		
Hammarkulletorget	0	4.2	8	0.6520	1.0940	1.5695	4.3780	40	29	o		o	o		o		7085	2816
Hjällbo centrum	0	3.4	13	0.9111	1.5466	2.0006	4.2603	46	36	o	o	o	o		o	o	4948	1813
Selma Lagerlöfs torg	0	2.9	30	0.5363	0.8015	1.9371	3.7632	56	45	o	o	o	o	o		o	15899	7629
Wieselgrensplatsen	0	3.6	44	1.2162	2.3154	2.366	5.4781	84	31	o	o	o		o	o	o	12500	7745
Vårväderstorget	1	3.3	3	0.7322	1.0054	1.9458	2.3964	53	39	o	o	o	o	o	o		6560	3631
Bergsjön centrum	2	3.8	11	0.5890	0.8115	1.7968	2.8702	56	32	o			o		o	o	6702	3574
Tuve torg	2	4.4	17	0.6194	0.8810	2.0138	2.5000	84	45	o	o	o	o			o	8934	3922
Axel Dahlströms torg	3	2.6	18	0.5236	0.6970	1.8098	3.6690	45	41	o	o		o			o	19034	11981
Kortedala torg	3	2.3	40	0.4741	0.6082	1.7564	2.7808	46	39	o	o	o	o	o	o		20433	11939
Kyrkbytorget	3	3.5	18	0.9200	1.1832	1.9804	3.8620	34	49	o	o	o	o			o	7321	4475
Länsmanstorget	3	2.7	9	0.7444	1.0381	1.8180	3.4531	52	52	o		o			o		7999	4165
Radiotorget	3	2.2	18	0.6491	0.8309	1.8043	3.5851	24	56							o	3310	1925
Rannebergen centrum	5	2.9	9	0.5126	0.3651	1.6167	2.1398	33	48							o	4352	2008
Brunnsbo torg	6	4.4	11	0.4579	0.5356	1.6597	2.566	78	52	o		o				o	5991	2875

c-line is the most integrated line reaching or crossing the centre; 'loyalty' means % of households in the catchment area who buy most of their everyday goods at their own local centre; number of functions refer to year 2000.

Appendix 2: Axial maps

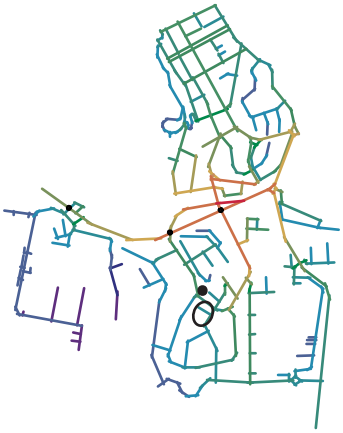
Axial maps of local centres in alphabetical order

Local centre

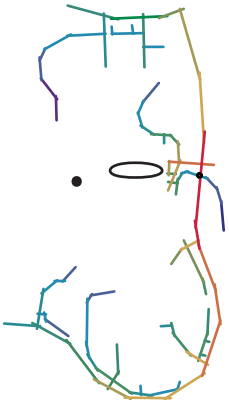
bus/tram stop

unconnected crossing (bridge, tunnel)

Axel Dahlströms Torg



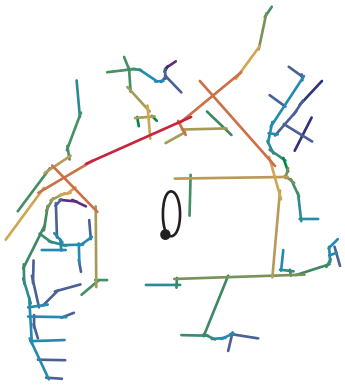
Bergsjön Centrum



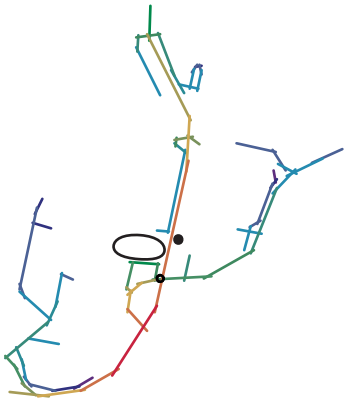
Brunnsbo Torg

pedestrian movement networks

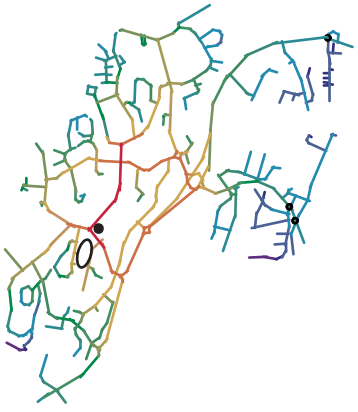
vehicular movement networks



Hammarkulletorget



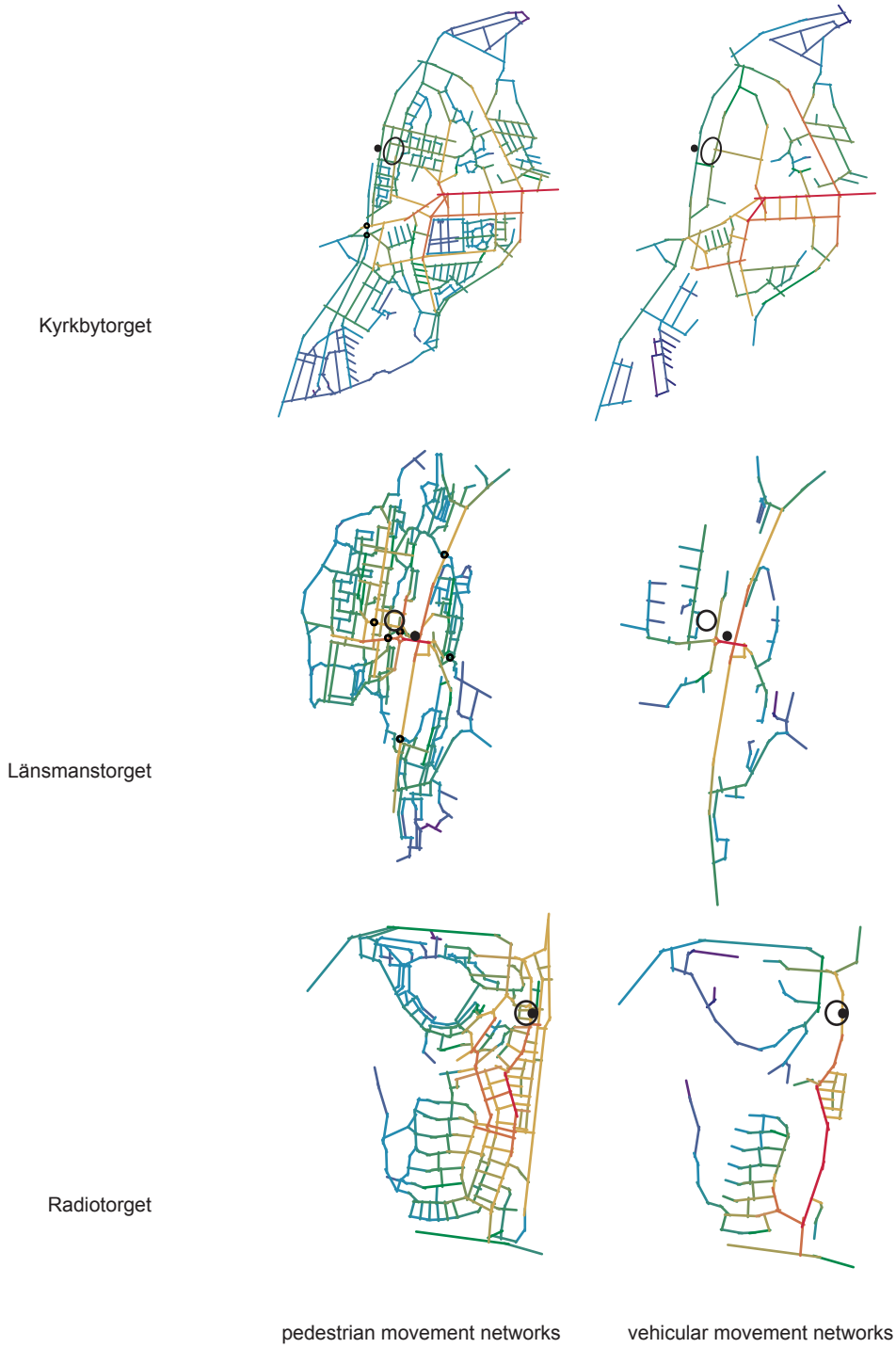
Hjällbo Centrum

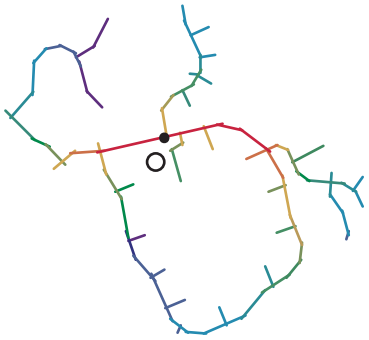


Kortedala Torg

pedestrian movement networks

vehicular movement networks


Kyrkbytorget
Länsmanstorget
Radiotorget
pedestrian movement networks
vehicular movement networks



Rannebergen Centrum

Selma Lagerlöfs Torg

Tuve Torg

pedestrian movement networks

vehicular movement networks

Vårväderstorget

Wieselgrensplatsen

pedestian movement networks

vehicular movement networks

Appendix 3: Cognitive mapping table

area / typology		map indications: Movement networks – Line	Movement networks – Outline	Buidings – Unspecified	Buidings – Specified	Objects	Design features	Names	Functions – Service, commerce	Functions – Land-use	Landscape – Vegetation	Landscape – Topography	Overall structure – Element relations	Overall structure – Context	Overall structure – Alternative routes
Tynnered concrete suburb	Johan	o		-	-				o		o	o			
	Anna	-			o		-		o	-	o	o	o		
	Ramin		-	-	-	-		-	-	-		-			
	Maya		-	-	-			-	-	-	o	o			
	Artur		o	-	-	o	o	-	-	-	o	o	o	o	o
	Patrik	o			-							-			
	Sevko		o	-	-		-	-	-	-		-			
	Jennie		-		-	-			-				o		
	Cecilia		-		-					-	-	-			
Gårdsten concrete suburb	Jom	o	o	o	o	-	o		-	-	o	o	o	o	-
	Suzi		-	o	o	o	-		-	o	-	-	o	o	-
	Ibrahahim		o		o			o	-	-		o	-	o	
	Yosra	o			-	o			o	o	-	-			
	Mathias	-	-	-		-					-	-	-		
	Arian	-		-	-					-	-	-	-	o	
	Yonas		o	o	-			-	-			-	o	oo	o
	Kani	o		-	o	o	-			-	o	o	-	o	
	Ayan	-	o		o	o	-	o		-	o	o	o	oo	
	Ivona		o		o	-	-		-	-	o	-	o	o	
Majorna urban grid	Otto		o	o	o		-	o	-	-			o	ooo	
	Sakari		o	o		o	o	o	o		o		o	oo	
	Denise		o	o	o	o	-	-	o	-			-		
	Fanni		o	o	o	o	o	-	o	o		-	o	oo	
	Peter		o	o	o	-		-	-	-			o	o	
	Rikard		o	-	-	-	-		o	-	o	o	o	oo	o
	Mina		o	o	o		-	o	o	o		o	o		
	Axel		o	o	o	-	o	o	o	o			o	o	
	Andrea	o	o	o	o		o	o	o	-		-	o	oo	o
Lessebo detached houses	Linn		o	o	o	-	-	-	o	-	o	-	o	ooo	o
	Maria		o	o	o	-		o	o		o		o	ooo	o
	C-W		o		o		-	o	-				o	o	o
	Peter		o			o				-	o	-	o	ooo	o
	Johanna	o			o	o		o	o	-	-	-			
	Sebastian		o	o	o				-	-		-	o	o	o
	Alexander		o	o	o	-	-		-	-	o	-	o	ooo	o
	Tina		o	-	o		-	-	o	-	o	-	o	o	o
	Anna H		o	o	o		-		o				o	o	
	Anna R		o	-	-	o		-	-	o	-				

o means many and/or clear indications

- means few and/or vague indications

estimation of context: '**o**' for indications of elements off the trail, '**oo**' for elements beyond those, and '**ooo**' for indications still further out