Proposal For A Methodical Use Of Space Syntax Analysis In Development and Land Use Plans

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0 Abstract

The correlations between the variables of space syntax analysis and observations in the real world have shown that spatial structures have a substantial effect on urban dynamics. It clarifies at least the quantitative side of some urban phenomenons such as like traffic, building density, land value, etc. By 'local-global interface' and 'multiplier effect' - concepts which are well established as part of space syntax analysis - spatial structures can be described qualitatively in relation to their use. They both influence the intelligibility of the spatial environment as well as the predictability of the social environment. These are qualities which allow individuals to behave efficiently, independently and allows them to feel in harmony with their social environment. This paper proposes a technique which integrates these 'synergism' concepts into development plans and land use plans by using spatial variables of space syntax analysis. It is used to influence the regulations concerning the three elementary components of planning - land use, building density and traffic - in a way that should intensify and stabilise the natural movement generated by the urban grid and help areas to find a self-regulating condition.

1 'Mastering' or 'monitoring' redevelopment

Cities develop permanently. Planning should regulate this development. It should try to distribute individual freedom among all citizens and also to guarantee it for the future allowing cities to work as a sustainable whole. Looking at cities throughout their history, we can not deny that even the most representative places will at some point experience a period of disinterest and decay - rarely has their revitalisation been spontaneous. Decay is probably the most sustainable status and that is not so unique. At one moment, places and areas are no longer supported by their larger context or they can no longer support them - structures and infrastructures, styles and conventions, once become unadapted, old or old-fashioned. This process of disharmonisation and loss of interest can, in most cases, not be reversed. Spatial and economical centralities shift and they become more and more global affecting what space can be used for successfully. Restoring an acceptable equilibrium between the local and the global scale needs at least local measures. The kind of answer that can be given to this depends considerably on the complexity of the property patterns and the number of concerned owners and users because it defines how available land and buildings are used for spatial and functional restructuring.

Masterplanning, associated with concentrated macro-architectural interventions, is more regular when the property pattern is rather simple and as far as a consensus exists about the financing of the infrastructure and a guarantee about the return of investment, which depends on the realisation of entire entities of the plan. This

technique of 'mastering' the development is obvious when important shortcomings exist in the urban fabric or when massive programmes can be realised.

A more 'soft' approach of redevelopment is 'monitoring'. The urban transformation is then considered as a complex process due to the initiatives of the thousands of individual owners and users in the area. This technique tries to guide the evolution into a direction that is already suggested by the spatial structure. It has to deliver a qualitative and sustainable environment, considered first of all as a social environment and last of all as an aesthetic problem. The 'monitoring' instruments have to be public documents, managed by the public urban planning departments. These departments are confronted with the continuous vitality of the city in all expected and unexpected aspects. The officials of these departments need concrete and flexible documents. If this soft monitoring technique will work, it has to integrate and profit by even the smallest initiative. Therefore, information must be easily accessible, the answer to each request clear and fast, the offered possibilities as large as possible. The pursued effect is that the more the process goes on and the synergism arises, the more the requests will tend to correspond with the possibilities created by the plan. In fact, this kind of planning tends to help urban areas settling themselves in a self-regulating process after a period of disurbanism and important changes in their larger environment.

Most development and land use plans combine both the mastering and the monitoring approach, depending on specific local dysfunctions, aims and strategies. This was also the case in the documents in which the methodical use of the space syntax for describing urban quality has been experimented in the past. A paradoxical situation has thereby been experienced: masterplanning masters less than monitoring. Extensive and massive projects tend to cause urban fragmentation by creating their own semi-public continuities and organisational rules. More scattered small projects optimise their interface with the public space and thus contribute to more urbanity.

2 A qualitative description of urbanity

High or low values of the model variables may not automatically be considered to indicate environmental qualities. The arbitrary relation between the output variables and qualitative urban phenomena can be wiped out by using double correlations or double proportions. Quality is not proportional to values, not even to the relations between values, but seems to be proportional to the correlations between groups of values. This correlation can be observed for both 'pure' variables of the model - for example connectivity and integration - or for 'hybrid' variables, meaning comparing model variables and observed densities of use - for example between movement and integration. This way of looking at urban structures uses space syntax analysis as a complex filter, which makes visible how all the quantitative descriptions produce urbanity - how they interact, reinforce, sustain or neutralise each other. In essence, this trick for escaping from the nonrelevance of quantitative description is old. Hundred of years ago, when the concept of the universe was expanding the old metric geometry was reduced into an exceptional form of an overall projective geometry. Double proportions are of the domain of the projective geometry. In the same way, a qualitative more absolute description of urbanity is to ask: how will the dynamism of an area fit with the dynamism of the larger city? Will they find a common interest? Will they confirm or contradict each other?

In the past, these concepts have been formulated, described or suggested by the originators of space syntax, Hillier, Hanson, Penn and others at the Bartlett, University College London. We have chosen a few quotations because of their formulation rather than for their chronological importance. This explains why some of them are from later dates than the application of the described technique.

'Natural movement is the proportion of movement on each line (in each street) that is determined by the structure of the urban grid rather than by the presence of specific attractors or magnets.' (Hillier, 1993; Hillier, 1996: 161)

'Spatial structures have a natural intelligibility, which means that we do not need signs to tell us where to go... This is expressed by the correlation between the connectivity values - a local property of a space which can be seen from there - and the integration values - which cannot be seen from there - of the spaces in that area.' (Hillier, 1987: 3-9)

'In an intelligible environment perceivable information is representative for the non-perceivable information. An unintelligible system is one where well connected spaces are not well integrated, so that what we can see of their connections misleads us about the status of that space in the system as a whole. Predictability in an area is the correlation between the integration values of the spaces and the observed densities of use.' (Hillier, 1994)

'If cities are "mechanisms for generating contact" (Jane Jacobs), one of their main tools lies in the way that they relate local and large scale patterns of movement, and how both are brought into contact with land uses... These local to global correlations are exactly what allows the parts of cities to come together to form a global whole... The consistent relations between local and global movement patterns are what allows us to behave rationally in our choice of location for land uses, whether these are where to work, sell or live... It is the precondition for the social function of the city.' (Penn, 1993)

'The more the set of dark points (the points of the local scatter, representing the spaces in a particular subarea) forms a line crossing the regression line for the whole city, but tending to greater steepness, then the subarea is distinctive.' (Hillier, 1996:174)

'In areas including retail there is an exponential rise in pedestrian flows with increased integration. A possible explanation is that the pattern of the grid gives rise to a pattern of pedestrian movement, and this in turn attracts retail land uses to take advantage of the passing trade. In this mixed areas the shops site themselves in spaces that are used for through-movement, and then become the destinations for to-movement, acting as a multiplier on the original flows.' (Penn, 1993: 6).

'Land uses and building density follow movement in the grid, both

adapting to and multiplying its effects.' (Hillier, 1993; Hillier, 1996:161).

'Simultaneous study of vehicular and pedestrian movement (Penn and Dalton, 1994) found that the degree to which vehicular traffic dominated pedestrian movement in the primary route structure of an urban area varied radically according to the dominant land use. In order to civilise the car it is necessary to bring pedestrian movement onto more equal terms. ... It is only by attracting a sufficient density of retail/commercial land uses that pedestrian numbers can be significantly raised, and that the recipe for viable long term retail centres depends on achieving sufficient levels of both local and global integration for the 'multiplier effect' to take off.... By exploiting self perpetuating and self regulating mechanisms such as the multiplier effect, long term conditions can be achieved. ... The requirement for both local and global integration for the shopping multiplier effect seems to be founded on the need for shops to both maximise the level of passing trade and to even it out through time.' (Penn, 1993: 12)

'The local to global correlations or the so-called local/global interface, in the essence, the above concepts have to contribute to the fact that individuals can live in a complex and dense social context "without getting on each others nerves". Common interest and global quality can only be sustainable if it is defined as the best compromise between the individual interests or perceived qualities. Individuals are simultaneously transspatial (or global) because of their intentions, and local because of their reactions; they think global and act or react local. The local and the global scale are different but inseparable natures of the same thing. If one attributes qualities, it is essentially reactive and therefore local. When several people are (co-)present in a space, no one can say if they share or divide this space. It depends on many things, but the difference is not perceivable. The difference exists only in the mind of the individuals. Between them, a consensus about the real nature of their co-presence is therefore superfluous. In a social context where co-presence is mainly made by people who don't know each other, the relevant information is that people are present or not. The only consensus we can expect is a probabilistic one. How can we have any expectation about the behaviour and presence of people we don't know? What one will do then, is to try to explain or predict the perceived co-presence by the information given by the environment, in essence, one's perception of spatial integration or, more general, of accessibility. When the spatial distribution of the real community corresponds with the one of the virtual community - that is to say when we see people where we expect to see them - we feel confirmed in our perception and understanding of our social environment. When our social environment seems spatially predictable, we can decide better where to live, to sell, to work; this means where to be local. Virtual communities can only become real, and be predictable, if spatial environments are intelligible. In large cities, where the global movements represent the major part of

the movement, local quality, seen as local predictability, can only arise if the real global community behaves like the virtual local community. Then the overall resulting distribution of movement in the subarea can be understood by the members of the local community from the local point of view. In complex cities and societies, it is less important 'where ones is or goes' or even how dense movement is, but moreover following which patterns the densities of movement are distributed in the subarea. Then, no manifest contradiction remains where we should live, sell and work from the point of view of the subarea, compared to the place we should do that from the point of view of the city as a whole. This state of synergy, the confirmation by the larger scale of the choices

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3 The multiplier effect of land use and building density on the natural movement

In monofunctional spaces, the intensity of natural movement can fluctuate importantly depending on daily or weekly cycles. This makes the real community, induced by the street grid, volatile and unstable. Urban quality, based on the local/global interface of the street grid, is then a statistical reality more than a permanently perceivable one. The natural phenomenon of the multiplier-effect, as described above, increases the real community where the virtual community tends already to be the most extensive. So far, shops, retail, diversified land use, work as a local attractor and amplify the patterns of natural movement. When the local/global-correlation is weak, the same multiplier effect will even increase the divergences, because then the land use, addressing the local and the global community, settles according to different integration patterns. In large cities, where the global community is much more extensive than the local one, the local retail will finally be attracted by the global movement and will let the subarea locally unpredictable. If planners would try to displace the natural movement by using strong attractors, even when the local/global-correlation is strong, the contradiction between the social and the spatial environment will have a destabilising and exhausting effect on the neighbourhood as well as on the attractors.

In conclusion, the suggestion here is that regulations will locate land uses according to where the multiplier effect already tends to create and to support them. That means the most constant and diverse mixture of attractors should be located in the most integrated spaces. Anyway, a good global/local correlation will be a precondition to start from. This precondition is often omitted, because of a missing capital for a few street grid modifications. The probable price to pay on long term for this 'economy' is the non-sustainability of the developments.

The capacity of building density to stabilise the effects of the local/global-interface depends mainly on the use of the buildings. Building density can be seen as local depth, which makes then increase the effects of local integration and connectivity. This leads us to say that we can at least use building densities where it tends to compensate high global integration by causing the effect of local integration, and therefore improves the effective local/global correlation.

4 The integration of all the traffic modes in one virtual community

If urban quality depends importantly on the harmonious dynamics between local and global scale, it is quite evident, when we try to regulate traffic, that we should support a synergism between the local and the global communities. Patterns of traffic, as well as these of land use and density, are considered as a natural effect of the street grid. Changing traffic patterns and presence by using abstract systems like regulations will not affect the underlying cause. Therefore, some considerations come forward:

- Human capacity to conceptualise complex structures seems far from unlimited. Can we therefore multiply in a single environment the number of environmental concepts or topologies corresponding with the different transport modes, for example on foot, by bicycle, car, bus or other public transport;

- It becomes more and more clear that spatial structures determine human spatial behaviour. We should be aware of the feasibility and reliability of measures which force people to behave different from what their conceptual and cognitive preferences and restrictions ask them to do;

- If urban quality depends on the degree of social synchronisation, can we then force the real community to behave differently from the virtual community, to be more represented in segregated space than integrated space;

- Macro-traffic structures - like railway, underground, highways, ringways, viaducts - inject and extract movement in and from the open system of the street grid. These macro-topological systems create centrality which is not inducted nor predictable from the structure of the urban grid.

Regarding to these considerations, the following principle attitude is adopted: traffic regulation and organisation should not cause the fragmentation of the virtual community. It means that patterns of accessibility and integration in an area should not differ much from one transport mode to another. This implies practically :

- That chains of highly integrated spaces should be practicable for all the

transportation-modes. The fragmentation of the public space should be rejected. Diversions and specialised traffic space, like tunnels, should have a temporary character. For example, a tunnel for car traffic, bypassing an integrated shopping street, should be closed from the moment that traffic attains acceptable rates, so that the most integrated space is constantly exposed to presence. Observations have lead to suggest that the proportion between cars and pedestrians in the street influences if pedestrians feel dominated by cars. Making more space for pedestrians in the most integrated spaces, combined with car-movement, is then preferable to creating specialised and parallel spaces;

- One way traffic increases the transspatial interest and an isotropical character of the space where it is applied - it has a disintegrating effect on the local scale and has therefore the same effect as a layered scattergram. In general, creating discontinuities seems to have a more destructive effect on the local integration pattern than on the global one. One way streets and movement restrictions should be only applied if they do not harm or weaken the local movement;

- Since pedestrian movement represents the biggest part of the local community, it should be favoured and stimulated, walkways not fragmented or obstructed;

- Macro-traffic structures, as mentioned above, should be connected to the open urban grid, where integration is high, so that injected movement becomes relatively invisible and predictable from the point of view of the reality of the urban grid and confirms the virtual community and the social synchronisation. Diverse land uses, higher building densities and the multiplier effect, in spaces where the natural integration is high, should absorb and diffuse the injected movement of the metro and railway stations, so that it takes over more easily the patterns of the local movement.

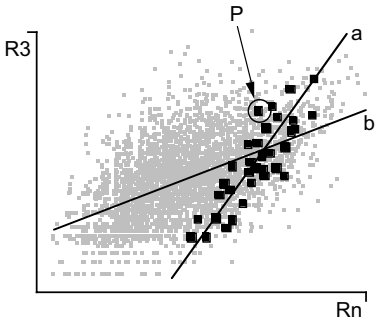

Figure 1

The unified virtual 'traffic' community has the following effects:

- Movement and presence, irrespective of their transportation mode, is more predictable;

- It decreases the threshold between the different transportation modes. People will more easily swap the modes and use those which fit the best with their need on each moment. This is favourable for the integration and better use of the public transport;

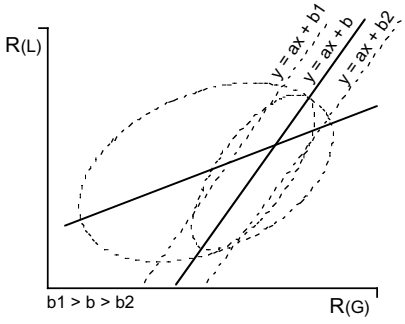

Figure 2

- Pedestrians and the local community, both important for urban quality, are not 'wasted' in specialised, segregated spaces.

5 Relativising the space syntax output

We start from here with the specific method proposed in this paper. Since a proper local/global-interface seems so essential for urban quality, we have to know where a space is positioned in this interface and if this interface is good or not. Therefore the morphological subareas have to be defined within an enlarged studied area. To add a topological depth, equal to 3, from the edge of the studied area, is the minimum of

what should be done, since radius 3 is the most local scale for which the local/global correlation is tested and also the scale which is used for determining the subareas. That is done by covering that area with all touching or overlapping subareas, which correspond as far as possible with the definition of a good local/global interface. This is to say analytically local scatters with the highest correlation coefficient, a steep and rising local regression line and a position of centre of gravity close to the global regression line. The scattergram in Figure 1 shows the correlation between the global integration (Radius = n, on the X-axis) and the local integration (Radius = 3, on the Y-axis). The local scatter (in black dots) represents the spaces of a subarea in the global scatter (in grey) of the larger surrounding city. We may consider this local scatter as the analytical representation of the local/global interface. Line b is the global regression line and line a the local regression line. Figure 2 shows schematically a local scatter with his local regression line y=ax+b, in his larger context. The lines y=ax+b1 and y=ax+b2 are examples of regression lines of other subareas.

Every space or line can by this techniques be positioned in the context of the area(s) to which it belongs. This position in the interface indicates how this space contributes to the regulation of the interface and which density, land use and traffic can be admitted. The position of a space (for example P in Figure 1) with regard to only the local and the global regression line, already gives a vague idea about the position and the role that this space has in the local/global interface of this subarea. We can see that the local integration value (Radius = 3) is relatively high and thus, that it's important for the cohesion and the distribution of movement in this subarea. We can see also that it's relatively poorly exposed to global integration (Radius = n) due to its position on the left side of the local regression line. Such distinctions and descriptions are what we can call 'relativising the integration values'. These vague descriptions become hard to control when one has to deal with all the streets of an area at the same time and even harder if streets belong to different areas. Another problem is that feedback control or later amendments to the plan become arbitrary if the synthesis of so much data into a complex document was not fully discursive. These problems of dealing with flows of complex data, became more and more clear during the study of a few particular land use plans. (Stegen and Remy, 1990-1993). For this reason a more analytical way for relativising the variables has been proposed and applied (Stegen and Remy, 1994-1995).

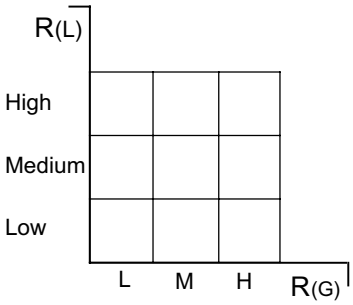

Figure 3a.

4	2	1
7	5	3
9	8	6

Figure 3b.

6 The 'planning-DNA'

Before 1994 the relativised integration values of the spaces used to be simplified by locating the space in a matrix of 3 by 3 sections. Figure 3 shows such a matrix. In fact, it is a simplification of a local scattergram - the x-axis represents the scale of global integration and the y-axis represents the scale of the local integration. Each axis had a colour scale: for global integration yellow/green/blue, and for local integration yellow/orange/red. The nine possible combinations of local and global integration, expressing nine different characters of space and located in the nine sections of the matrix, were expressed by colour couples (Figure 3-c) going from yellow/yellow in section 9 to red/blue in section 1. These colour couples served for characterising the spaces on a map, the colour which indicates the global integration in the centre of the public space, and the one for local integration along the building fronts. The experiences with the plans before 1994 had revealed that a 'richer' differentiation of the relativised

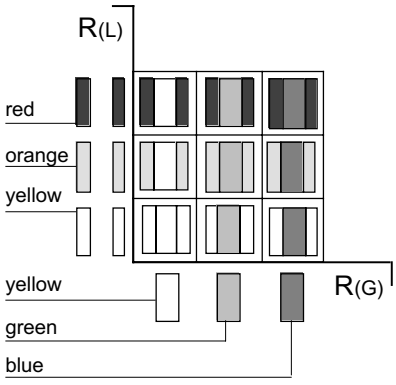

Figure 3c.

integration - a bigger matrix - should be undesirable compared to the problems it could cause. First, and because of the (possible) legal status of the documents, colours must be unequivocally readable even after reproduction. Second, a more differentiated matrix would not be filled up by a richer choice of land use. Therefore, the question of relativising the absolute syntactic measures and categorising the spaces was still a question of translation into 9 categories. The old concept of the planning-DNA stayed usable.

7 A flower-card for each area

The recognition of the 9 space categories in the elongated form of the local scatter needs a rereading of what is behind this scatters. This interpretation came to say that:

- the 9/5/1 diagonal of the matrix corresponds with the local regression line (line a in Figures 1 and 5). It goes from both the local and global most segregated spaces to the both most integrated spaces;

- the frame of reference for a subarea is, first of all, the bigger city from which it is a part. 'High' or 'low' local integration is not relevant without this context. In the definition of what is a good local scatter, we suggest that the mean local integration value should be around the intersection of the local and the global regression line. It is to say the global regression line (line b in Figure 5) is the neutral value for the local integration values and corresponds with the 7/5/3 line in the matrix. The zone A in Figure 4 is then the upper half of the matrix and zone B the lower half;

- the global integration values are representative for all the local subareas. 'High' and 'low' global integration may then be read 'as such' from the scattergram without inclination or analytical transformation. The 2/5/8 vertical in the matrix corresponds neutral point of the local scatter - this is the crossing point between the local and the global regression line.

- and finally, the 4/5/6 diagonal of the matrix corresponds with a perpendicular line (line e in Figure 5) on the local regression line going through the neutral point.

Starting from this card and around the drawn lines, we can now define the zones for the space categories which would correspond with the sections of the matrix. The limits 2/4 and 6/8 are defined by a perpendicular line on the global regression line (b); the limits 4/7 and 3/6 by a perpendicular on the line d. The limits of the zone containing the spaces of category 5 are made by an ellipse the dimensions of which are 1/3 of the smallest ellipse which circumscribes the local scattergram.

In Figure 6 this 'flower' card is put on the scattergram in Figure 1 and we can see, for example, that the space P belongs to the spatial character 2, at least if we relate it to the indicated local regression line. With the matrix now appended to the graph, we can indicate in section 2, regarding to which subarea this space P has the position 2.

As shown schematically in Figure 2, the regression lines as well as the shapes of the local scatters can differ. Therefore it is quite evident that such a flower-card will be made for each subarea in the planning area and also for every subarea outside the

planning area, integrating locally (up to a depth of 3) any space inside the planning area. Such flower-cards are made for every checked correlation. Figure 7 gives an example of the typical underlayer on which every space of the planning area will be 'weighted'. Both scattergrams represent the larger context of the whole city, the left one is the local/global correlation and the right one the Radius= 6/Global correlation. The most horizontal line is the global regression line. The steeper lines, named A to E, are the local regression lines of all the relevant subareas in the planning area on which the respective flower-cards should be positioned.

Figure 8 shows an example of the underlayer complete with the information of one line. The matrix now contains the relativised integration values which should be representative for the definition of land uses, building densities and traffic regulations. The local/global integration of this line is relativised with the flower-card, and becomes position 5 in subarea C, and position 3 in subarea B. In the Radius = 6/Global interface the same space has position 8 in both subareas B and C. The character of space is rarely so ambiguous as the example above. It is given here especially for illustrating the possibilities.

After relativising all the spaces of the studied area into a spatial character of the matrix, the streets can be drawn like in Figure 9, where the characters of the spaces are represented by the colour codes as shown before. But what to do with the ambiguous situations? Formerly until 1993, we had not so explicitly appreciated contradictions because of a lack of sensibility for what became the local/global interface. The consciousness of the importance of ambiguity in complex systems and the fact that the part/whole relation was more and more (as pointed out by Hillier et al) lead to more attention for subareas, for relativised syntactic variables and the ambiguity which it has brought about.

8 Dealing with ambiguous space

During the period that this method was developed the phenomenon of spatial ambiguity has been extensively considered. It would be misplaced to go into this here. Restricting it to a few general ideas and attitudes makes it rather dogmatic, but it as necessary to explain the practice it brought about.

In a mechanistic approach of the reality, ambiguity has a negative connotation. However, in complex systems, like urban systems, and following a chaos/deterministic approach, ambiguity may be seen rather as a positive property which stabilises the system. Therefore relevant ambiguities are kept 'alive'. The drawback of it is that the complexity of the 'planning-instrument' is considerably increased by accepting and maintaining ambiguities in a discursive approach of 'making plans'. In the present method two types of spatial ambiguity have finally been assimilated.

9 The line-ambiguity due to overlapping subareas

The first kind of ambiguity is due to the ambiguous position of a line in the matrix, as shown above. A line belongs then at the same time to more than one local cluster of lines or subarea. In fact, this problem arises because we distinguished entities, i.e. subareas, which are in essence inseparably interwoven with each other. It is a rather artificial ambiguity in a sense that it comes out of the analytical approach. The aim

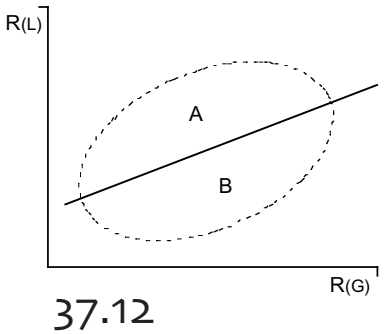

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Figure 4.

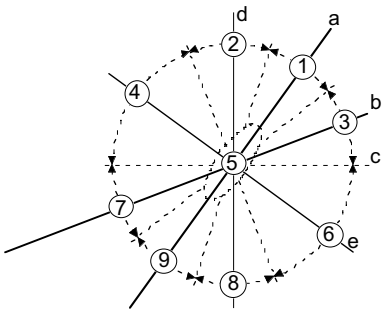

Figure 5.

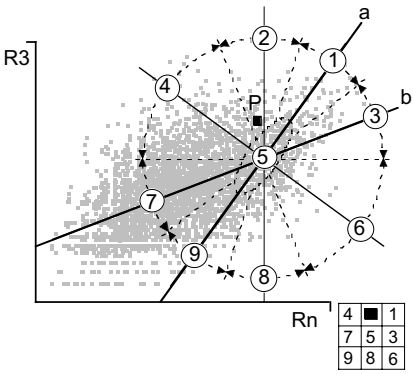

Figure 6.

here is to suppress it 'sooner or later'. Yet the most of the spaces still belong rather predominantly to one subarea. The matrix position the line has in this subarea is then maintained. The lines which after that still stay ambiguous can be considered as one of two types. First, we have those spaces which are rather integrated, both local and global. They are the principal, shallowest spaces which link the subareas to each other. Because such a line is longer than most other lines, the ambiguity is interpreted as 'going from one character into another'. So, the line will have that character or position in the matrix which accords with its specific task in each subarea. The switching point is given by specific circumstances, like geomorphology, building types, street width, etc. Figure 10 shows how this ambiguity is practically and graphically treated. In fact, we may say that the ambiguity is cancelled out by the attribution of different characters at the both sides of the line.

Also segregated spaces can be common to different overlapping subareas and therefore be 'line-ambiguous'. They mostly belong to the positions 7, 8, or 9. The ambiguity is fully but provisionally maintained and both spatial characters will be mentioned on the document by alternating the both colour codes. Spaces in this relativised integration position have a very local meaning and can be filled-in by a large choice of land use and traffic types. The conditions which regulate all these possibilities, will allow us to suppress the ambiguity as soon as more concrete requests push these spaces in a particular evolutional direction.

10 The spatial-ambiguity due to overlapping lines

The second kind of ambiguity is due to the ambiguity of a place - the convex space - with regards to axial lines. Spaces where different lines are 'present', occur frequently and have rich isovists are what makes them important structurers of their environment. Their ambiguous character makes them well equipped for different tasks at the same time. They offer to the urban system a elasticity to absorb important fluctuations of use. These spaces are critically indispensable for a flexible local/global interface. It is evident that this ambiguity of spatial character should be reflected. However, we need to be aware of not taking the line overlaps into account too literally, especially the free ends of lines. If we see the topological lines from an instrumentalistic point of view (see for example, Dewey) as components of knowledge, they are models or concepts generated in our mind outside the reality. These elements do not have a reality which precedes this process of knowledge. They are not reductions but abstractions of the reality. The precise position of a line is not so important for the output variables - and also their relativised form - which are returned by space syntax analysis. What is more important is the relative depth from one space to another.

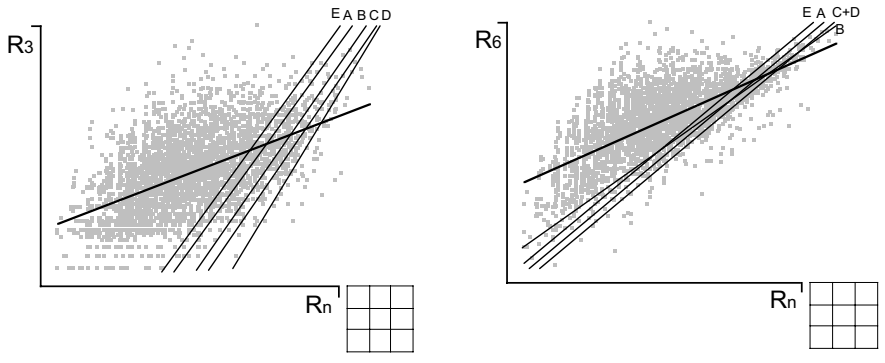

Figure 7.

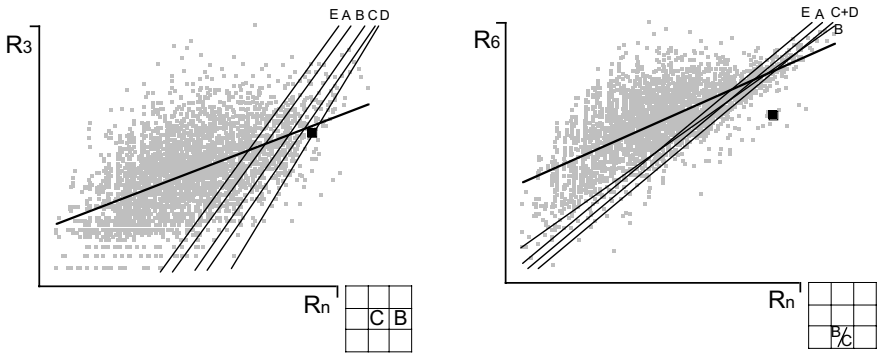

Figure 8.

This has an influence on how we interpret space according to the free ends of lines. Figure 11 shows how the ambiguity of the free ends is assimilated. The building fronts, in front of the open ends, from where the last node before the open end can be seen, keep stable the character of the open end.

Figure 9.

When lines are crossing more perpendicularly, like they mostly do on regular street intersections, the length of ambiguity is so small, that it becomes shorter than one building unit. Also, the graphical expression of it on the document becomes impossible. In these cases the highest local and global integration values which occur in both the characters, are combined and together become the resulting character for the environment of the street intersection. This attitude guarantees the continuity of high integrated paths and causes a very local land use enrichment on the corners, which corresponds with a spontaneous tendency.

11 Land use, traffic, building density according to the relativised integration map

Figure 12 shows a part of a relativised integration map made for the development plan in Antwerp (Stegen and Remy, 1994-1995). (The black strips behind the building fronts concern not the relativised integration data but another model, termed Sequence). Below we will briefly be explained how the data of this relativised integration map can be integrated into documents for mastering redevelopment.

Each human activity interfaces with environments of all kinds. These exchanges diffuse goods and information as long as it is available and accessible. From that point of view, urban development is a complex process of supply and demand. Retail, for example, supplies goods or services where the city supplies presence. Every offer or supply tries to fit with or even to create demands. The easiest way for every supply is to capitalise on the natural accessibility and high probability of presence of demand, offered by the potentials of the street grid. But the supply-side attracts also by itself. Its status of making available and accessible things and services the demand side needs, causes movement through the environment. Each activity can be put on a scale of being more 'demand side' or 'supply side', taking in account how many visitors the activity needs, before it can effectively work. The more an activity is 'supplying', the more it capitalises predominantly on natural or other movement. The more an activity is 'demanding', the more it is recessive. The most intimate, recessive space is the inside of a private house. Examples of highly dominant land uses are concert or congress halls, big hotels with important external spaces, railway stations, etc. The full list of the dominance values is given in the legend of 'the relativised integration

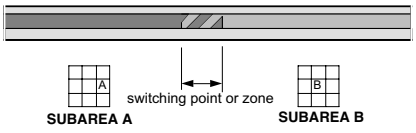

Figure 10.

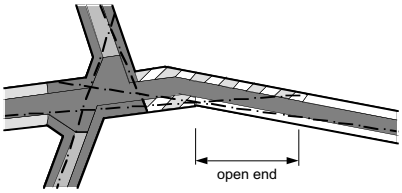

Figure 11.

/ land use' plan under Appendix 1. The formerly mentioned multiplier effect we intend to generate for the good of a qualitative urban environment is a situation that occurs when dominant activities correspond spatially with natural movement. Compared with the precise and analytical method that syntactic measures offer for dealing with natural movement, the effect of the activities or land uses on the urban system are actually still quite vague. Trying to bring the land use side of the equation into a more analytical form, parameters were introduced which should make at the end the effect of land use more 'computable'. These parameters are mentioned under Appendix 2.

The main aim of all this is to increase predictability in space as well over time. This means creating a spatial pattern of presence corresponding with the local virtual community and maintaining these patterns irrespective of important fluctuations of the absolute values. We mentioned already that the precondition is a well-shaped local/global interface, which will make the global virtual community predictable, seen from the local point of view, and that the local supply side will benefit from the global movement. This is to say that local and global centrality, and also the exogenous centrality, has to be brought together on the top of the local scatter. Figure 13 illustrates this. Spaces on top of the local scatter, here mentioned as N2, receive their endogenous, local centrality from the spaces below them in the scatter. It will depend on the appropriated spatial distribution of land use if a demand would flow from the bottom to the top in the local scatter that sustains the natural movement. In order to save predictability through time, it is necessary that a diffuse underlayer of 'demand land use', i.e. dwellings, is created and guaranteed. This diffuse supply of movement, transformed by the street grid into the patterns of natural movement, will offer a predictable social environment even at the quietest periods of the day. Spatial characters, corresponding with positions 1, 3 and 6 in the matrix, are considered as appropriate for activities which are more oriented to the global scale. In conclusion, we can say that the primary effect we would generate by land use attribution is creating movement which corresponds with the virtual local communities.

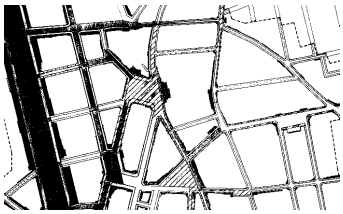

Figure 12.

With the table, see Appendix 1, land use can be attributed to each of the 9 spatial characters. As from the earliest planning documents in 1990 in which space syntax analysis and the Sequence model has somewhat been used, a flexible attribution of land use was pursued by relating land uses to the street spaces - not the blocks - through the interface of a conditional matrix. What is this about? Traditional zoning plans render each land use by a colour on zones or building blocks. More recently, the notion that zoning regulations do not correspond with the urban nature brought urban planning to use enlarged zoning regulations, the so-called mixed areas. Then a colour on the plan indicated a predominant land use, extended by a certain percentage or 'cocktail' of other activities. This allows the decisions about what is acceptable to be temporarily suspended and allows the possibility that the right nature of mix uses will arise spontaneously. The problem was, of course, still the same - what to do where? The statement that land use tended to be mixed is mainly a consequence of a zonal or metric view on it. Seen from the point of view of the spatial topological network a striking 'de-mix' appears. Therefore, a big part of the reasons why we should describe and regulate cities as 'mixed' and create flexible plans should expire. In spite of that, even when it should be possible to know what is the ideal urban

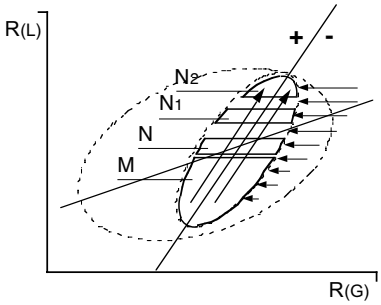

Figure 13.

organisation and if a consensus on that should be possible, a certain flexibility is still necessary because of the dominantly defensive application of urban planning. 'What is the best place for this use?' is mostly not the question, because 'the' place is not available due to the inertia that private properties give to the urban system. The problem looks more like 'what is a reasonable good use of this place?' and 'how is this particular and asked for use acceptable here?'. That is why and how this method deals with flexibility in planning instruments. The speculation is that all the 'reasonable good' singular solutions will make a quiet, good working whole. The 'reasonable good use' is intimately linked with the 'how acceptable', and is given by the space syntax analysis as far as this paper is concerned. Therefore the relativised syntactic data is brought in relation with land use through the appreciation and condition matrix in Appendix 1. The appreciations give, on a scale of 5 steps, how desirable a land use is where the corresponding colour code is applied in the map. The conditions develop on the local interface between public space and private domain, about the more local or global character of the activities and about massing of the units. In conclusion, this document treats the way in which the non-public domain should react functionally to the potentials caused by the topological public structure of the city.

12 Traffic

We said above that it will depend on the appropriated spatial distribution of land use if a predictable demand would flow from the bottom to the top in the local scatter and sustain the natural movement. It depends, of course, also on an appropriate supply of space for movement. The top bottom, and vice versa, movements are schematically indicated (1) in Figure 14. Local centralities should be very well linked to each other (2). If spaces must somehow be protected against passing through motor traffic, it should only be at the right side of the spatial characters 6 (3). These attitudes pursues the spontaneous layout of a global movement structure, a natural supergrid which integrates the local centralities (4) and which should be bypassed only during the overflow periods. Connections between locally segregated supergrids (5), such as speedways, ring, etc. and the deeper spaces in the subareas should be avoided.

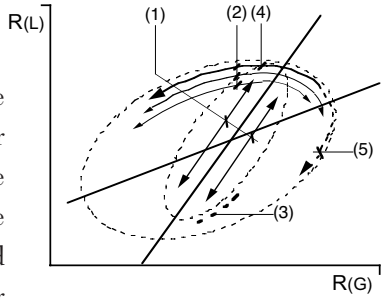

Figure 14.

Because distribution of land use and the flows of movement between them are undetachable, the organisation of traffic, the proposals for traffic infrastructures, the organisation and the partition of the public space, have also been related to the spatial characters in the relativised integration matrix. These relations are again modulated by an appreciation and condition matrix. This matrix is shown as Appendix 3. The legend is represented under Figure 15 (An extract of the plan is not given here because of the poor reproduction in black and white).

13 Building densities

The main aim of the land use regulations is to enhance predictability and allow people to better understand their social environment. That is at the end also the aim of modulating the building densities but here it is caused by making more space available, which is principally neutral regarding to the supply or the demand side. It has been established (5) that it is reliable for the explanation of movement to use building height as an external parameter combined with the integration values. Buildings and other non-public spaces can be seen as local depth, mostly non-distributing or

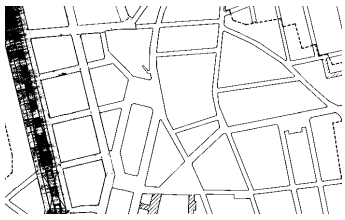

Figure 15.

hierarchically distributing. In that sense one can redraw the topological model by adding these depths and then use the resulting space syntax measures. This attitude has not been followed in the current method. We would defend rather a rigorous use of the space syntax model for the following reasons. First, movement can better be understood or simulated by a model if it is considered in a homogeneous accessible environment. Public space is, in relation to private space, relatively homogeneously accessible and should be treated separately. Second, the interfaces between public and semi-public or private space are not understood enough to be left to the internal processing of the model. Whether we add lines in the model or not, it changes nothing in reality. How exactly building density has then been used? The reasoning in the proposed application is as follows.

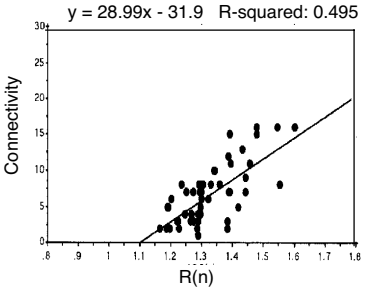

Figure 16a.

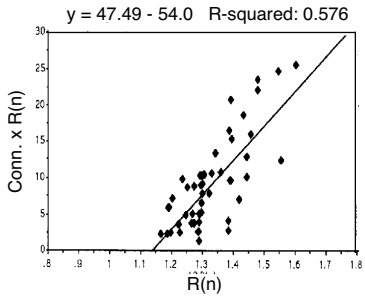

Figure 16b.

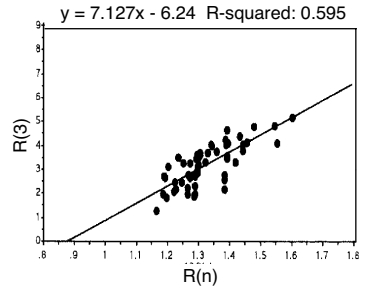

Figure 17a.

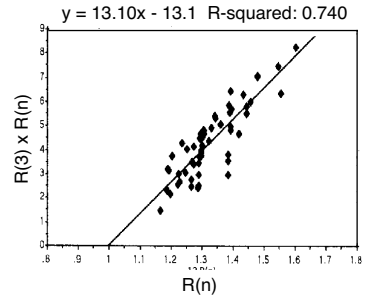

Figure 17b.

The centrality that building density gives to a space it encloses can be visible. For example, when the surrounding activities and building fronts shape a highly connected and complex isovist. Traditionally, important shopping streets were characterised by a complex and optimised interface between private and public space. Building density can also been visualised by building height. These characteristics of density are essentially locally perceivable and cause, in fact and in concept, a very local centrality comparing to what connectivity does. We would conclude by saying that adding building density is comparable to adding connectivity and local centrality, and that building density has an influence on the intelligibility and thus on the local/global interface.

Building density as such does not modulate attraction in the sense we defined it before. Attraction is rather determined by the activities which occupy the buildings. Density, as the quantitative side, feeds the multiplier effect only in combination with the land use - the qualitative side. It has become clearer that land value and building density are spontaneously influenced by global more than by local centrality. It should not be our intention to crush and distort this dynamics. In conclusion, building density was made proportional to global integration, at least to its relativised form. This means by corresponding at least to the patterns of global integration inside each subarea separately and if possible, also corresponding to the overall pattern of global integration in the city as a whole. What will be the effect of this?

It will first make possible space available where the demand and the need exist and it avoids the destabilising and erosive effect on environments caused by undersupply or overdemand. Given the absolute precondition of an acceptable local/global interface, i.e. a good local to global correlation, and a respect for the land use distribution as mentioned above, we may expect that a good correlation between density and global integration will optimise the multiplier effect. It will supply building space for both the central and residential functions where local integration is high. It makes building space available, out of the central functions, for residential use in the central spaces of the subareas according to the suggestion under the title 'land use' stated above. This attitude makes cities more intelligible and the subareas more distinctive if density is perceivable as connectivity, complexity or building height. Finally, it makes social environments more predictable because it amplifies the endogenous centrality progressively from the most intimate to the most frequented public spaces, or analytically expressed from the bottom to the top of the local scatter.

The increasing effect on intelligibility is simulated analytically in Figure 16, the effect on predictability in Figure 17. The scatter is a local scatter of a subarea. The R-squared value is representative for the intelligibility in the connectivity / Radius = n correlation and representative for the social predictability - the local/global interface - in the local/global correlation. When the Radius = 3 or Connectivity value of each space rises separately and proportionally to the Radius = n value the correlation, as expressed by the R-squared value, becomes better. Not only does the correlation becomes better but also the regression line tends towards greater steepness and reflects the tendency of subareas to become more distinctive (Hillier, 1996: 174). The steepness of the regression line and the distinctiveness of the subarea is proportionate to the a-value in the equation y = ax-b of the regression line, written at the top of the scattergrams. From this analytical point of view, it looks quite evident. In fact, it is a way to visualise the effect the modulation of building densities has in the complex urban system on the local/global interface.

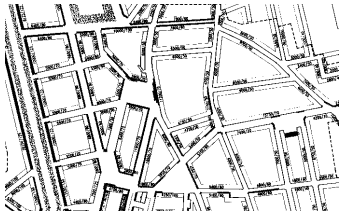

Figure 18.

37.17

An example of a map which contains the information about the pursued building density is shown in Figure 18. It shows the same surface as Figure 12. On these documents, and following the former considerations about densities, density is indicated in relation to the public space. Density is expressed as the quantity of building surfaces accessible from the streets. It is given for the fronts of the building blocks by two numbers - the absolute value (m2 building floor) and the relative value (m2 building floor/m front length along the street). The relative values are also represented with a colour code, admitting a more global reading of the document. The fields of the colour scale are divided as follows: < 40, 40-79, 80-119, 120-159, 160-199, >199 m2/m.

This map also contains information coming from the Sequence model. Here, the information about the sequential integration of the fronts is not exactly the same as the original outcome of the model as it was indicated on the document as shown in

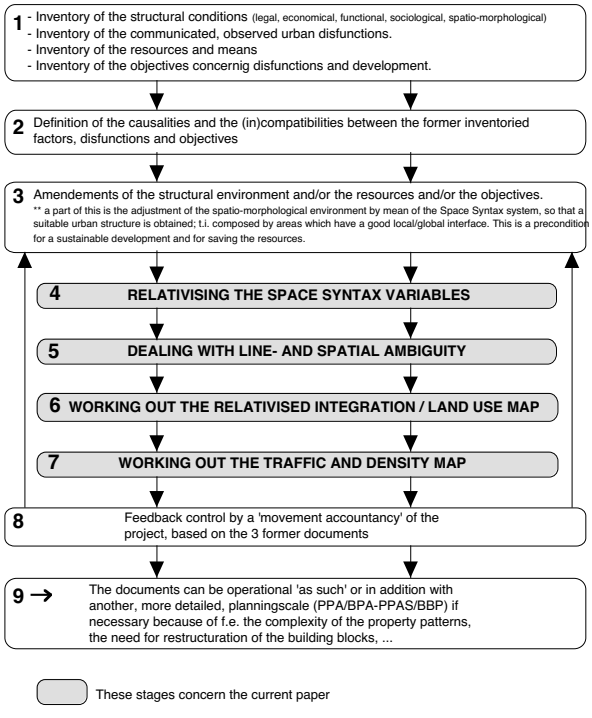

Figure 19.

Figure 12. It is now transformed so that it admits to choices about the way density and centrality could and should be expressed or suggested for each particular place - with building height, complex fronts and isovists, a high density of front doors, etc. In a narrow, straight street for example it will be difficult to express density or centrality by building height. The information about the sequential integration has still another architectural meaning as it indicates how remarkable, complex or exceptional the fronts of the buildings should be. The way this is to be expressed, by styles, colours and/or shapes, is not imposed and left to the initiative of the owners, builders and architects. In conclusion, this document contains the way the non-public domain should react metrically to the potentials caused by the topological public structure of the city.

14 Conclusion and the position of the discussed method in the planning process

Space syntax analysis, which offers knowledge about how human understand and use spatial structures, allows what we could define as a probabilistic, functional design (Stegen, 1997). For city management and planning, it means that a quite important freedom can be allowed to the singular private initiatives around a spatial structure which causes deterministically and probabilistically the global pursued evolution. The method, described in this paper, goes systematically from space syntax analysis to documents for urban management which indicate the tolerable margins for individual initiatives and projects without running the risk of losing the pursued global deterministic effect. The successive stages of the method in the larger planning horizon are schematically expressed in Figure 19. For the clarity, the graph does not contain the administrative and democratising steps of the planning process. Especially the last one becomes more and more indispensable since techniques and models become available reaching the information to influence purposefully the deterministic urban processes.

Notes

(1) The relative unimportance of absolute values is due to human incapacity to perceive these absolute values. This is true for all our senses, including our social sense.

(2) Many papers and publications about space syntax show how much spatial morphology and mental accessibility are related.

(3) The correlations used to be checked on different environmental levels systematically for Local/Global, Radius = 6/Global, and more occasionally for Local/Radius = 6.

(4) One can argue that colours could be substituted by black and white patterns and hatches. This alternative is indeed usable for the consultation of a planning document regarding to one plot or property. However, for a more global understanding of the planning document only colour documents seemed effective.

(5) The definition of the edge for this category 5 is quite arbitrary. Computerisation of this technique should allow to use more representative descriptions.

(6) Streets or more irregular spaces, even narrow, softly swinging through the urban fabric have deeply overlapping axes shaping complex topological triangulations with the lateral incoming spaces combined with a high and constant connectivity. Throughout history these spaces seem to be very capable of holding important retail and market activities even when they are losing global centrality.

(7) This approach goes back to where the axial line is an abstraction from - the isovist.

(8) These strips come out of the Sequence-2 model which reflects on topologies between fronts and places (not between places and places as space syntax does). It returns what can be understood as integration values of the building front, depending on the degree in which the obstacles (fronts) makes the spatial structure perceivable. This model is made and applied by LaSE and G. Stegen and F. Remy for dealing with land use according to building arrangements.

(9) Buursink J. (1980, Stad en ruimte, Assen; p.95) uses the concept of exogenous centrality in addition to endogenous centrality to make a distinction between centrality which is induced by the surrounding areas (endogenous) and the one which rises from the use of a place as a node in a network of long distance - international - relations. To be compatible with the concept of the local/global interface the local as well as the global centrality has to be considered as 'induced' endogenous centralities. Exogenous centrality is the 'injected' centrality caused by movement out of other topologies than the open public spatial system,

like railway stations, metro stations, ring structures.
(10) For an extensive argumentation of the possibilities and conditions in the matrix, see Part III -'De Structuurschets' (Stegen and Remy, 1994-1995).
(11) For example, the use of the ground floor and the distribution between public and private spaces are of great importance.
(12) For example, by tunnels.
(13) Following the principle of entropy, the more an environment is homogeneous acceptable the more patterns of distribution of phenomenons are simple.

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Stegen and Remy (1990-19) five Particular lay-out plans (PPA or PPAS) were studied in the Brussels Region and made operational. : "Leopold-II sections A, B, C and C°" and "Scheutbosch-bis".
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37.20

APPENDIX 1

LEGEND										
NUMBER IN THE INTEGRATIONMATRIX	1	2	3	4	5	6	7	8	9	
COLORCODE ON THE MAP										
housing, type 1 : houses, appartments	+	++	+	++	+	0	++	+	0	2
	1/5		1/5			1		5	3	
housing, type 2 : social housing estates	0	++	0	++	+	0	++	--	0	2
	1		1/5			1			3	
sheltered housing: f.e. service flats , ...	0	++	-	++	+	0	++	--	0	2
	1		1/5			1			3	
kindergartens	+	++	--	++	+	--	+	--	-	3
nursery schools	+	++	--	++	+	--	+	--	-	3
professions, service and attendance (coupled with the residence and max. 5 pers.)	+	+	+	0	+	-	0	0	-	5
								3	3	
stores and shops for primary needs	++	+	0	0	+	--	-	--	--	8
infrastructure for education, religion, culture (< 1001 m2)	+	++	-	0	0	-	-	--	-	7
social community buildings for local use	+	++	--	+	0	--	-	--	--	6
horeca - type 1 (more local oriented and < 100 m2)	+	++	0	0	0	--	-	--	--	6
production and maintenance enterprises	0	0	++	-	+	+	0	+	0	5
	7/8	7/8	7	7/8	7		7/8		4	
hotels - type 1 (without externalities and < 15 rooms)	+	+	+	0	0	0	-	0	-	7
conference facilities - type 1 (< 201 pers)	+	0	+	--	0	+	--	--	-	6
								4	4	
non-commercial and public services for daily and local	+	++	-	+	+	--	-	-	--	7
public transport - type 2 : stops for bus, tram, taxi	++	+	++	+	+	+	-	0	--	1
primary school	+	++	-	+	0	-	-	--	--	3
cinema and concerthall : < 251 persons	++	+	+	0	0	-	-	-	-	7
									4	
feast and spectaclehall, type 2 : without horeca 3 and for less than 201 persons.	++	+	+	-	0	-	--	-	0	7
									4	
apparthotel, flathotel	+	0	+	-	0	0	--	--	0	7
									4	
youth hostel	+	0	+	-	+	-	--	--	0	6
									4	
hotels-type 2 : with externalities corresponding with horeca 2 and for less than 76 rooms.	+	-	++	--	+	0	--	-	-	8
									4	
educative, religious and cultural infrastructure, type 2 (> 1000 m2)	+	0	++	-	0	0	--	-	-	8
									4	
hospitals	+	0	++	--	0	0	--	-	-	7
									4	
public transport - type 1: trainstations and metrostations	++	+	++	-	0	0	--	--	--	1
public administrations - 1 : supra local departments , accessible for public.	+	0	++	--	0	0	-	-	-	6
								4	4	

APPENDIX 2

An analytical formulation of land use with regards to co-presence and the multiplier effect.

In the paper was mentioned that 'it will depend on the appropriated spatial distribution of land use if a demand would flow from the bottom to the top in the local scatter and sustain the natural movement'. The natural movement, like it has been defined, is given by space syntax analysis and is amended somewhat by biases of all kind and also locally by land use and density. But what means 'demand' and how does it flow? After all, supply and demand are confusing concepts because, related to things, they are always reversible under another shape. That is similar to the principle of entropy - it is a process of exchange between available place and available energy. Shops, for example, are the interfaces between available goods and available money (presence). Space for retail activities demands more presence than the mean available space used to contain. It has, like every activity, its own specific balance between available space and users, seen as the sum of the 'visitors' and the 'occupiers'. These last ones are all the people who manage the available space and decide on the access of visitors. If we define the 'more supplying side' of the urban activities as what for example a shop does, in contrast to what a dwelling does, it corresponds with the usual definition of an 'attractor' - it attracts because it intensifies or 'multiplies' space. With regards to movement and presence, it is also meaningful the local spatial depth of a shop is more accessible, more available for movement and presence, than the local depth of a house. Compared to the multiplied space, the singular more intimate one - or the people who are 'occupiers' of that space - shapes the demand side. If somewhere in the city, space is multiplied (= created) by a land use a potential from the singular space to the newborn one arises. The proportion between singular space and the numbers of 'occupiers' is a very stable relation. Very roughly, we can say that every 25 m2 of building surface in the city represents one occupier. It can be seen as the unit of the latent demand in the urban system. From the moment this potential comes out and moves, the public spatial system takes over and structures it in what was defined as the natural movement.

If land use must sustain the natural movement the willingness, the capacity and the quickness by which the activities can absorb movement and presence, should be adapted to the movement that the street grid offers. By describing land uses more analytically and using structural characteristics we try to deal with these properties and with the combined effect that the structural characteristics has where the private land use interferes with the public space. This combined effect is what interests us the most with regards to the predictability of the social environments.

This effect has been conceptualised as 'pressure'. When a land use causes a negative pressure, it attracts more than it is more supplying. When it causes a positive pressure, it is more demanding. Regarding to the quantitative side of movement, this 'pressure' depends primarily on the balance between 'occupiers' and 'visitors'. Regarding to the qualitative side, other factors which influence the visibility and intelligibility of presence should be taken in account. The basic equation is:

PFd = S.e. (1-md)

PFd is the mean pressure caused by a unit on the public space during a time unit (d= one day).

S is the surface of the unit, expressed in 100 m2
e is the number of occupiers per 100 m2. This is generally 3:100/25 = 4.
md is the daily multiplier factor, the specific daily proportion between visitors and occupiers for that activity. It is proportional to the dominance-value in the table under Appendix 1.

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A unit f.ex., of 200 m2 , which has a md -value of 1.5 , has a PFd -value = 2.4 . (1-1.5) = -4

The pressure that all the singular parcels cause on the public space, makes for a pattern of more positive or negative quoted public spaces in the street grid. The final aim - that a demand would flow from the bottom to the top in the local scatter- is accomplished when the pattern of distribution of pressure through the street grid is the inverse to the pattern of local integration.

The extended general expression, which contains factors reflecting how perceptible the effect of attraction is and therefore how intelligible the multiplier effect, has never been used because of the difficulty to quantify some factors. However, the additional factors below have influenced in a non-discursive way the appreciations and conditions proposed in the integration/land use table in Appendix 1.

o is the degree of frankness of the activity. This is comparable to the degree of asymmetry of its interface with the public domain.
p is the degree of permanence of each occupier
r is the action-radius of the visitor
f is the frequency of visitors

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- Building density is indeed a question of spatial morphology and therefore it influences the natural movement. However, we like to remember that we preferred to not integrate it into one unified space syntax model, but moreover to handle it as an additional factor.

- Occupiers are not only inhabitants. The distinction between occupiers and visitors is defined for each activity by a significant difference of permanence.

- In fact, this value fluctuates mostly between 15 and 40 m2/person and a person can be more than once a 'occupier'. In spite of that, quite precise and quick estimations of the demand side are with this possible.

public administrations - 2 : regional departments, accessible for public	++	-	++	--	-	+	--	0	0	6
									4	
public administrations - 3 : departments which are not accessible for public	0	--	++	--	--	+	--	+	+	4
									4	
private administrations: head-office of enterprises, companies, banks, insurances, ...	++	--	++	--	-	+	--	0	--	8
storages	--	--	+	--	0	++	--	+	+	5
									4	
secondary school	+	-	++	--	++	0	--	0	-	5

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hotels-3: > 75 rooms, with externalities like horeca 2 and 3, congress facilities	+	-	+	--	-	+	--	0	0	9
								4	4	
feast and spectacle halls - type 3: without limitation	+	--	+	--	0	0	--	0	0	8
								4	4	
cinemas and concerthalls - type 2: > 250 pers.	+	--	+	--	0	0	--	0	0	1
								4	4	?
public parking areas and buildings	++	+	++	--	-	0	--	-	--	7
private parking areas and buildings are to be appreciated following the main function										
Congress and festival infrastructure - type2 : > 200 pers.	+	--	+	--	0	0	--	0	0	1
								4	4	?
	DOMINANCE-VALUES									▲

Explanation of the appreciations:
++ = advisable / **+** = favourable / **0** = acceptable / **-** = to avoid / **--** = harmfull

Explanations of the conditions:
(1) to avoid on the groundfloor or in direct contact with the public domain
(2) max. density: 20 m2/m front length
(3) only if the residential use is the main land use and if this street opens up on spatial characters 2, 4, 5, or 7.
(4) favourable when this street is non-permanent, short and opening up on spatial characters 1, 3, 5, 6 and 8.
(5) the density of the residential use has to be higher than 40 m2/m front length
(6) better suitable for larger units (chain and department stores)
(7) blind walls should be avoided here and these uses should be arranged at the back, deeper in the blocks, not along the front.
(8) only for units smaller than 500 m2
(9) for units smaller than 200 m2

APPENDIX 3

TRANSFORMATION TABLE: RELATIVISED INTEGRATION <-> TRAFFIC

NUMBER IN THE INTEGRATIONMATRIX	1	2	3	4	5	6	7	8	9
COLORCODE ON THE MAP									
High traffic intensities on groundfloor	+	-	+	- -	- -	+	- -	-	- -
	1/11	1/11	1					6	
High traffic intensities under ground									
Normal mixed traffic	++	+	++	-	+	++	0	+	0
		11							8
Zone 30 (max. 30 km/h)	+	++	+	++	+	-	+	0	+
				10	10		10		10
Additional and/or temporary traffic restrictions	-	0	- -	+	0	- -	+	0	+
	7	7	9	7	8	9	8	8	8
For pedestrians and bicycles only	- -	- -	- -	-	-	- -	+	-	+
Land use linked regulations	- -	- -	- -	- -	- -				
							2/3/4/5		
..., but accessible for public transport and taxis									
Entries or exits for tunnels (A=roads, B=tram) or for parkings (=P)	+	- -	+	- -	- -	+	- -	-	- -
		P= -			P=0				

Explanation of the appreciations:
++ = advisable / + = favourable / 0 = acceptable / - = to avoid / - - = harmfull

Explanation of the conditions :
(1) Acceptable if enough space is available for fast and slow traffic: at least 5 meter roadwidth per direction, large walkways and a separate cycle-track.
(2) If the different ac tivities which are settled here are not very permanent and all active at the same time, this street should better be closed out of the active period.
(3) Zone 30 (max.30 km/h) or residential area with limited access to traffic (R.A.L.A.T. = 'woonerf'), in case this street contains principally residential land use.
(4) If the activities here are mixed, only local destination traffic is acceptable and regulated by using one way traffic, traffic loops or R.A.L.A.T (woonerf)
(5) If the activities are mainly enterprises for production, maintenance or storage, the streets have to open up on spaces with a higher global integration value : 9 -> 8, 7 -> 5, 8 -> 6.
(6) Only acceptable for short links between streets with a matrix position 1, 3 and 6.