**Mapping Landscape Spaces:**

**A Review of Quantitative Mapping Methods and Tools**

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**Introduction**

Distinctions are always made between landscape design practice and landscape research. These two important discourses point to the fundamental gap of different landscape communication ways. In practice, designers predominantly concentrate on the more subjective understanding which tends to the personal description of spaces using design vocabulary, such as sequence, orientation and connectivity (Loile and Bernard, 2003; Bell, 2004; Robinson, 2004). These vocabulary indicate the representation of spatial and visual characteristics defined as the visual characters presenting spatial attributions of landscape. Landscape researchers focus on the measurement of indicators including ecological, urban morphological and environmental psychological parameters etc. (McGarigal, 2001; Tveit et al., 2006; Salat, 2011), in order to provide more objective explanation of landscape. Although these quantitative perspectives are also concerned with the architecture of landscape, from the design perspective they do not significantly address the spatio-visual characteristics of spaces intuitively. Under this circumstance the question is in order to get between communication, how to translate the quantitative indicators into design vocabulary and how to apply the measurements into the design process?

As the potential solution for integrating ways of describing landscape spaces, mapping is a key term connecting the above both domains, which is an valuable medium to associate information and visualize it for purposes of understanding complex and abstract design knowledge and thinking (Abram and Hall, 2006). Mapping landscape spaces contains a series of methods and techniques for visualizing, understanding and communication of spatial and visual landscape characteristics to show morphological clues. Through different mapping methods, the abstract spatial elements are being indexical and put together to present metaphorical notions of spaces.

In the past decades of years, new methods and technologies based on multi-disciplines have been developed to map visible landscape and measure landscape quality. Many data-based analysis and modelling tools are introduced in landscape studies (Ervin, 2001; Palmer, 2004; Dupont et al., 2014). This article aims to provide an overview of possibilities for designers to get inter-subjective understanding of landscape spaces. In order to achieve it, literatures of the existing quantitative methods of mapping landscape space are reviewed. Six categories of methods and tools are classified, which are virtual 3D-landscapes, landscape metrics, grid cell analysis, isovists, viewsheds and eye-tracking analysis. Moreover, in order to show how the indicators be translated into spatial and visual characteristics and how the mapping methods work, the practical application of each mapping method or tool is elaborated by a typical case study analysis.

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