Networks and Opportunistic Urban Design: a strategy for regeneration of public spaces in Lisbon

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Abstract

Network thinking has opened up new research fields for the understanding of the city form. Cities are not completely predicable and they are much more about self-organized networks than about rational top-down planning and design. Self-organization is a property of complex open systems and the city is not an exception. Urban development and regeneration requires new creative responses bottom-up based approaches. However a theory which creates a framework for examining self-organized cities was unavailable until recently.

Using complexity theories and network thinking, the design of cities should start within an entirely new field, emerging in response to major changes in society. Also the understanding of the concepts of scale-free networks, self-similarity structures, and the process of unfolding can be utilized to understand the cities' form and to predict and design efficiently new developments. Opportunistic urban design, invites us to consider innovative urban design solutions that respond to a specific context. This abstract focuses on the discussion of these topics in a research project that is being developed on the city of Lisbon considering the cross-referencing of its natural morphology with the city's street movement which generates a self-organized network composed by links (streets) and nodes (plazas). The final aim is to define a pedestrian network informed by the understanding of patterns of public life which enable a public space to become a successful place.

The main goal of this project is to explore opportunistic urban design solutions based on the identification of networks as a powerful structure to regenerate the city at different scales. If the propose of top-down planning is to legitimize 'what should be done', opportunistic design thinking seeks bottom-up actions of 'what can be done' - a process of creative thinking leading to more flexible, more inventive and more contextually responsive strategies of intervention into the urban environment.

Key Words: Urban Design, Self-organization, pedestrian, networks, space syntax

1   Introduction

There has been a growing awareness of the importance of network and system thinking in planning and urban design. This fact is associated with the growing recognition that cities are complex and not entirely predictable systems. This has a major impact in planning theory, as well as the actual top-down structure of planning law, practice and administration, all based on the assumption that cities are essentially predictable entities (Portugali 2008). Conversely, cities as self-organized systems produce a kind of order, which is emergent and bottom-up, following the deterministic laws of nature. Urban development and regeneration requires new creative responses based on complexity theories and bottom-up approaches. The design of cities should start within an entirely new field, emerging in response to the major changes in society. Also the

understanding of the concepts of patterns, emergence, scale-free networks, self-similarity structures, and the process of unfolding can be utilized to understand the form of the cities and to predict and design efficiently new developments.

Opportunistic urban design invites us to consider innovative urban design solutions that respond to a specific context.

In this paper we discuss these concepts in the scope of a research - Lisbon Pedestrian Network (LPN) which aims to put forward a pilot project for the promotion of pedestrian walk in Lisbon following the recommendations of Walk21 - International Charter for Walking.

In this research, we propose to demonstrate that Central Lisbon, as a whole, can be treated through win-win strategies as a network of streets and plazas (links and nodes) which would give back the pedestrian life, and facilitate and support connectivity so that human interactions can occur. The idea is to explore and understand the power of networks for the success and regeneration of public space. The important thing is not the isolated buildings, squares or streets but the network of spaces, buildings and the spaces between them. The real benefits will come when we start to see increased connectivity and re-use of resources beyond those which they were originally intended.

This paper starts by explaining the context of the research and the state of the art of research which we followed. The second part of the paper is the definition of our research goals and methods. Thirdly a case study is presented in which space syntax systemic approach was used to enable us to observe the relationship between certain spatial patterns and the social life that occurs in the case study. The paper ends with some preliminary conclusions and topics for discussion.

2   Framework

Studies of cities as complex organized systems and networks have emerged in the 1960s when physicists like Prigogine started to study the phenomena of emergence in physical-material systems. As researchers we have become attracted by this paradigm, a new domain which has been coined by CTC – Complex Theories of Cities (Portugali et al., 2012). Regarding planning and urban design we explored Bill Hillier's space syntax theory, a framework which use a modeling technique, known as spatial networks, to consider the spaces between buildings in the design of urban spaces helping us to understand the way we live and work in cities and how we interact with our surroundings.

The background of this theory goes back to the work of William Whyte since the 1970s. Whyte observed the people behavior in city's public spaces and described the public life in urban centers in an objective and measurable way. This process of observation and analysis enabled Whyte to identify several spatial patterns of behavior. Furthermore he found that people's behavior was very predictable and that certain regularities/patterns of spatial and social life emerged spontaneously in certain urban configurations (Whyte 1980).

Since the 1970s Jan Gehl has also extensively researched on the relations between the shape and the use of public spaces (Gehl 1971, 2010). He applied his findings especially in the city of Copenhagen which became an outstanding example of a pedestrian and cycling city. Gehl's findings on patterns of pedestrian life and his recommendations are highly applicable to a variety of locations around the world.

Following Hillier, Whyte and Gehl we advocate for a new way of designing public spaces – the bottom-up place design - an approach that starts with a full understanding of the way people use spaces. Through observation and by talking to the public spaces' users we can identify the qualities of space that people praise and then use this knowledge to shape livable communities (Gehl 2010). Increasing the social life of public spaces enables also to contribute to the quality of life of individuals and the entire society.

The pedestrian movement is a fundamental aspect of environmental performance within the study of the spatial form of the city (Holanda 2002). Bill Hillier proposed a new theory for the space configuration analysis that allows establishing spatial patterns and spatial relation systems, through variables such as permeability (access and movements), intelligibility (clarity of understanding the space), segregation and integration (topological conditions of closeness in relation to the whole spatial system). Hillier and Hanson (1984) claims that culture and people's behavior is embodied in the organization of spaces.

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3   Lisbon Pedestrian Network

The Lisbon Pedestrian Network (LPN) is an interdisciplinary research project focused on the relationship between the social life of the city and the spatiality within the urban web which exists primarily in the space between buildings.

This research project emerged from the convergence of researchers from various disciplines within a common interest of studding the social life of public spaces and it encompasses the geographical, historical and configurationally approaches.

From the geographical and historical point of view early studies about the relationship between topography and urban form in Lisbon (Guerreiro 2002) analyze its organic growth based on pedestrian movement and according to the fundamental law of minimum: minimum material, minimum effort and a uniform spatial distribution (Stevens, 1974). A study carried on by Urban Design students from ISCTE-IUL substantiate this view of several pedestrian spaces in Lisbon (the outputs are available at *LISBOA_VALES* blog, http://projectourbanoiscte2011.wordpress.com/). The network structure of the city, created over time by the movement of human pedestrians and animals, has grew along its complex topography in ridge lines, valley lines and contour lines reproducing the natural topography which is still the most evident feature of Lisbon city (Figure **1**). Shaping a web of links (streets) and nodes (intersections – plazas), these hidden patterns represent a powerful instrument for the reestablishment of the XXI Century urbanity.

3.1   Goals

The main objective of this research is to recognize within the city of Lisbon, a chain of emerging public life patterns associated with a pedestrian network, at different scales, and make them visible and operational through a bottom-up design process.

A further aim of the project is to highlight local strategic opportunities for improving Lisbon's pedestrian network. These opportunities will be identified in different plazas and streets through careful analysis of the public realm. The idea is to explore and understand the power of networks for the success and regeneration of public space, constantly making strong connections between nodes and links (plazas and streets). By analyzing how different spaces are connected, we can find patterns of accessibility and examine how streets and communities function in relation to each other and thus forming win–win strategies.

The initial goal of this project includes the study of the central area of the city – the so called "Lisbon of the seven hills" - which can later be extended to the full central area and possibly, in the long term, to the surroundings. By providing the connectivity between urban spaces and places of varying character we expect with this research to encourage walking in Lisbon.

Two important issues are considered in this research. Firstly the fact that the re-establish of the pedestrian network is based on the city's natural morphology and therefore uses links and nodes which facilitate and support connectivity so that human interactions can occur. Secondly the understanding of how public spaces work, through the observation of people's behavior (Whyte 1980), can be related with the emergence phenomenon. As stated by Steve Johnson, emergence is the "movement of low-level rules to a higher level of sophistication" (Johnson 2002: 14), which means that cities gain the ability to become more efficient, more adaptable and flexible throughout time. This is one of the most revolutionary theories of contemporaneity which underlies the idea that preside our research.

The city is above all made of people, not of infrastructures: "First life, then spaces, then buildings, the other way around doesn't work (…) (Gehl 2010).

As a consequence, and within the actual economic and social crisis, the challenge will be to rehabilitate public spaces without money and with people engagement.

3.2   Methodology

The LPN research seeks to integrate the three analytical levels: spatial patterns, spatial life and social life (Holanda 2002); and is based on the idea that the life of the public spaces is largely dependent on space matters.

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Within this research the theories which evaluate the relationship between these analytical levels are used. Special reference is made to the pioneer works of William Whyte and his observation techniques in "The life of small urban spaces" 1980, Jan Gehl's patterns in "Life between buildings" 1971, and Bill Hillier & Julian Hanson's space syntax theory stressed in "The social logic of space" 1984.

To achieve the mentioned goals the development of the research encompasses five complementary tasks.

The first task consists on the update of the literature review considering the relationship between the fabric of the city and the society, and more specifically on public spaces. Base on this theoretical research the scripts for public space observation will be prepared.

The second task seeks to assess the potential for the exploitation of a pedestrian network in Lisbon. The main goal of this task is to evidence the set of nodes (plazas and squares) and links (street-axis) that are based on the pedestrian movement, and allow the creation of a self-organized network of public spaces with a strong potential for urban and social regeneration.

In the third task we aim to identify the potential and weaknesses of the chosen places regarding accessibility, uses and activities, comfort & image and socialization which form the diagram of the place (placemaking). Systems thinking and the recognition of living and social spatial patterns will be the main focus of this task. Given that a pattern always represents a relationship and a solution in a particular context (Alexander 1977) the goal is to find these patterns or the lack of them in each place in order to strategically (re)establish connections and emergence patterns.

Task four and five operate almost simultaneously and correspond to the technical part of the proposal and are used to support the development of the second and third tasks. The fourth task corresponds to the techniques for street-level observation and includes an ethnographic approach corresponding to the understanding of perceptions and meanings for people. The fifth task corresponds to an abstraction of the place and uses space syntax to analyze spatial configuration using quantitative descriptions that are combined with the cultural and social significance of the space.

4   A case study

Intensive observations and analyses of public spaces has been done by the research team and special attention has been paid to a very successful plaza, *Praça Paiva Couceiro*, where Whyte's and Gehl's techniques were rehearsed and the same universal patterns of spatial and social life presented by these authors were found.

The study of this node (plaza) gave us the needed background for continuing the study to the other nodes of the web and enabled the understanding of how they could be linked within an opportunistic urban design strategy.

This study followed a methodology based on the use of several observation and analysis tools which were explored during several months. The main goal was to outline issues related to the spatial configuration of the plaza that are related to the theory of Social Logic of Space and confront the techniques of space syntax analysis with observation techniques.

The observations started by several empirical visits to the place where the team randomly photographed and registered behaviors of the people who were passing through or staying at the plaza. Besides this observation the team also identified the major actors of the place and interviewed them in order to obtain further information about the daily dynamics of the plaza. This first random observation was vital to define the fixed observation positions that would be chosen in the second phase of observation. The second phase encompassed the use of time-lapse film technique as well as observations from fixed places (behavior mapping and counting). In the third phase of analysis we used some measures of space syntax provided by Depthmap software and the results enabled us to acknowledge the role of accessibility in the success of this public space and the importance of its configuration in shaping its social life. Space syntax analysis included the study of configurational relations interpreted by using lines (axial maps and derivatives), points (ivsovists or isovists fields) (Figure 2, left) and polygons (convex spaces). The outcomes were a set of variables that enable the understanding of the hierarchies within the potential movement in the plaza, according to the pedestrian's point of view.

Advantages and disadvantages of previously design options for that plaza were also highlighted when different layouts were compared (one prior to 2010 and one implemented in 2010). This

comparison between different layouts and the information obtained from the observations enable us to suggest design solutions to some identified problems within the plaza, namely access difficulties between the plaza and the surroundings (Figure **2** and Figure **3**).

5   Preliminary conclusions and discussion

This paper explores the first outcomes of a research that considers the cross-referencing of Lisbon's natural morphology with the city's self-organized network of streets composed by links streets) and nodes (plazas).

The final goal of the research is to define a pedestrian network for Lisbon based on the understanding of the public life patterns and using a bottom-up design approach.

As literature explores, the configuration of the public spaces in human settlements, i.e., the interdependence of its constituent elements (roads, squares, plazas, stairways, among others) is closely related with the individual's movement processes. This relation can provide valuable information for the interpretation and flow simulation, namely in the pedestrian network.

The theory of Space Syntax includes strategies for the representation of the built environment based on the analysis of topological relations within urban systems and therefore has a major role within the research. However it presents some limitations related with the topography. Because our study includes the role of topography in the shape of the city, several tools are also being used like the 'model of territorial cycles' from Italian School of Process Typology (Cannigia 1979). Thus, the scales of analysis are adjusted according to the variables used, starting with the interpretation of the urban system as a whole (Lisbon city) and ending with the identification of the topological properties for each one of the viewpoints identified in the public spaces system. The combination of space syntax's tools and representation strategies with the other research observation techniques will enable to quantify and qualify the pedestrian network of existing and proposed public spaces to Lisbon as well as to consider the inherent potential of urban configurational properties.

Figure 1: Lisbon's map showing in yellow the ridge lines and in blue the valley lines which correspond to the network of city's streets.

Figure 2: Praça Paiva Couceiro; left, VGA analysis (visual step depth); right, 1 and 2 shows places of identified jaywalking patterns, 3 shows an hypothesis for a new passage based on the several analysis performed and on paths worn through the grass ("desire lines").

Figure 3: Praça Paiva Couceiro, jaywalking patterns. Situation 1 and 2 showed in Figure 2.

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