Configurations of experience

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Abstract
Architects have a problem with vagueness because we describe the way spaces "work" in terms of qualities-of-place and categories-of-place, which are ill defined and applied intuitively. Conversely, space syntax has not become part of the architects' way of thinking in spite of a scientific approach.

In this paper, eight qualities-of-place are defined in terms of space syntax methods, and used to make rigorous distinctions between architectural ideas in terms of the opportunities for interaction offered to people using the space.

Some speculation is made into the possibilities for a method that could be used early in the design process, and into implications for directing space syntax research

Keywords
Interaction, qualities-of-place, places, paths, views, privateness, genotype

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1. Introduction

This paper is a result of a longstanding interest in Space Syntax, and my puzzlement both at the negative attitude of colleagues and at my own failure to apply the ideas to my daily work.

Space syntax offers a powerful way of analysing the way space works for people, yet it has made little impact on the way most architects understand the design of buildings. This paper suggests that space syntax techniques might be presented in a different way, recasting the principal concepts in terms of experiences-of-place, which would fit better with the way architects think about their design work.

My experience as an Architect leads me to believe that we tend to think about buildings in terms of what a place is "like," which is to say in terms of qualities-of-place and categories-of-place. This way of thinking suffers from vagueness, since the ideas are poorly tied to physical facts. This leaves us unable to mount logical arguments about how people are likely to behave in the spaces we design, or to explain the effective value of minor changes to a spatial layout.

Space Syntax seems to be presented almost exclusively in terms of geometric features of the environment and aspects of human behaviour without offering general ideas about place to mediate between them. It is regularly used to make a critique of a fully developed plan, but it seems to be presented in a way which is incompatible with the way Architects understand buildings, and so it is not used during the design process.

2. Architects Work With Schemata & Qualities Of Experience

There are two widely recognised ways in which architects design. The first is to design with prototypes, taking pre-designed parts and making them work with the particular requirements of the project. The parts may be geometric systems, ideal facades, elements of the building (like window bays), whole rooms, or whole buildings such as flats or even blocks of flats which have been used before.

The second way is to work with ideas about peoples' activities and experiences and find ways to make real places that allow for them to occur. These ideas are traditionally represented with "bubble diagrams," although my experience in practice is that architects more often use a "sketch plan" where activities are bounded by an approximate size and shape of enclosure and are named by the type of space typically used for that purpose. These sketch plans look superficially like design by prototype, often showing arrangements of rectangular rooms, but they are really "conceptual graphics" since the boundaries are notional and physical qualities are annotated on the drawings as Figure 1

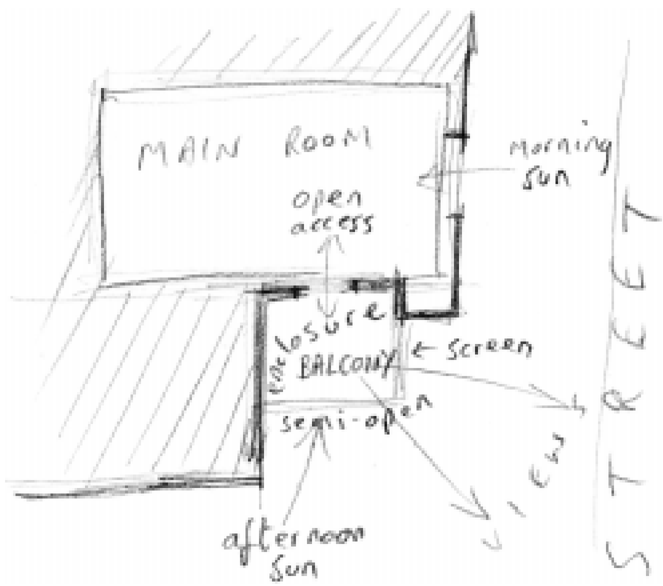

Figure 1: Conceptual "design sketch" annotated with space types and physical qualities

In this example we can see that spaces are usually labelled with names for building parts, such as "balcony." However, only the idea of a balcony is indicated not a design for a balcony, so the idea represents a category of human activity and experience of place, not a physical item such as "a Stokes Foundry model FR22 iron balcony." Norberg-Schultz (1971) calls these ideas "schemata" after Piaget, being a bundle of memories, perceptions and expectations.

Conversely, annotations such as "views" refer directly to qualities of experience, but since this is an architectural drawing we know that this is intended to represent qualities of the building fabric which will afford that experience. We also know that physical qualities implied by the geometry are provisional, such as the locations of the main room and the balcony which might be flipped relative to the street.

So we find that when architects are designing, even though it may not look like it, they are usually thinking about human experiences of activity within a space, represented by schemata and by qualities of place.

3. Space Syntax is a Socio-Spatial Theory

It is sometimes said that Space Syntax is not based in any single theoretical framework, but is an open assemblage of methods of analysis. Yet if we look at the methods that are used in the great majority of the published work we find they study differences between places based on the behaviour of people using them. This is no surprise when we look at the origins of these methods in the social analysis of Hillier & Hanson's book "A Social Logic of Space," which remains explicit in more recent domestic analysis. Hanson (1998) writes of "The fine tuning of configuration to modulate the social dynamics of the house's many occupants." If we look at the most widely used methods we can see that the behaviour in question is "social" in the sense that it involves aspects of human activity that afford or prevent interaction between people. We will look at the varieties of interaction below.

But of course, space syntax is not only a social theory, but a spatial one. In looking for factors that affect behaviour only spaces are considered, not solid forms, and only spaces that people can enter (although this is left implicit). Moreover, only the configuration of spaces is analysed – this defines a very restricted set of abstract features to be found in the environment. It is hard to see what general effect they could have on the way people behave except in affecting where people can go relative to other people, and who can see whom. These are the activities that make up human interaction, and we can see that space syntax relates to the three main ways in which people can interact; in closed groups, in open encounters, and in more remote communication. It is perhaps significant that some interesting studies of configuration which do not correlate to human interaction are not studies of space as such, but the configuration of form.

The “convex space” is the base unit of all Space Syntax analysis, and is defined by co-visibility and inter-accessibility. In other words, people within the chosen boundary can all see each other, and can all move to meet each other. Why would this make any difference to people’s behaviour? Clearly it is because these two facts invite interaction between people. If people truly ignore each other then it doesn’t matter who can see anyone else. However, these facts are basic to the functioning of a closed group where a continuity of interaction depends on people being able to communicate directly, aware that they can go and talk to another person even if they do not do so.

Movement is related to axial integration so consistently that we are very confident in using syntax analysis to predict likely movement patterns. Again we can ask why movement patterns matter. For the most part a person has an interest in the movement of people in order to predict the likelihood of unplanned meetings (encounters) with other people. It is in the interest of the shopkeeper to know how many potential customers he is likely to encounter, and in the interest of the pedestrian to know whether he or she is likely to encounter enough people to feel safe through “virtual community.”

Isovists representing views can be drawn through all spaces, but they are unique where they extend beyond the boundaries of movement. What is the difference for human users between two unconnected spaces and two connected only by an isovist? Well of course in the latter case people can communicate with each other between the spaces, albeit remotely. Even the act of observation is communication – it communicates information to the observer, and if noticed it probably affects the actions of those observed.

4. Behaviour is affected by the environment through the experiences of users.
We have looked at the types of social behaviour studied under the title of Space Syntax, and we know that there is a wealth of literature on various methods of measuring the configuration of space that correlates with this behaviour, but it is hard to find research that connects the two. The central proposal of this paper is that the mechanism that joins configuration to behaviour is human perception and cognition. This is to say that the environment can affect people’s behaviour only to the extent that they perceive relevant aspects of it, and then use these percepts to derive realistic expectations about what they can expect to occur in such a place. People behave in accordance with the expectations raised by their experience of the place they are in.

We have already described such bundles of memories, perceptions and expectations as "schemata". Our expectations of interaction, as studied in space syntax, are here taken to be specifically social schemata. It is proposed that the "schemata" that lie behind architectural ideas, as described in section 2, are also social schemata. It therefore seems possible to define architectural ideas in terms of space syntax. At the simplest level, a convex space that we can see to be ideal for a group of people to dwell in for a while is likely to be perceived to be "a room." Even if it is a defined area of a garden it is likely to be described as an "outdoor room." Most architectural ideas comprise more complex relationships between different categories of people and the possible forms of interaction between them. The expectation of a particular type of interaction, such as encounter, is itself an experience of a quality-of-place (it might seem like a "busy" place).

To go back one stage, what is it about a place that gives people the impression that it is "a room" as described above? Perceptual psychology suggests that some aspects of the environment act as "cues" for this perception, for instance, a sense of enclosure is a good cue that a place might be good to dwell in. These cues are direct perceptions of the world around us in contrast to the schemata that arise from them, but are experienced as qualities-of-place of a different sort. A place can feel "enclosed" as well as more generally feeling "like a room."

Finally we must ask what exactly we must see in order to perceive a cue for a social quality-of-place. Here we can return to space syntax methodology. We know what features of the environment are measured by the various methods, they are abstract spatial relations which describe the configuration of spaces that humans can enter and use, expressed as convex spaces, axial lines & isovists. These are "features" in the technical sense (see for example Gordon 1993). When such features are detected in a particular combination they act as cues.

5. How can the three types of potential interaction be experienced?

The expectation of unplanned encounter is experienced as the "busyness" of a route, which is not how busy it is at particular time, but a perception of how busy it is likely to be; how much potential it holds for meeting others. We could grade this as shown in Figure 2a.

We can call the expectation that a group could dwell in a place the quality of "habitability." This depends on what might disrupt the interaction between group members. It might be that the space itself splits up the group, or that it does not provide adequate separation from those outside the group. In this sense "encounter" can be seen as an inverse of group formation. We can rate this as shown in Figure 2b.

The expectation of communication with others suggests a degree of physical separation that prevents more comprehensive interaction, but which forms a link between the spaces each person occupies. This means that we can take it to be a question of how well people can see each other. It should be noted that this may be asymmetrical; there may be a lot of potential for people in space A to see those in space B, but much less the other way round, because those in space A can control whether they are in view, and those in space B cannot. A balcony is an exemplar of this situation, where those above can move back from the edge, but those below cannot make a difference. We can rate the potential for communication as Figure 2c.

Figure 2a Rating "busyness " (encounter potential) :

	Operational definition	Typical example of such a place	percentage
b1.	co-presence certain	Big city railway station; inside a shop	> 80%
b2.	co-presence likely	Suburban shopping street; foyer of large building	60-80%
b3.	co-presence an evens chance	Quiet road of houses; corridor	40-60%
b4.	co-presence unlikely	Recess off a street; private room	20-40%
b5.	no chance of encounter	Lockable courtyard or room	0-20%

Figure 2b Rating "habitability " (group interaction potential) :

	Operational definition	Typical example of such a place	percentage
h1.	No disruption to the group	A private room	> 80%
h2.	Group easily maintained	A room without a door	60-80%
h3.	Usable place	A courtyard with public access	40-60%
h4.	Group disrupted	A public foyer with access to a "magnet" place	20-40%
h5.	Group cannot interact	A busy street or corridor	0-20%

Figure 2c Rating "communication " (potential) :

	Operational definition	Typical example of a such a link	percentage
c1.	One person can see another entirely	Open space or sheet of glass	> 80%
c2.	obstruction not restricting communication	Low wall or wire mesh division	60-80%
c3.	Restricted visibility	Blinds or a colonnade	40-60%
c4.	Minimal communication possible	Eye level wall or perforated screen	20-40%
c5.	No direct visual contact	A normal full-height wall	0-20%

Figure 2: Rating interaction potential

6. Qualities of the perception of space

Having looked at the way people may experience potential interaction, we can go on to the perceptions of the world that act as cues for those experiences. A configuration of spaces can affect the degree to which those within a space can see each other and move to meet each other, and how well they can see those in other spaces and move to meet them. This gives four qualities-of-place directly related to the perception of the physical environment.

We can see that each "quality" is a way of describing existing techniques of space syntax. The degree to which those within a space can see each other is the "visibility" offered by the space, and the degree to which people can move about that space is it's "accessibility." The ease with which people can move into a space from outside is controlled by the "enclosure" of that space.

How much outsiders can see of the space could be described as the privacy afforded by that space, but we can see that this is the same as the "communication potential" described above. The three other qualities are described below.

6.1 "Visibility"

In Iranian cities the historic cores, in spite of their usually central position, are not able to accommodate the contemporary requirements of life in a modern city centre, since they were generated by quite different social, economic and material circumstances to those which prevail today (Karimi & Hanson, 1999).

6.2 "Accessibility"

Perfect "accessibility" in a space would be where anyone can get to all parts directly, whatever mobility problems they might have, even in a wheelchair. A failure of accessibility would be a barrier that would effectively prevent any given person from going to meet certain others. This could mean a fence across the middle of the space, or the cumulative difficulty of many people with different abilities, from the wheelchair-user needing help at a kerb to the child slightly inconvenienced by steps. When looking at a route between places we can add up all barriers to movement along the way to get an idea of how hard it will be for people to use this route, and whether they will prefer another. Levels of "accessibility" are proposed in Figure 3b.

6.3 "Enclosure"

Outsiders moving through a group-space will disrupt the group, so the "enclosure" of space is important. To be true to the effects on interaction this must mean something more than just the degree to which the perimeter of the space is inaccessible. "Enclosure" must be taken to mean the degree to which there is physical protection from busy through-routes. In this sense, "enclosure" is the opposite of permeability and of "busyness potential." The "enclosure" of a route has a rather different effect on interaction. If a route is completely "enclosed" against movement across its boundaries then there are no choices to be made; the route is simple. A busy route crossing the path you are following will impede your progress and demand a decision. We can rate the experience of "enclosure" as shown in Table 3c.

Figure 3a Rating the "visibility" of a space (or co-visibility of people) :

	Operational definition	Typical example of such a place	percentage
v1.	Every person can see others entirely	An entirely empty room	> 80%
v2.	Some restriction of view, not restricting communication	Room with table & chairs; any space divided by railings	60-80%
v3.	Restricted visibility	Substantial columns in a small space	40-60%
v4.	Minimal communication possible	Interconnected rooms	20-40%
v5.	No direct visual contact to some part	L shape room	0-20%

Figure 3b Rating "accessibility " of a space (or inter-accessibility of people) :

	Operational definition	Typical example of such a place	percentage
u1.	No significant change in surface	Any continuous floor	> 80%
u2.	wheeled vehicles or the frail are restricted	Large kerb or few steps	60-80%
u3.	An effort for the able-bodied	Staircase, rope barrier, embankment	40-60%
u4.	Difficult for anyone to pass across	Barriers in a courtroom, park railings	20-40%
u5.	Some people completely separated from others	Glass wall, tall fence, change in level greater than 2m	0-20%

Figure 3c Rating "enclosure" of a space (being the opposite of a busy route) :

	Operational definition	Typical example of a such a link	percentage
e1.	Occupants control	An end-space, or a lockable door	> 80%
e2.	Occupants dominate	A room from which another is accessed	60-80%
e3.	No Overall control	A room on a route; a quiet piazza	40-60%
e4.	Traffic dominates	Alcove off a route; piazza on a busy route	20-40%
e5.	Traffic has control	A busy passageway (virtual community)	0-20%

Figure 3: Rating physical qualities

7. How can space syntax measure these qualities?

To find out where there are significant variations in the environment we must map the boundaries of significant differences and use these boundaries to represent zones of similarity – convex spaces in space syntax terminology – in the form of a diagram.

We have seen that interaction depends on the two concerns of space syntax; where people can go and what they can see. These are not abstract matters; features of the environment only matter in so far as they affect people. The boundaries we are looking for are obstructions to people moving about, and objects that prevent one person seeing another. It is usual in space syntax methodology to treat all boundaries as obstructions to sight and movement. To achieve the level of detail required to determine qualities-of-place it is necessary to represent them separately on a "boundary map," annotated to show the degree of obstruction to visibility and accessibility ("v" values & "a" values). Figure 4a is an example of a boundary map for a small balcony to a hotel room, photographed in Figure 4b. We will investigate how each of the four "qualities-of-space" found above can be derived from this information.

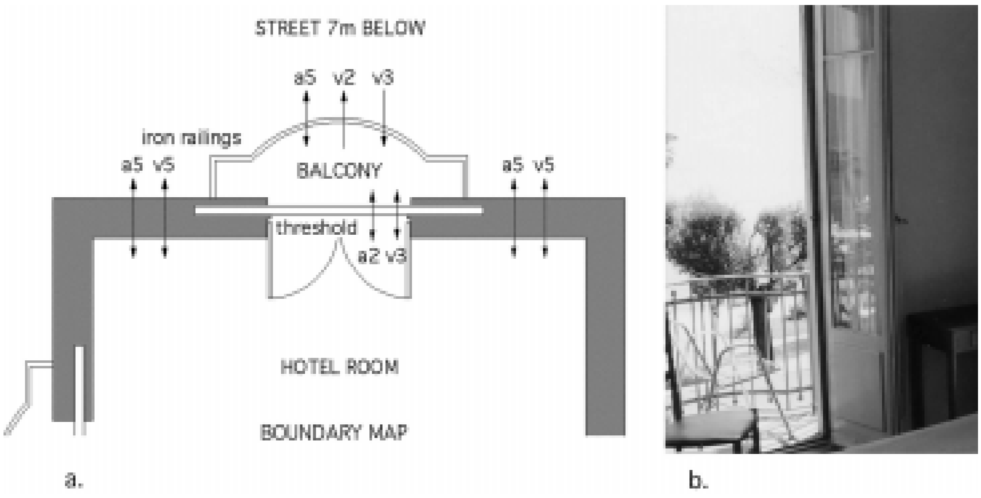

Figure 4: Example

7.1 measuring "visibility"

As usual, the first thing is to draw convex spaces, this time only taking into account visual boundaries to derive "visual spaces" (Figure 5a). It will be noticed that we do not have an exclusive partition of space. The physical boundaries have different levels of restriction on visibility, so that while the balcony railings define a visual space at the most rigorous level of visibility (v1), if we allow the slight obstruction of the railings (rated v2) we can draw a single space reaching out into the street. Within the balcony itself, two visibility spaces are shown, both rated v1. Normally we would choose the fattest to represent the space, but alternatively we can add them together as a larger space of limited visibility. This gives two alternative representations of the whole balcony space; two spaces of perfect co-visibility (v1) but only 53% coincidence (Figure 5b), or a single space allowing some trivial obstructions (v2) such as the railings (Figure 5c). In this case the latter seems a better representation, because this level of obstruction is rated as 60-80% visibility (above), whereas the addition of two unobstructed spaces shows only 53% visibility. We may take it that the higher measure is more accurate, say 70%.

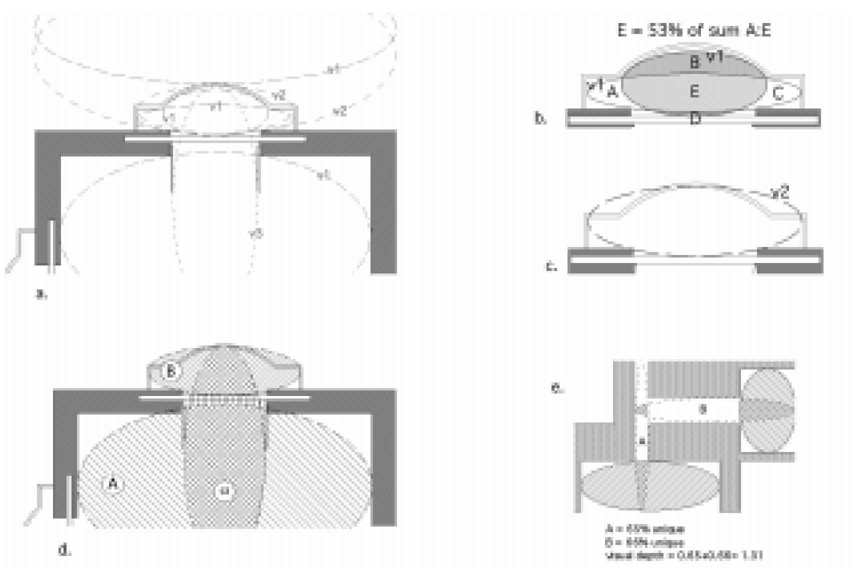

Figure 5: Visual spaces.

Figure 5d shows two convex spaces, (A) and (B), joined by a link-space (i). The link space shows the specific level of visibility between these two spaces. We can measure this by the co-incidence between these different spaces; being the sum of the areas of ellipses (A), (B) & (i), divided by the areas co-incident (shown cross-hatched). In this case there is 23% visibility between the room and the balcony (with the doors open), or a visual depth of 0.77, not quite one axial line apart.

We can extend this to spaces that cannot be connected by a single visual link, after the fashion of Dalton's "fractional analysis." Figure 5e shows two notional spaces connected by two links - the coincidence of these spaces suggests a visual depth of 1.3; less than normal axial analysis, but apparently taking into account the different visibilities of broad & narrow paths, and the angle between each link.

7.2 measuring "Accessibility"

To measure accessibility we can do almost the same things, but use the boundaries to movement shown on our map to draw mobility spaces. These are spaces where a person with a given level of mobility, rated by "a" values above, can move to any part (see Figure 6a). Since a barrier to vision is in practice almost always also a barrier to movement, if an access space is not identical to a visual space it will be smaller. There is no necessary reason why access spaces should be convex - access does not follow lines-of-sight like co-visibility - but it is convenient to do so provided that we remember that adjacent spaces with the same 'a' rating are essentially unbroken. In this case the balcony is shown with three access spaces all at the same value, and therefore has 100% accessibility between parts. Again, we can show a hierarchy of access spaces of different grades of obstruction; a link-space is shown valued "a2," coincident with other spaces but ignoring the threshold.

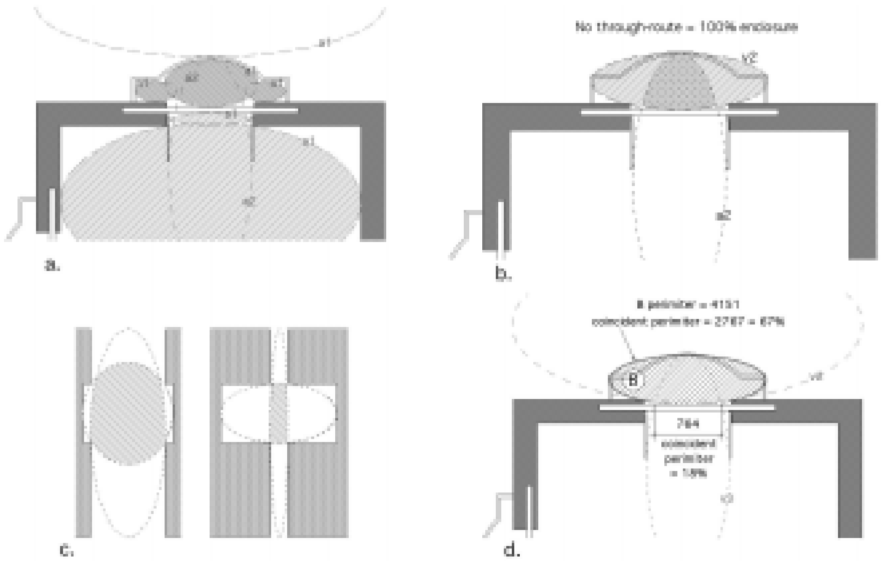

Figure 6: Physical qualities.

A typical "convex space," with co-visibility and co-accessibility, would comprise a "visual space" containing a set of subspaces which are "access spaces". The accessibility between two convex spaces can be defined by the access value of the link between them (in this case "a2" or 60-80% accessibility).

7.3 measuring “enclosure”

We have defined “enclosure” in terms of control over access. For the example above, there is no chance of the balcony being used as a route to somewhere else - it can be accessed only from the bedroom. So for the purposes of predicting interaction we can say that it has 100% "enclosure," even though it is open to view (Figure 6b). We can look at a hypothetical situation to see how lesser degrees of enclosure might be measured (Figure 6c). We can draw an access space for the route that passes through the place we are considering. The proportion of our place which is coincident with the route-space measures the degree of permeability offered. To make an estimate of the potential disruption to users of that place the degree of coincidence of each route would need to be multiplied by it's "busyness" (see next section).

7.4 measuring “communication”

The “communication value” of a place depends on the visual links to other places. This seems to be measurable only by the proportion of the boundary which is open to observation. This is more easily understood by its opposite, privacy. The privacy of a place can be measured by the amount of the boundary that obstructs vision multiplied by the percentage visibility through that boundary. Figure 6d shows the proportion of the boundary of the balcony that it shares with a visual link to the street, and with a link to the bedroom, each multiplied by the visibility rating of that boundary. This leaves a communication rating for the balcony of 59% (or 41% privacy). You might think that such a balcony has no privacy at all, but it is fairly well divided from the bedroom when the glazed doors are closed, and overlooking from the street is reduced by the height difference.

In this case, the "privacy" of the link makes little sense, but the literature shows many occasions when it is important to know the degree to which a route is overlooked from other spaces.

8. Qualities-of-place make up places, paths & views

Having measured the qualities that make for the social perception of space, we are in a position to predict the potential for interaction offered by each space. In the simple example given it is easy to see which spaces are "places" in the sense that they are good places to dwell, affording control over interaction to those who inhabit them. The balcony clearly has this property, but to what extent? For the occupants to maintain interaction with each other the space must have good visibility and accessibility internally; for the occupants to control interaction with others it needs good privacy (poor communication) and good enclosure, at least as an option for them to exercise. A door is a good example of optional enclosure.

We might set a threshold value for each quality, being the minimum requirement for a given space to work as a "place" as defined above (which means it is a "convex space" as defined above). This would allow an algorithm to be used to find which spaces in a system are "places" and therefore offer the potential for dwelling. An alternative we can use here is to find the average for the four values, which for the balcony in this example is 78%. This is lower than the value for the bedroom, but is good enough to count as a place. This fits with our intuitive understanding that people on the balcony have pretty good control over their interactions with others, but are not completely secluded.

We have seen that a “place” may be defined as a space with particularly good habitability potential, but there are vast qualitative differences between a football stadium and a booth just big enough for two. We can define categories of size based on the type of interaction that can take place there, see Figure 7a below.

Why do people move through a space? Because it lies between the place they were dwelling in and another place they wish to go to. Traffic can only ever be between habitable spaces (“places”) because people are never in perpetual motion. If the only route between two places passes through a third, then there is potential for encounter between inhabitants and those passing through. How much “encounter potential” exists in a space depends on how many pairs of places there are connected through it. We may call this the “route density.”

However, in typical street patterns people have a choice of route. Space Syntax shows that people tend to choose routes with the fewest turns, and more specifically with the fewest axial lines (lines of sight). We have seen above that this is the same as the "visibility" of the set of spaces that make up the route (paragraph 7.1.3). We have also seen that the "enclosure" of these spaces measures the simplicity of the route, and "accessibility" is the opposite of the physical difficulty of moving along the route. If we apply the four qualities to a route in the same way that we did to a convex space (above) we have a value for the attractiveness of that route.

If this weighting is applied to all the routes in a system to modify the rating of “route density” at any point, it appears to give similar results to axial integration. The experience of “a busy place” is therefore cued by a perception built up over time of its position in the network, not just by the boundaries of that particular place. There may of course be other cultural cues such as crowd barriers, but these are not configurational cues.

Where two "places" are linked by a space that has no accessibility, the link still has social significance as it forms a view between them. We can therefore use the social qualities of space as an algorithm for converting a map of visual and access spaces into a diagram of socially significant "places," "routes" and "views" (see Figure 7b). These are defined two ways, by geometric features of the environment and by the qualities of interaction we can expect to observe.

7a. Rating "Places" by type

	Operational definition	Typical example	diameter
t1.	Only room for one person	Alcove, cab of a crane, etc	0-1m
t2.	Others are within reach	Booth in a restaurant, Entrance passage	1-3m
t3.	All close enough for speech	Standard domestic room, patio	3-6m
t4.	All can easily be met by moving	Large hall, most urban outside spaces	6-30m
t5.	Others are within vision	Sports stadium; huge public square	30-500m

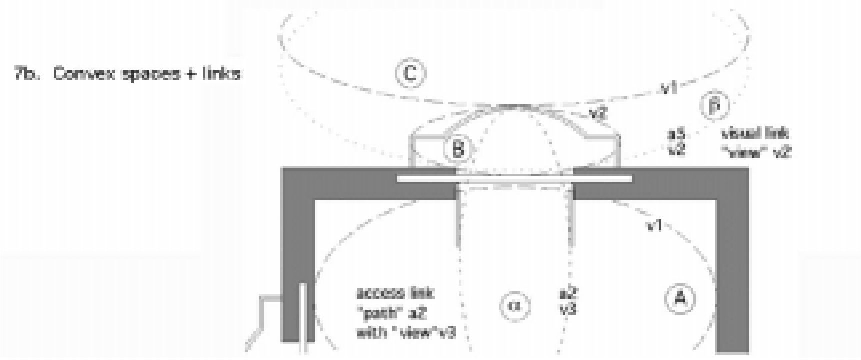

Figure 7: Places & links.

We have now arrived at a representation of space as a system of interaction potentials. However, across this system there are obvious inequalities. Some places are private; they are usable only by their "owners". Of course this is often established by locked doors, but configuration can do the same job by making certain spaces eminently habitable so that they are occupied and others do not enter. To get to these places people must often pass through other spaces, and since this deprives the occupants of those spaces of control over interaction it makes them less habitable. In fact, a route can be traced from each end-space (with only one entrance) to the public realm, on which each space can be rated for habitability. The most habitable space has the potential to dominate the others, wherever they are in the chain, because those deeper down the route are inaccessible to everyone except the inhabitants of the dominant space, and those near the outside of the route are compromised by being used as gangways to the dominant space.

Deep spaces can be described as "servant spaces," because they are usable only in conjunction with the dominant space. Spaces used to reach a dominant space, such as the front garden of a house, become semi-private because they are traversed only by those who are going to the dominant space. These "entry spaces" with the dominant space and "servant spaces" can be seen as a suite of spaces which belong together and in some ways act as a single space. We can tell what is public space, because it starts at the outside of the system and forms continuous routes of spaces which rate highly for "busyness" and low for "habitability." Where a space shows reasonable habitability but is used to access several dominant spaces it cannot be made part of any individual suite of spaces, but can be classed as semi-public. Since this categorises spaces according to how private they are, we can rate spaces by degrees of "privateness" (not privacy which is different) as Figure 8a.

a. Rating "privateness " of a space

	Operational definition	Typical example
d1.	Dominant space	The most habitable space on a route; a lockable room
d2.	Servant space	Space only usable from a dominant space; cupboard
d3.	Semi-private space	Space dominated by access to another; front garden
d4.	Semi-public space	Courtyard to flats; outdoor room in a public park
d5.	Public space	The street

b. palate of qualities

	Spatial qualities		Network qualities
v	visibility	b	busyness potential
a	accessibility	h	Habitability potential
e	enclosure	c	communication potential
t	Type of place	p	privateness

Figure 8: Qualities

We now have a palate of eight qualities-of-place defined by the possibilities of social interaction using space syntax methodology, shown in Figure 8b.

9. Defining the genotype of an architectural idea

We can use the social qualities-of-place found above briefly to investigate how they can sharpen architectural ideas, and be used in the design process.

One of the important ways in which a building "works" is by controlling the interaction between people. If we look at common categories-of-place used by architects, we can see that not only are they schemata (as discussed above), but they are social schemata, being in essence about configuring human interaction. We can return to "the balcony" as an example of such a category-of-place and apply our palate of qualities-of-place to define these schemata.

Balconies can vary greatly in their physical attributes, from the tiny "French balcony" (Figure 9a) to large living areas recessed into the facade of a building (Figure 9b). But one thing they have in common is a pair of spatial relationships; access from a relatively private room, and views to a relatively public space outside (Figure 9c).

Figure 9: Balconies (photographs by author)

In fact we can generalise, and say that all categories-of-place can be defined by a set of necessary paths and views to other places. In doing this we create a "genotype" of that experience, as demonstrated in Hanson (1998), using the freedom of a graph to represent these abstract ideas about spatial relations which do not necessarily map directly onto physical arrangements. We should note that this would represent the necessary spatial relationships, but there might be others in addition; several different views for instance. We could try to represent the genotype for a balcony as Figure 9d.

However, we need more information on each of the necessary relationships. A balcony is usually thought of as an external space, but many have roofs, often the floor of the balcony above. The essential fact is that communication with the external space is almost unobstructed. If someone glazes-in a balcony it surely loses its "balcony" nature. However, it is important that it is not physically accessible from the public space; a balcony that anyone can step into is merely a patio. The relationship of an almost complete view with an effective barrier to movement can be represented as a graph (Figure 10a), where the visual asymmetry is also represented.

What if this same relation held between a balcony and an internal space, perhaps the same space from which the balcony is accessed? Here we would call it a gallery, and the existence of a separately defined term demonstrates this boundary of meaning between the two categories-of-space, even if the terms are sometimes confused. We can say that at least some views must be to a place less private than the balcony; a semi-public or public place (a garden, street, or countryside). Similarly, the second relation must be to a relatively private room; a dominant place to which the balcony is a servant space (as defined in paragraph 8.9). If it were accessed from a more public space it would be called a terrace. It is in these definitions of "privateness" that we see how properties of the entire network are encoded in a discussion that seems to be focused on just three spaces. This is a configurational definition in the widest sense, and bears witness to one of the fundamental discoveries of Space Syntax; that the nature of a place is deeply affected by its position in the network. We can add to our representation as Figure 10b.

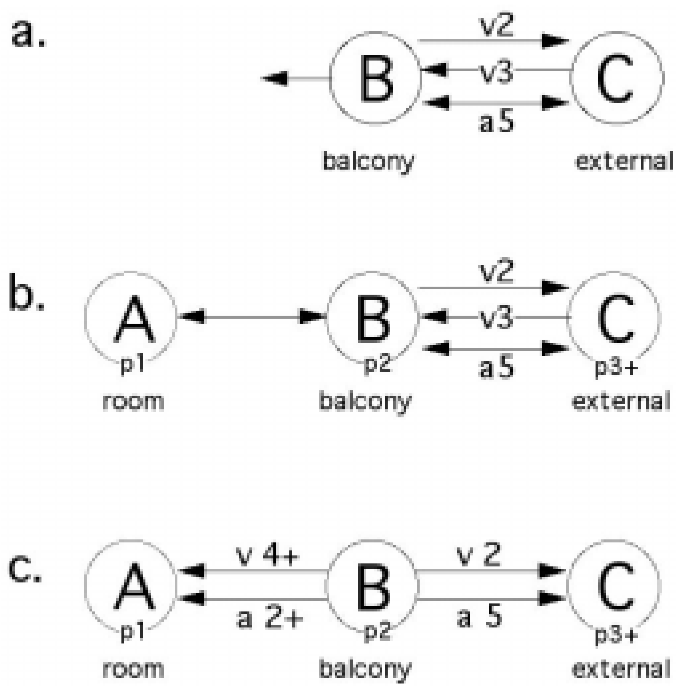

Figure 10: Genotype graphs.

Looking in detail at the necessary relation between the balcony and its room, we can note that at least some visual link is always present. Good physical access is also required by definition, at least an easy step, if not level access. A complete representation of the Balcony genotype would be as Figure 10c. This matches up with analysis of the plans of each of the three balconies pictured above.

10. Further work

If room permitted we could look at the graphs for various examples of the same category-of-place, not just to show that the genotype holds for them all, but to demonstrate that the qualitative differences between the examples are reflected in the graph. For example, balconies pictured have different values for place type, being respectively t1, t2 and t3. A comparison with similar categories-of-place shows the essential difference in a graph even where many qualities are the same, for instance between a balcony and a gallery.

Most interesting would be to explore the use of rigorously defined genotypes and qualities in the design process. This would involve transforming the Client's brief (program) into a series of genotypes by interpreting the activities by their demands on interaction (sometimes done using an adjacency matrix). Site conditions may also be represented as a graph of spaces & links, and the various graphs added together by matching the relationships required by one with the spaces offered by another.

To get to a "design sketch" we would need to draw out the physical constraints of the graph created. The general size of each place is given by the "t value," and linking spaces can be drawn between them with a level of coincidence appropriate for the visual and access values given in the graph. There will also be information to add, where the demands of the graph are not specific we can choose values for qualities that we feel are appropriate, developing a unique variant of an idea.

A further level of concreteness will be added by checking the qualities against the physical possibilities that can create them. The relation between the balcony and the external space in our example requires asymmetric visibility, which might be achieved with blinds, differential lighting, or a change in level. It also requires a barrier to movement, which might be a wall, a metal grill, or again a change in level. Of course a change in level is the normal solution for a balcony, but this syntactic analysis of qualities suggests that a similar effect might be gained by a metal grill with internal blinds.

11. Conclusions – social qualities make sense with space syntax

Space syntax methods can be used to make sense of apparently vague architectural ideas about places and qualities-of-place. This is because many categories-of-space are essentially patterns of potential human interaction, and therefore can be described in terms of relationships between places, paths & views. This allows the objective definition of ideas and an evaluation of how the spaces will "work" in social terms.

In a paper to the third Space Syntax Symposium Hillier reflected that the metric centre of a town is usually different from the centre of axial analysis, and asked "Which is the true picture" (Hillier 2001 p 24). This ceases to be a problem if we see the axial centre as a concentration of potential for human interaction, not as a spatial concept of the same order as the metric centre. As a wider point, Space Syntax makes sense as a socio-spatial theory of the potential for human interaction afforded by the configuration of usable space.

We can speculate that other, non-spatial, features of buildings could be represented in a similar way to define other, non-social, qualities-of-place. This might build up a more complete analysis of how a given design will be experienced. It allows us to ask a design "what are you like?"

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