

SPACE NETWORKS:TOWARDS A SPACE NOTATION FOR USE IN COMPLEX
URBAN SYSTEMS

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Abstract

Research time span:33 months (Ph.D.).Started October 1971.This year supported by Univ.of Edinburgh.The research has been broken down into Space,Spatial Perception--Spatial Behaviour,Notation of this interaction.The space-as-defined-by-activity Notation was originally developed through undergraduate design work, as the conventional tools of Plan-Section-Elevation,then Axonometrics,Central Perspectives were proven inadequate for the conception and communication of complex urban environments based on activity,Movement as its basis.The notation was used by this writer for designing a multipurpose building for his finals.The research remains firmly design-orientated,seeking out general principles.

Movement through space

A good way for the pedestrian to get and structure information of his urban space is to move through it.J.J.Gibson(5)has pointed out how human depth perception is dependent on locomotion,and D.Appleyard(2)refers to it as Apparent(v.Real)Motion of the Environment.

On the design level one can subdivide the environment into Physical and Human Space Networks.A Physical Space Network is the 3-dimensional information that has never been forthcoming,and will depend on a change of our Planning mentality.On the other hand,a Human Space Network,what we are here concerned with,although covert, has always been there:it is the volume of the wake of a pedestrian as he moves through space.

In doing so,and leaving behind him this hidden trail,he at the same time goes through a sequence of perceptual frames.But for him,in order to have this experience,there is another mental corridor connecting him with a visible goal,or non-visible destination.This mental corridor may be(and the hypothesis is that it is)an erroneous one directionally and dimensionally,but permits him the behaviour of movement all the same.Heidegger(as re-

ferred to by C.N-Schulz (I6): "When I go towards the exit of a room I am already there".

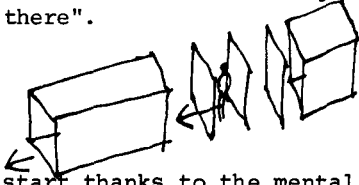


FIGURE 1. You start thanks to the mental corridor, you experience in a sequence, and leave behind you the hidden trail.

In that manner Space is defined dynamically. As a network. But when no movement, or other human activity is of influence, then, to use Kurt Lewin's term as referred to by C.N.-Schulz (I6), Hodological space (space of possible movement) approaches Euclidean space.

And although the designer has to decide upon the Euclidean space, and communicate through it to the builder, he conceives, or ought to, through the Hodological one. The former is only the built part of the latter which remains the pedestrian-user's experience. And the level at which designer and user can communicate, and where their prestructures can pass the baton, relay race fashion (9). For those designing with the anonymous user in mind, on the high density urban scale, the multipurpose buildings, and assuming changes, and allowing for choices, an Exploratory experience, rather than a Habitual one (Robert Bechtel's terms (4)), ought to be anticipated. On that level, new design tools are needed in order to notate this experience.

The space elements leading to the development of the Space Networks Notation, all three, show a positive space. As Van Lier puts it: "Le caractere entourant que l'architecture reside d'abord dans le volume d'air qui colle a notre peau que nous traversons de tout notre corps (aucun objet ne nous touche aussi completement (20)) This space exists on its own right, suggests movement in it by its structure, or downright sucks you through:

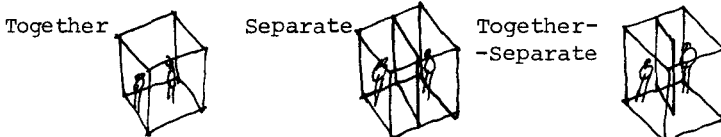


FIGURE 2. Together-Separate: A contradiction to live in.

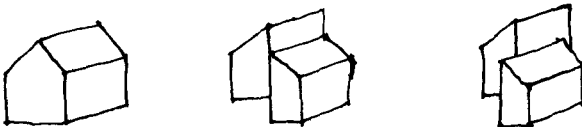


FIGURE 3. Articulation: Not more space, but a structured one.



FIGURE 4. Kinesthesia: The space that induces movement: The space--indepth quality of the films--and hasn't the Danish director Carl Dreyer rightly called architecture the cinema's closest relative?!(drawing from published paper of same writer(I3).

The Space-Movement Notation

The effort has therefore been to notate the space as it is given meaning by the activities in it. Primarily the movement through it that makes it perceivable. The notation (in fact this is its second level of development) consists of four spatially defined conceptual components: The TUBE, which is the corridor that connects where you are now, with where you have come from, and where you are going to. The SEQUENTIAL, which is the perception frames you experience in succession. The BINARY, that relates to the pair of a corridor and a big space (this comes close to the first level of development of the notation), and where a balance is obtained by contrast of volume and activity (in that the corridor is mainly for passage). And the SECTION-PERSPECTIVE, where you can imagine doing away with facades: see buildings in the process of demolition.

Defining by way of illustrating from the multipurpose building designed:

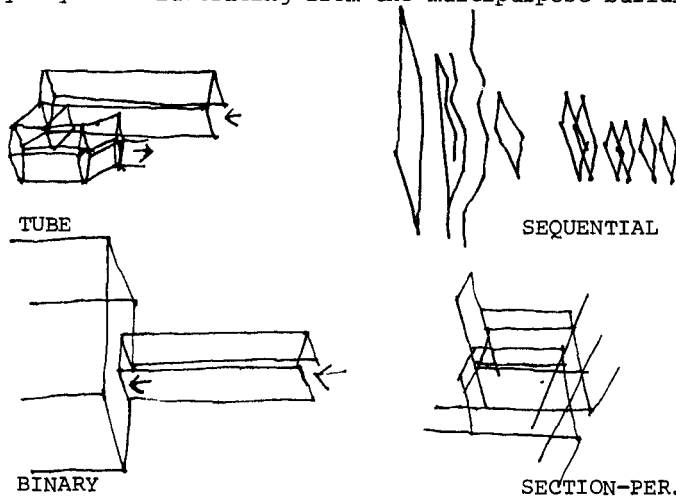
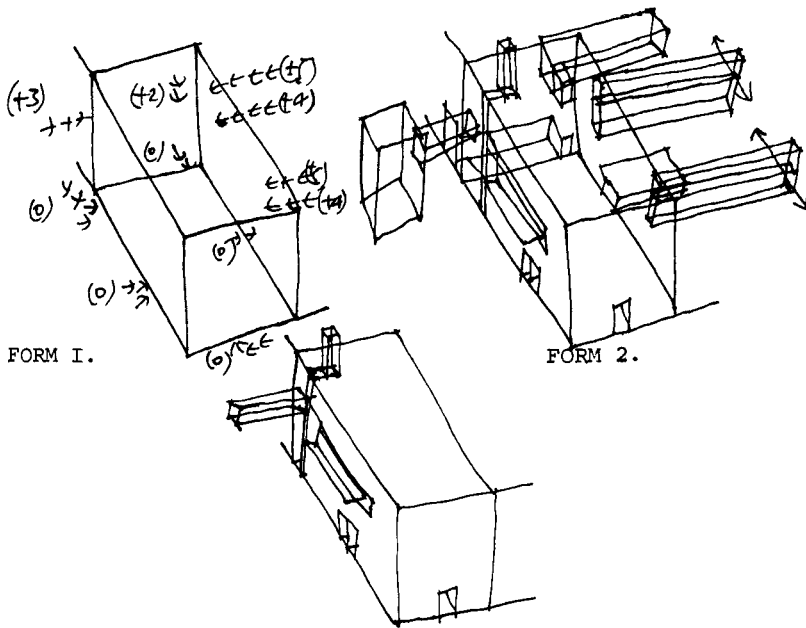


FIGURE 5. All four components may be used for same part of the building. This allows for the difference in cognitive-perceptual structures of the pedestrian-users.



FORM 3.

FIGURE 6. Taking the multipurpose building as an example, by using the Human and Physical Space Networks, the designer is allowed an early holistic appraisal of the possible building (FORM I.). He then proceeds to freeze these networks in a form by way of which he can communicate to other designers and the public. He therefore conceives through Hodological space. FORM 2 is the inside of the building and its physical and human lifelines with the environment. He then can in turn communicate to the builder through Euclidean space (FORM 3, which is the built part of FORM 2). And although the building is structured by the use of the notation (based on the broad, but limited, cognitive-perceptual areas people share), a high degree of looseness in design is permitted.

Back in 1955 Jackie Tyrwhitt (19): "Here is our contemporary urban planning problem. How to find the key to an intellectual system that will help us to organise buildings, colour, and movement in space, without relying entirely upon either the introspective intuition, or upon the obsolete and static single viewpoint based on the limited optical science of the Renaissance". Since then, and even before (Thiel (17) started on his "development of a comprehensive system based on theoretical and empirical studies", in 1951) a (limited) number of notations has come out--Philip Thiel

(18)recently communicated that Prof Robert Buchanan,Dept of Landscape,University of Washington has been preparing an annotated bibliography on notational systems.The Space Networks notation outlined in this paper,can,I think,be located between the cognitive-perceptual scales of T.E.Hall's(7)microspace behaviour,and Lynch's(I0)Images.And between the movement-uses scales of Alexander's(I4)pattern language,and the sequential experiences of Halprin(8)et al.However,Donald Appleyard(I)soberly replied(3)to this writer that:"Notation systems can be important ways of changing the way designers think about buildings,but they tend to be idiosyncratic--no one uses anyone else's".Which calls for a comparative analysis to bring out their common denominators and complementariness.

TABLE I.To point out some of the properties and characteristics of the four spatial conceptual components:

	TUBE	SEQUENTIAL	BINARY	SECTION-PER.
A.Architectural Scale	--	X	X	
Planning Scale	X			XX
B.MIND SENSES	--			--
C.BASIC COGNITIVE-PERCEPTUAL SYSTEM	--			
D.DESIGNER USER	Whole	In parts	In wholes	--
E.EXPLORATORY LOCOMOTION HABITUAL LOC.	--			
F.ORIENTATION PERCEPTION	--			
G.PERSPECTIVES		Series of Centrals.		Endless Isometric.
H.TUBE			Quicker than Binary.	
SEQUENTIAL	Depends on holistic Tube.Quickly becomes Tube.		Continuity Breaks down on Binary level.	
BINARY	Articulates Tube through senses.Quickly becomes Tube.			
SECTION-PER.				

In Figure 5, we saw how all four conceptual components were used for the same part of the building. However, each one of those four spatial representations of 3-dimensional experience is distinct. And any one of them may relate specifically to a particular section. Example:

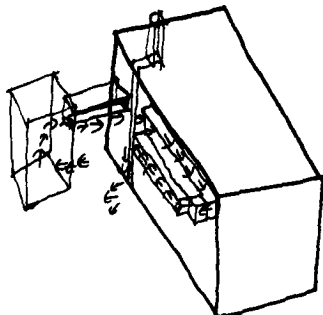


FIGURE 7. In this case a Tube (activity: exhibition gallery), which was subsequently checked by the Sequential.

In Table I. (refers to (H)) we may notice how the element of speed can bring out a polymorphous property. And there is also an hierarchy (refers to (C)): the Basic Cognitive-Perceptual System of Tube and Sequential. That is, the sequential experience, and the mental corridor in front of us, which allows it.

Intended Fieldwork and Pilot Questionnaires

When, at the beginning of the paper, the above-mentioned mental corridor was called 'erroneous', it was meant that it is distorted being the subjective image of the physically objectively measured space the pedestrian is moving through. This image is influenced by intended activity, then subsequently structured by experienced activity. Although mental space will still not correspond to the physical one. It will in fact remain characteristically distorted depending on the activity that is giving it identity (: a friend did two drawings of her telephone, the first observing perspective laws--a true architect herself paying homage to Brunelleschi and Alberti. The second drawing, distorted as it was, gave away its scale, its nearness, and an invitation to grab it--assuming you could read the cues).

Vision has been taken as the dominating factor in perception, and mediating kinesthesia, and to quote J.J. Gibson (5): "Spatial behaviour is intimately connected with spatial perception". Rapoport (15) after accepting the undeniable effect of design on behaviour justifiably suspects it to be less than what the designers have thought. Now, by including cognition (: faculty of knowing and perceiving), the Spatial Perception--Spatial Behaviour interaction

becomes that of Image -- Activity, which in turn is the relation between Tube and Sequential. In order to orientate, pedestrians will need more than a point-to-point experience, although it will distort their Tube, or mental corridor, so that it will fit these perceptions. By Orientation it is meant: a) Where one is (Position), b) Where one is going to (Direction and Distance of goal or destination), and c) the space one is to pass through -- which may for instance give the choice between a destination and a goal. Example: "Mobilization wanted Washington Boulevard or Jefferson Davis Highway for their March from the bridge since each large road had a bold unimpered view of the Pentagon. The Govt insisted on Boundary Channel, a narrow road" (12).

To the designer asking what makes Hodological space possible, the mental corridor, the sequential experience, and their relationship, is the theoretical ground that after having stemmed out of design, can provide directions of research: In what distorted continuity form is mental space information stored on the scale of the large public building? In other words how do people orientate, and how do they subsequently behave in an Exploratory and after a period of time Habitual manner.

From what is known to me (and summarily seen from Rapoport (15) and Goodey (6) sizing up the field, and confirmed by Kevin Lynch (II), spatial cognition and perception work is mostly at the larger scale of the environment. Unless confined in a static situation.

Preparing for Space Networks fieldwork, a multipurpose area has been located which will hopefully prove spatially suitable. Complex from the point of view of orientation, it is the basement connection of three Edinburgh University buildings, and still retains contact with the outside environment. Questionnaires will be used (in fact pilot surveys on daily networks, and directions connecting the street scale with a particular room in a building, and mental mapping of an area, are being shown useful at this stage). And the Portapak, portable Video, will be required for observation and recording, in such an 'identity' simulation (to use Harman's term, as referred to by Gary Winkel (21) taken to mean: the real world is used to obtain knowledge about itself. Versus the 'analytical' highly abstractive simulation).

The aim of this research is to reach a high enough level of complexity to identify with real life situations, but also a low enough level so that the designer can in fact use it. All at the risk of course of trying hard on every Psychologist's patience.

References

- I) Appleyard, D., (Lynch, and Myer) 1964, The View from the Road, M.I.T. Press, Cambridge, Mass.
- 2) -----1965, Motion, Sequence and the City. The Nature and Art of Motion. Edited by G. Kepes. Studio Vista, London. PP 176-192.
- 3) -----22nd March 1973. Letter from: Prof Urban Design, Institute of Urban and Regional Development, Univ. California.
- 4) Bechtel, R., 1967, Human Movement and Architecture. Reprint in Environmental Psychology. Edited by Ittelson and Proshansky. PP 642-645.
- 5) Gibson, J.J., 1952, Perception of the Visual World. Allen and Unwin.
- 6) Goodey, B., Jan 1972, Perception of the Environment: An Introduction to the Literature. Univ. of Birmingham.
- 7) Hall, T.E., October 1963, A System for the Notation of Proxemic Behavior. American Anthropologist Vol. 65, No. 5. PP 1003-1026.
- 8) Halprin, L., July 1965, Motation. Progressive Arch. PP 126-133.
- 9) Hillier, B. (and Leaman, Adrian), 22nd March 1973. Discussion at the R.I.B.A. on their paper The Man-Environment Paradigm. To be published. They are of the R.I.B.A. Intelligence Unit.
- 10) Lynch, K., 1960, The Image of the City. M.I.T. Press, Cambridge, Mass.
- 11) -----, 21st March 1973, Letter from: Prof City Design, Dept of Urban Studies and Planning, M.I.T., Cambridge, Mass.
- 12) Mailer, N., The Armies of the Night. Page 254.
- 13) Mitropoulos, E., 1969, Recherche d'une Methode vers un Systeme Urbain. Revue La Maison Nr. 9/69/25. Bruxelles. PP 326-332.
- 14) Montgomery, R., Jan/Feb 1970, Pattern Language: Contribution of Chr. Alexander's C.E.S. to the science of design. Architectural Forum. PP 53-59.
- 15) Rapoport, Am., Nov 1971, Some observations Regarding Man-Envir. Studies. Arch. Res. and Teaching. Vol. 2, Nr. I. PP 4-14.
- 16) N.-Schulz, C., 1971, Existence Space and Architecture. Studio Vista, London.

- 17) Thiel, Ph. , April 1961, A Sequence-Experience Notation for Arch. and Urban Spaces. Town Planning Review Vol. 32. PP 33-52.
- 18) -----, 19th March 1973. Letter from: College of Arch. and Urban Planning, Dept of Arch. , Univ. of Washington, Seattle.
- 19) Tyrwhitt, J. 1955, The Moving Eye, Explorations Forum. Univ. of Toronto. PP 115-119.
- 20.) Van Lier, H. , L'Espace Architectural. Entry in Encyclopaedia Universalis, art. Architecture.
- 21) Winkel, G. , (and Sasanoff, R.) , 1966, An Approach to an Objective Analysis of Behavior in Arch. Space. Condensed reprint in Env. Psychology. Edited by Ittelson and Proshansky. PP 619-631.