Chapter 4

Space Syntax Approaches in Architecture

ABSTRACT

This chapter introduces three Space Syntax techniques – axial line analysis, convex space analysis, and visibility graph analysis (VGA). Conventional applications of the axial line technique typically range from domestic buildings to urban environments, providing a quantitative understanding of spatial configurations. Convex space analysis is typically used to capture relationships between human behaviour and the built environment, and VGA is used to reveal human spatial perceptions and responses in a specific built environment. This chapter provides a brief explanation of each technique before reviewing recent trends and developments in Space Syntax research. Two case studies are presented in the chapter to demonstrate axial line analysis and VGA for four urban neighbourhoods in Seoul (South Korea) and architectural plans for four aged care developments, two in Australia and two in South Korea.

INTRODUCTION

The canonical works of Space Syntax are The Social Logic of Space (Hillier & Hanson, 1984), Space is the Machine (Hillier, 1996) and Decoding Houses and Homes (Hanson, 1998). Collectively these three define the primary conceptual framework of the theory. In the first of these, Hillier and Hanson (1984) argue that spatial organisation has social consequences, and present a range of techniques for analysing the two-dimensional spatial properties

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of built environments. In these techniques, the syntactic properties of an architectural or urban plan are abstracted, using various protocols, into a set of nodes and edges in a graph. Once converted in this way, the graph can be mathematically analysed, and the results are mapped back to the properties of the plan it was derived from. In this way, Space Syntax approaches are used to reveal the relationships between spaces and the social properties that necessitate or sustain these relationships (Hillier & Hanson, 1984).

Three basic correlations or mappings between human activities and spatial geometry are central to the majority of the Space Syntax techniques (Hillier & Vaughan, 2007). First, the movement of people through space can be conceptualised in terms of vectors or directions, leading to the proposition that “people move in lines”. Second, people inhabit and interact in visually defined spaces, which, in geometric terms, are known as convex spaces. A convex space is one in which a straight line connecting any two points in the space does not cross a wall. Or, more intuitively, a convex room is one wherein, regardless of where you stand, the entire room is visible. Third, people understand the world, and find their way through it, using visual fields which change relative to the properties of the location they are in. These three correlations could be regarded as being between aspects of spatial topology and human behavioural, social and cognitive patterns, respectively (Figure 1).

The first of these three correlations or mappings is undertaken in Space Syntax using alpha analysis (employing an axial line map), the second, gamma analysis (using a convex space map), and the third uses isovists (or isovist fields). The first two of these, which rely on graph theory, are introduced in *The Social Logic of Space*, which also provides techniques for measuring and comparing the properties of graphs, including the extent to which nodes are integrated or segregated. Axial line analysis is ideally suited to studying street configurations in urban settlements, as streets could be regarded as primarily serving as spaces of movement. Convex space analysis is commonly used for studying the interior spatial configuration of buildings, as these are among the most important sites of social interaction and inhabitation. Hillier and Hanson (1984; Hanson, 1998), also introduce the concept of a building genotype, which can be uncovered using a “justified permeability map”. This type of graph, which has had several different names over time, is called a justified plan graph (JPG) in the present book. The third approach, visibility analysis using isovists, was initially presented as an adjunct to convex and axial analysis, however, over time it has developed into an important technique in its
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