>> Space, movement and scale in the Dutch city

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Research and design

It is proposed that some of the difficulties of the research-design problem are only apparent - are in fact a result of the paradigm in which the research-design relationship is too often posed. Within this paradigm, it is conventionally presumed that the result of environmental research is an increase in objective knowledge about the environment which then needs to be incorporated into the process of designing, replacing or reducing the intuitive component and thus supposedly improving the outcome of that process. Far from trying to eliminate 'subjectivity' in the form of the preconceptions of researchers or designers, we need in fact to recognise that the intelligibility of the results of both scientific research and the design process are dependent on the preconceptions and prestructurings of the problem in the minds of researchers and designers. The cognitive schemes by which we interpret the world and prestructure our observations are in fact an integral part of the field of science and need to be seen as an essential part of the subject matter of science. (Hillier et al 1972)

The idea of a science which produces factual knowledge or information which can be assimilated into design, along with a view of design which proceeds by decomposing a problem into its elements, adding the information derived from scientific work, and then synthesising (inducing) a solution by means of a set of logical or procedural rules, therefore needs explicitly to be replaced by a view that has it that both science and design operate reflexively between prestucturings of problems (or more generally of parts of the world), and those parts of the world as they show themselves to be when examined in those terms.

The question then of what the purpose is of research in the design field, and in the field of the built environment, is simply answered: it is to affect the preconceptions and prestructurings of the shape and nature of the built environment in the minds of the designers themselves, so that they may approach problems with better, more complete and more workable preconceptions and prestructurings. These prestructurings are in the form of more or less general models that can structure an understanding of real world relations and dynamics and an approach to particular cases.

Space syntax and the city as spatial/movement structure.

Space syntax (Hillier & Hanson 1984) works by revealing structures within the urban spatial network, which previous studies have already shown may relate strongly to patterns of movement and use (e.g. Hillier et al 1987; Hillier et al 1993; Peponis et al 1989; Read 1996). One of the most productive lines in the study of these patterns and the spatial structures underlying them, has turned out to be the investigation of relationships of scale built into them. It will be proposed here that a structured relationship of the local to the wider city scales in the space and movement patterns of Dutch cities is fundamental to the coherence and legibility of these environments in use.

The basis of the space syntax model is the minimum set of longest 'sightlines' set up in the plan of the city which cover the whole continuous pattern of open space. This is known as the axial map, and these sightlines are then considered as elements (without further consideration of their length or any other properties) which are analysed in the computer for their relationships of connection with each other. The most basic measure of each element is its depth or average 'distance' (integration) in terms of number of 'steps' of connection to all the other elements in the system and already this simple topological manipulation of the axial map will begin to reveal structure in the whole complex of elements. The structure which space syntax reveals is built into the pattern of open public space of the city by complex processes of development of urban form through time or through design and exists, as will be shown, in the form of a hierarchy of routes through the urban spatial pattern.

These are established on the basis of some quite straight-forward spatial geometries (see Read forthcoming/a): 'fast' routes through the spatial pattern established by these geometries (corresponding to spaces and continuous series of spaces which have a strong linearity and continuity, and have sightlines which are long in relation to the general length of sightline in the city) tend to condense and concentrate movement to themselves, establishing a higher order subset of space in the city which is specialised for medium and long distance movement. This subset of urban space, known as the supergrid, forms a continuous network facilitating this longer distance movement - and coincidentally establishing a relatively less complex, relatively more legible and 'mentally mappable' spatial pattern serving the bulk of movement (and orientation) needs of city users. A slightly more complex topological manipulation of the axial map reveals this supergrid (see Read forthcoming/a) to a surprising level of accuracy. The effect is reflected in the so-called 'integration gradient map' (figure 1) which as well as representing this effect shows just the sort of continuities one would expect in any representation of a whole-city movement network, designed as it is or should be to convey continuous streams of traffic over whole-city scale distances. The fact that we can predict and represent the supergrid of the city by such a manipulation (there is no information in the analysis other than grid shape information introduced through the geometry of the axial map itself) directly and powerfully demonstrates the influence of grid shape on movement patterns in the city, as well as the effectiveness of space syntax in exposing this influence.

Figure 1. Supergrid of Amsterdam - calculated solely on the basis of the axial map. The surprising (though not perfect) level of accuracy in this representation is itself a powerful confirmation of the power of grid shape over movement patterns. Amsterdam has a 'weaker', less predictable supergrid than cities such as London.

Lower down the hierarchy, the layout shapes of areas determine to a very significant degree the level to which interiors of areas (or more generally, clusters of non-supergrid spaces) are used and the degree and manner of interaction between supergrid movement and area movement. A body of empirical research (reported in depth in Read 1999) relating space syntax grid shape parameters to movement densities of people in the public space of about 40 neighbourhoods in five Dutch cities has established that the density of moving people in the public space of those neighbourhoods is strongly determined by shape characteristics of the layouts of those neighbourhoods. This relationship is represented in the graph (figure 2) where each point represents a neighbourhood with activity rates in the public space of the neighbourhood as a whole on the vertical axis and the space syntax measure of local integration - again for the public space of the neighbourhood as a whole on the horizontal axis. No account was taken of any other factor but the shape and connective characteristics (as measured by space syntax) of the area layout in reaching this result, and no relationship at all was found between either population densities or housing densities of the areas considered and rates of activity in their public space. An attempt to represent this

result spatially on an axial map is shown in the ‘area integration map’ of Amsterdam in figure 3.

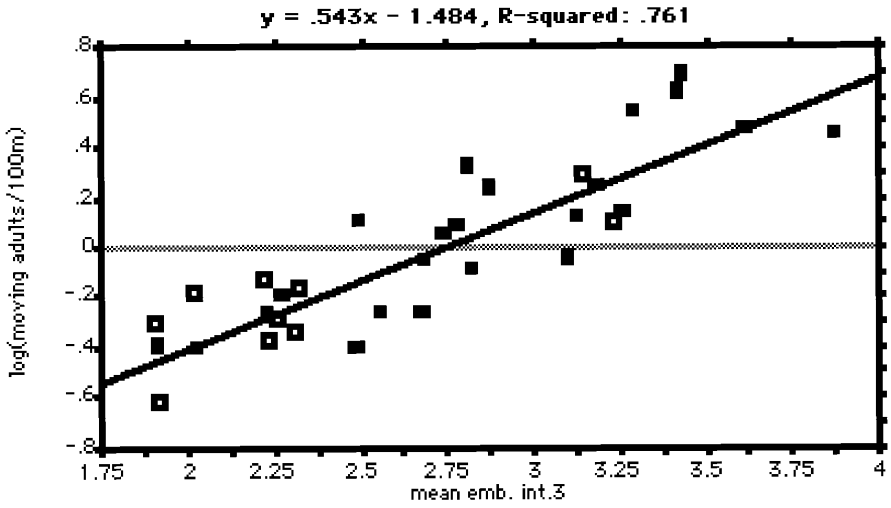

Figure 2.
Correlation between local ‘integration’ measures for whole areas and the occupation of that public space by people in 40 neighbourhoods in Dutch cities.

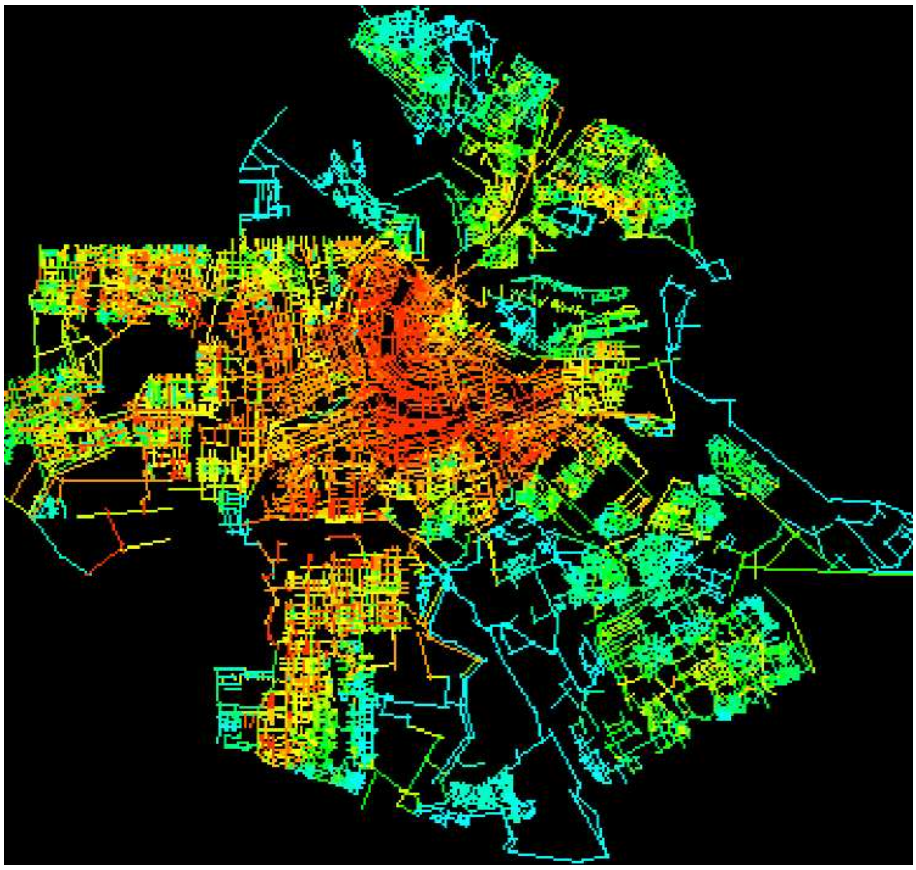

Figure 3.
'Area integration map' of Amsterdam.

Here we need to be careful to remember that whenever space syntax talks about shape, it is in relation to its connection to the whole complex of urban public space. Notions like 'orthogonal' or 'radial' for example, in relation to layout patterns, are highly local and de-contextualised and are not sufficient to capture this quality of a complex integrated connectivity with the surrounding spatial pattern.

The space syntax measure used in obtaining these results is an extended version of the graph theory measure of connectivity (simply the number of elements the element being considered intersects with) and the conclusion that I want to take from these results here is simply that a grid with a high general rate of connectivity between its streets - that is where all sightlines tend to cross a relatively high number of other sightlines - will tend to be one which supports a high rate of activity in its public space. An ideal geometric figure made up of straight elements with a high rate of connection between its elements is of course the simple orthogonal grid. This result, while it must of course again be qualified with the observation that what space syntax was measuring was not just the simple geometric form but also the way this form is contextualised through a more or less seamless connection with its surroundings, serves to confirm that at ground level people are going to tend to use a layout grid more concentratedly when it is more transparent. It is worth noting that an orthogonal grid presents more intersections

to the view of a person at ground level than any other form and that a mobile person will quickly receive a lot of visual information about an orthogonally gridded neighbourhood, from the views down side streets, as he or she moves through it.

The spatial structure of the city proposed here consists therefore very simply of two levels of movement and flow loosely related to two scales of movement space (figure 4). The 'top' layer - not the largest scale in the modern city, but that middle scale that operates around the urban district scale and within the borders of the traditional 'compact' city - consists of this supergrid, conveying movement at the scale of the district and the central city, while the 'lower' layer can be thought of as the neighbourhood grid or spatial layout, which through its shape either promotes activity within the interior of the area or inhibits it and, vitally, facilitates movement interaction between the two layers. The results of these findings could be taken to represent a particular spatial logic of Dutch cities. The results suggest that these layers can be considered as a first approximation as acting independently of each other. However even at the level of this first approximation, it has already been noted (Read, forthcoming/a; section 6.3) that there is within the spread of results in figure 2 the first signs of an interaction between these two notional layers. The model as set up here allows us to further explore and elaborate on the relation between these layers and to comment on the possible significance of this interaction for the character and functioning of cities. It does appear however that in Dutch cities at least, but possibly in all cities to a greater or lesser extent, the local/whole-city interface occurs across a quite clearly defined (and legible) spatial threshold; that between the supergrid and the area.

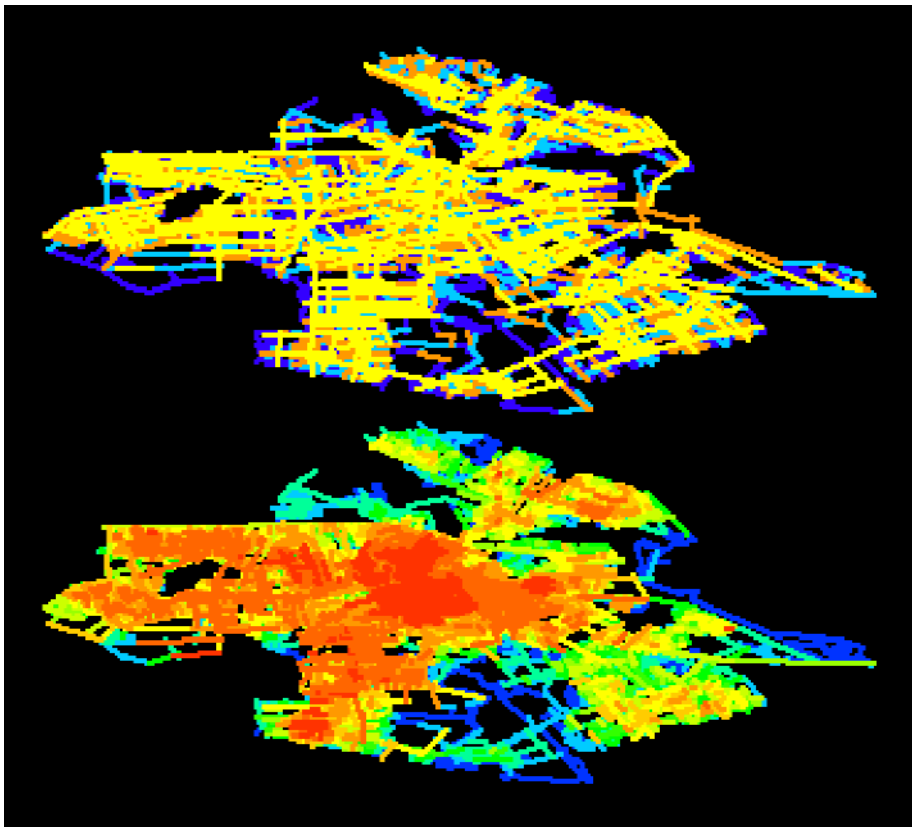

Figure 4.
The two levels of the spatial hierarchy which structures Dutch urban space and orders the complex of particulars with Dutch urban space.

Spatial/movement structure, the complex of urban particulars, and intelligibility.

The central (compact) city is clearly for the most part more ordered than disordered, more intelligible than chaotic. It is proposed here that the substantial part of this ordering and intelligibility factor is founded in a structure whose basis is spatial but whose effect can never be reduced to the purely spatial or to simplistic notions of the 'reading' of spatial cues. Rather it has to do with the way the activity, economy and culture of the city find their place within underlying spatial and movement structures, forming alignments and 'encrustations' (ordered around this spatial/movement armature) and adding up to a total environment within which people act, to a very high degree as an integral part of that alignment and encrustation. Functionally and socially diverse and mixed urban environments are necessarily complex, but it is proposed that intelligible urban environments are composed of a complexity ordered within a coordinated multiplex structure: a totality comprising both mobile and static elements coordinated and structured around space. The patterns of the everyday life that unfold in public space are constrained therefore by the shapes of the urban spaces in which they unravel, and this urban space is (in open spatial grids like that of the traditional central city at least) an extended

non-local and clearly structured network which forms the surface on which the spatial aspect of social entities - urban community for example - and everyday cultural and economic patterns are written. Without attempting to comment on the exact nature of these patterns, or the transformations they may be undergoing, it is proposed that the structure organises patterns of interface in the surface of the city, differentiating volumes and scales of movement and becoming part of the formal articulation (therefore recognisable and legible) of the city as a usable social and functional entity.

The simple two layer spatial hierarchy described above is the essential underpinning of a 'thick' layered structuring of everyday urban reality which includes spatial and movement patterns as well as the overlaid patterns of street-level community, economy and culture. It renders areas coherent and distinctive within the urban whole, and urban space intelligible in everyday use. Urban areas include integrally aspects of culture, economy and space in an total environmental ensemble which is not separated perceptually into its components by its users. Boden and Molotch (1994) talk about a copresence of people which is 'thick' with detail in order to argue for the enduring importance of face to face copresence for communication and the transfer of meaning. The meanings of events and statements depend on the way particulars inform or 'index' each other in complex everyday social exchange, the sequential ordering of particulars in time establishing a referencing or structure which is essential to the meanings of those events. It is proposed here that an analogous structuring or indexing in space of a multiplicity of urban particulars underpins the city as a communicative medium, making urban locations intelligible with respect to each other. The characteristic two layer spatial hierarchy found in the Dutch city manifests itself in the real world therefore as a simple legible code that consists of the ordering of a multiplex complexity around a characteristically urban structure whose basis turns out, according to the above research, to be spatial. The code confers, in a very straightforward way, structure and legibility on the mass of particulars in real urban space.

The spatial model of the Dutch city proposed here becomes therefore a basis for the further investigation of scale relations and associated aspects urban quality and function in Dutch urban areas. Techniques are being developed (see Read forthcoming/b) which allow the nature and dynamics of these scale relationships and their influence on urban quality and function to be explored.

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