

Plans and Lines of Movement

A studio experiment

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Abstract

This work is based on a studio experience carried out with 1st year undergraduate students at the School of Architecture of the Federal University of Rio Grande do Sul (Brazil) during the year 2000; an experience that introduces a methodology of spatial analysis applied to the assessment and control of design performance. The use of such method has delivered interesting results in the work of students in architectural design. For the student it might not be clear - as it must be for an architect - that the act of distributing walls and furniture in space is also (and always) a way of defining routes where people move and moreover that a plan is in any case a set of lines of movement. In what follows it is shown the concepts utilized in such procedures - concepts that were passed to students in theory classes - and how they are applied in the studio work.

Keywords:

spatial analysis,
morphology,
movement, design
performance

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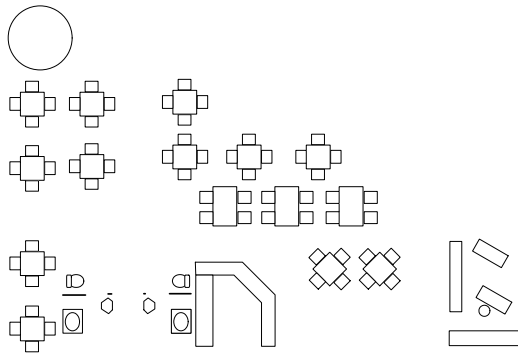
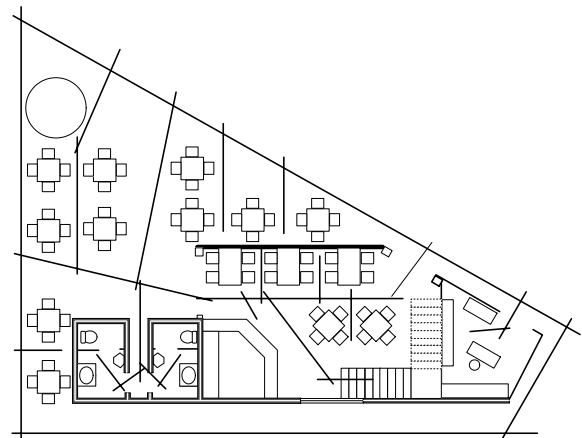
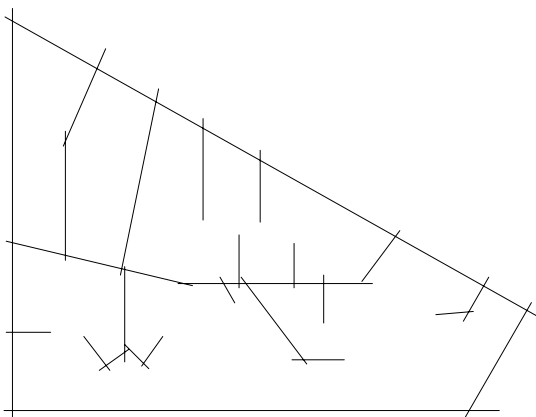


Fig. 1



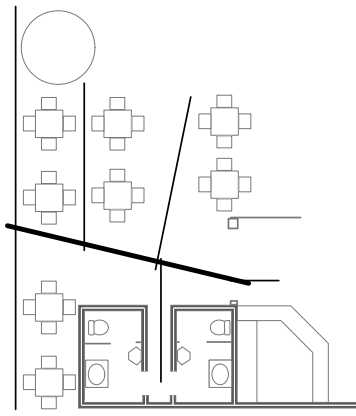


Fig. 2

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Introduction: Accessibility systems

The conceptual point of departure in this work is that plans are space ordering descriptions. The issue of describing such ordering and moreover of describing how such ordering defines the way space is used by people is central in architecture. In its inherent ordering effort a plan is a generator of routes. The position of walls, doors, furniture and equipment defines a set of routes or, in other words, a set of lines of movement. This set of lines is the actual accessibility structure of a building or its accessibility system. The notion of system - a whole constituted by parts that in some way relate - is crucial in the description of plans as accessibility systems or as systems of routes.

The local and the global

Costa was worried about segregation, when he wrote the Pilot Plan Any route in a plan carries two sorts of accessibility; they coexist. One is local. Local accessibility refers to adjacency. The degree of local accessibility of a route is given by how connected such route is to adjacent routes. The other accessibility is global. Global accessibility refers to the position of a route in relation to all other routes in the system. The degree of global accessibility of a route is given by the extent of its use as the shortest path between all pairs of routes in the system or, in other words, by the capacity of that route in integrating the system. The set of most integrating routes in a plan is the integration core. The simultaneous perception of

local and global accessibility sets up the intelligibility of the building, that is to say, the way the building is perceived by people.¹ The concept is germane to the main assertion in the Theory of Configuration that a perception of the relationship between whole and parts is crucial in the way visual and spatial events are apprehended by people.²

The performance of spatial distribution

The description of plans as accessibility systems - structured by lines of movement - allows for an assessment of what has been called, in the procedure shown here, the performance of spatial distribution. The point here is that every architectural program is, in a way or another, a way of dealing with human interface. Such an interface happens in two ways; either towards integrating space or by segregating space. Each and every distribution scheme in architecture can be described in the terms of such differentials of accessibility. From the most

integrating routes in a plan to the most segregated, a whole rank of accessibility is implicit (is natural to) in each particular spatial distribution. On the other hand, human activities tend to follow, also naturally, a similar pattern. A whole rank of specific spatial demands emerge between the most public, collective or integration demanding activities and the most seclusion or segregation demanding activities. The way a plan structures space is always supposed to be an attempt of meeting these demands. The assessment of plan performance is a description of the degree of coherence between the pattern of routes that is generated by the plan and the supposed (or expected) distribution of people.

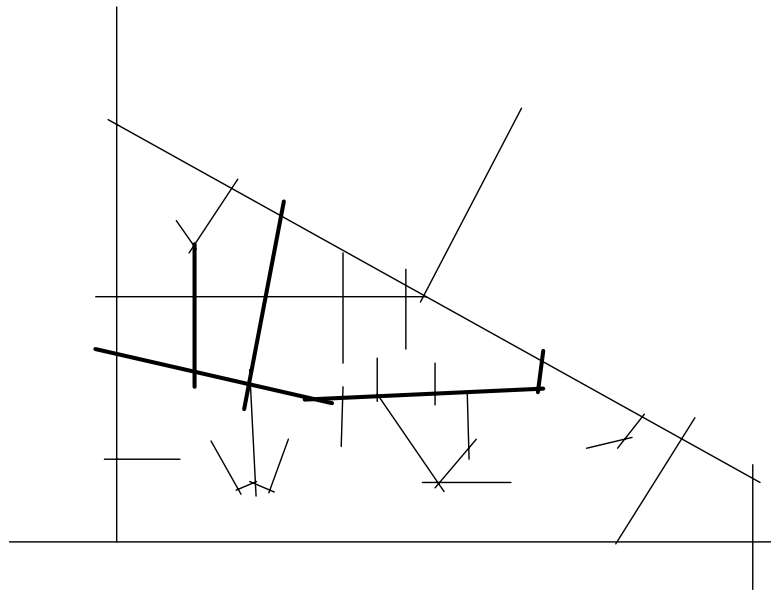


Fig. 3

Gradations of accessibility

In the design exercise carried out with students these concepts were made operative. The description of the system of routes is expressed in a diagram of lines of movement. This diagram imitates, as approximate as possible, the actual routes that are described by people when moving in a plan. The position of doors and furniture sets up the route pattern. The translation or reduction of such route system into a set of axial segments allows for the description of specific topological features in the plan; all based upon gradations of accessibility. The diagrams of lines of movement used in the plan analysis are quite similar to conventional axial maps. In the same way as urban blocks and buildings set up the axial segments in urban analysis, the architectural elements - walls and furniture - set up the axial segments in the analysis of building plans; simply by describing the routes by where people move. A straight line means a route without interruption. An inflection means one step of articulation and of segregation as well. Doors always articulate two lines, even when the route is straight; an articulation that represents a threshold between two spaces.

Activity level

The assessment of activity distribution takes into account the amount of people that is supposed to be spatially linked to a route. The arrangement of a plan shows, at least hypothetically, the amount of people that is supposed to be attached to different positions in the proposed spatial distribution. Quantities of people are naturally allocated to the different routes in the accessibility system or, in a different way, different quantities of people are supposed to be in different parts of the accessibility system. This is part of the design strategy. The assessment of the plan performance is a measurement of the coherence between the degree of accessibility of each route and the amount of people that is supposed to depend on that route. On the more accessible routes or, the more integrated, it is naturally expected more people to depend. The contrary should happen naturally to the less accessible routes. When a plan is adequately arranged it is expected such a coherence. The measurement of plan performance is a statistical correlation between the distribution of accessibility in the system and the expected distribution of people.

Objects and routes: the studio work

The studio exercise carried out in order to test and develop the procedure is the project of a small leisure area inside the University campus in Porto Alegre. The necessity of distributing a small list of objects in space - tables, a coffee/bar/fast food equipment, a snooker table, a small stage (just a plat-

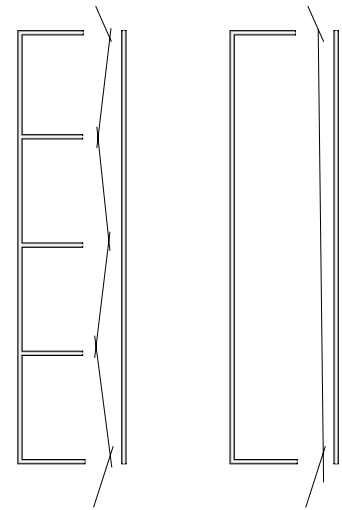


Fig. 4



Fig. 5



Fig. 6

form) and toilets - has implied in the acknowledgement of a number of rather basic architectural issues which are essential to be grasped by the student as early as possible in the course of architecture. The main issue as far as this work is concerned is that architecture, more than dealing with the visual dimension of the world - the so called dimension of spectacle - deals with people in a quite particular way i.e. deals with the way people distribute themselves in space. For the proposition of describing plans as lines of movement the site of the University Campus seemed quite appropriate. The campus is central in the city and surrounded by heavy traffic in all sides; in terms of spatial continuity of the pedestrian routes it might be regarded as a sort of large urban island. In the interior of such an island the buildings of the different faculties are distributed. The leisure area be also part of the local intervention. The projects produced by the students will eventually, in a way or another, modify these paths.

The design process is naturally informed by the presence of global routes and the stu-

dents are recommended to consider in their projects the potential of these lines as strong global integration promoters. The exercise is deliberately simple and the students show a tendency of dealing with (or distributing) lines of movement in order to structure the plans. The issue of route continuity becomes the key phenomenon. Although the coffee/bar is supposed to be indoors, the proposed briefing ask for tables both indoors and partly at the open space. The issue of integration becomes crucial and the assessment of the distribu-

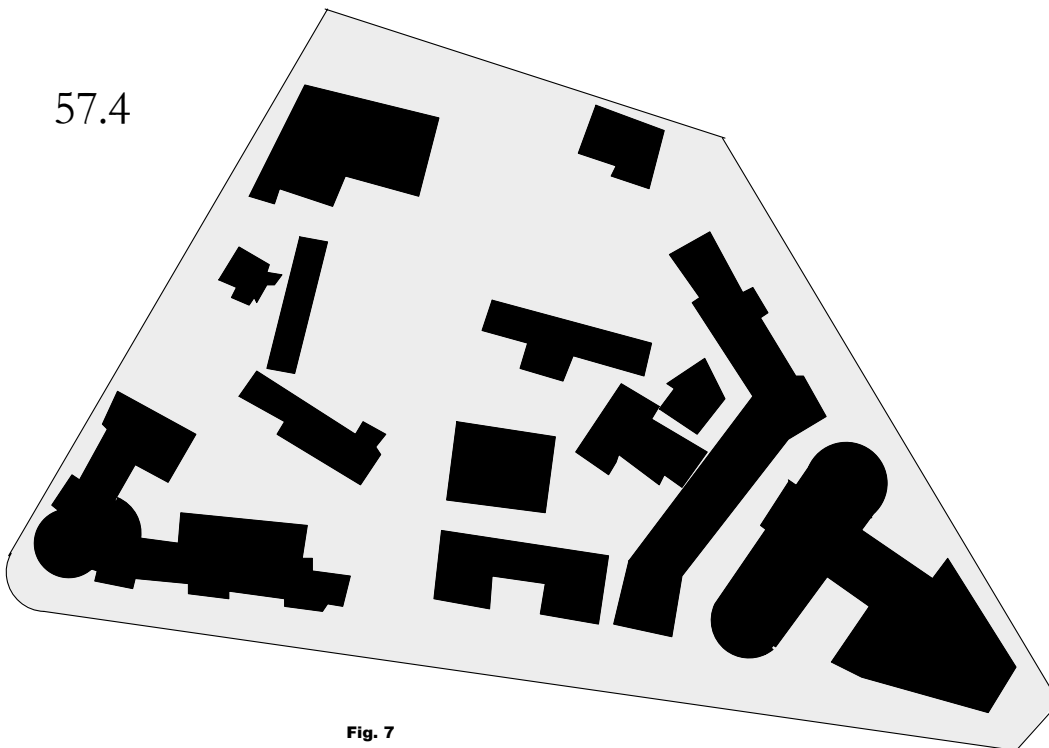


Fig. 7

Fig. 8



tion of equipment and furniture based upon the distribution of paths has become a guide in order to check the way the plan is working. Long routes tend to integrate, fragmented routes tend to segregate. The visualization and use of paths as structuring elements in spatial distribution become quite an effective instrument of design, especially for the novice. The figure shows a typical output of such a procedure. The blackened routes are the most integrated and the dotted ones are the most secluded or segregated.

Monitoring the design process

Besides the structuring effect, the design process monitored by the diagram of lines of movement allows for the comparison between different stages of the process - the evolution and the alternatives in the work of each student - and also for objective comparisons between

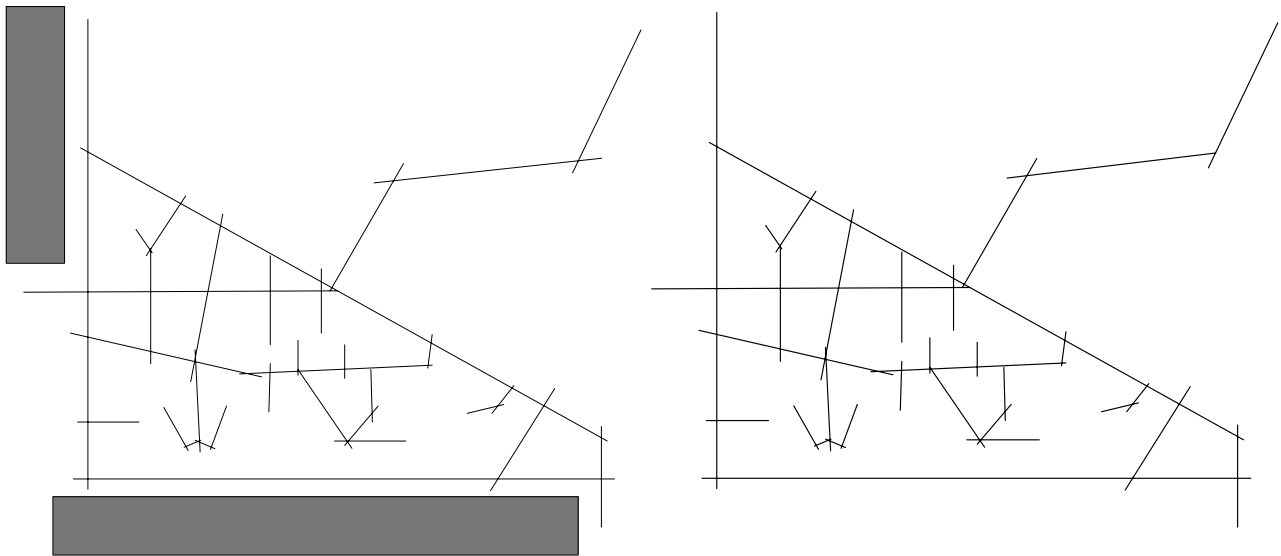


Fig. 9

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the work of different students. A set of measurements is used for that purpose. They are: the mean integration level of the plan, its degree of connectivity, fragmentation, tension, intelligibility and eventually the measurement of performance. These measurements are naturally related in the analysis of the same plan. When a plan is highly integrated it tends to generate long lines of movement. On the contrary if it is low in integration it tends to be composed by short lines of movement. The system is fragmented. The measurements of tension - mean length of the lines - and fragmentation - given by the quotient between the number of lines and the area of the system - have performed quite in tune with the topological measurements based upon the connectivity matrix - integration and connectivity.

These measurements are always relative. When applied to a set of cases they will allow for comparisons yet each set of cases will have its own standards. The spatial character of each activity or program is naturally typical of that program. In hospitals, for instance, the pattern of accessibility is mostly based upon control and segregation. That is the nature of this building type. The opposite will happen to a shopping centre where integration is the main requirement. Hence the specificity of each set of measurements when used for comparative purposes. When other plan alternatives are offered to one situation the set of topological parameters will indicate how the initially proposed system of routes is affected by modifications. The consequences of changes in the distribution of furniture, position of doors or even changes in the entire plan arrangement can be this way monitored.

The architecture of movement

Students tend to start their training in architecture very much impregnated either by the spectacle dimension of architecture - style and representation effects - or by technological paraphernalia. The issue of spatial distribution is frequently the hard bit to be learned. For similar visual and technological propositions thousands of solutions for the distribution of space can be applied. The use of lines of movement as a way of reading spatial structures is not new in the architectural discipline. At the *École de Beaux-Arts* the assessment of the quality of 'la marche' was compulsory. For modernist architects, and Le Corbusier amongst them, the 'promenade architecturale' has been a main structuring device. The notions of serial vision (Cullen) and the sequence diagrams (Appleyard et al) are germane to the diagrams of

lines of movement presented above. For the student, as for the designer in general, the visualization of a route pattern derived from the plan might be either a clear indication of how a plan is capable of structuring the movement pattern or, in the opposite way, how it sets up a confused set of lines that is unable of providing a clearly identifiable structure of paths. The essence of this analysis is eventually the acknowledgement of an architecture of movement that underlies the cosmetic dimension of the discipline.³

Endnotes

1 These concepts are fully discussed in Hillier and Hanson's *The Social Logic of Space* (CUP,1984).

2 This is in Kepes,G. *The Vision's Language*, Ed. Infinito, Buenos Aires,1976.

3 The expression architecture of movement is taken from greek architect Dimitri Pikionis. Cited in Tzonis and Transvilibility, *Thresholds 19*, MIT Department of Architecture,1999, p.22.

Bibliography

Hillier,B. Hanson,J. 1984. *The Social Logic of Space* CUP

Kepes,G. 1976. *The Vision Language* Ed.Infinito, Buenos Aires

Pikionis,D. 1999. "Pikionis and Transviability" *Thresholds 19*, MIT Department of Architecture