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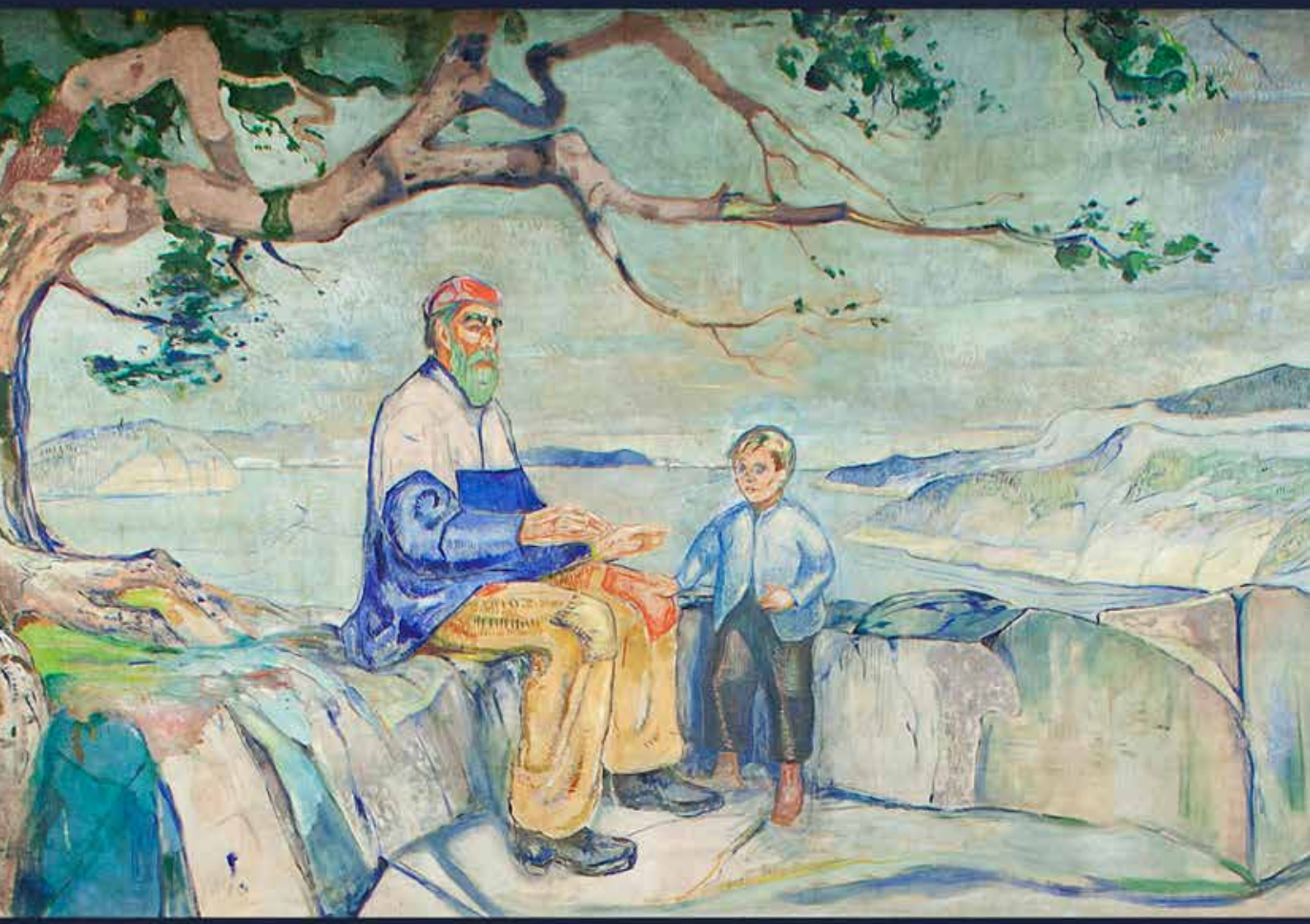

Lessons from the Past, Visions for the Future

Celebrating One Hundred Years of Landscape Architecture Education in Europe

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Lessons from the past, visions for the future: Celebrating one hundred years of landscape architecture education in Europe

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Digital methods for mapping landscape space

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Introduction

In the field of landscape architecture, landscape design is an important area of knowledge and activity (Evert et al., 2010). Landscape design is about the construction and articulation of outdoor space and results in landscape architectonic compositions. Landscape architectonic compositions deal with form and meaning, and provide a physical, functional and aesthetic arrangement of a variety of structural elements to achieve desired social, cultural and ecological outcomes (Vroom, 2006). In order to understand and communicate about the spatial and visual properties (in short: spatio-visual properties) of landscape architectonic compositions tools, representations and vocabulary are of fundamental importance for landscape architecture (Nijhuis, 2011). Landscape architects have always been eager to develop and employ manual and digital media that can support thinking and communicating about spatio-visual properties of landscape architectonic compositions. Despite its importance, there are only a few attempts to implement and develop digital tools that help to understand and describe the visual manifestation of landscape space, how space is organised and what ordering principles play a role, from both qualitative and quantitative perspectives.

Educational and research institutions have an important part to play in raising awareness, they must take the lead in educating students and inspiring practitioners, building up their knowledge and passing it on, and adding new tools to the traditional craftsman's toolbox. This paper explores some digital methods for mapping landscape space, as a means for thinking and communication about spatio-visual properties of landscape. It aims to stimulate the development of a digital culture in landscape architecture while exploiting digital tools in their powerful integrating, analytical and graphical capacities.

Methods for mapping spatio-visual properties

In this paper, the focus is on digital methods for exploring the spatio-visual manifestation of open spaces, surfaces, screens and volumes and their relationships in terms of structural organisation (e.g. balance, tension, rhythm, proportion, scale) and ordering principles (e.g. axis, symmetry, hierarchy, datum, transformation) (cf. Bell, 1993). The basic premise is that the shape of space, plasticity (form of space-determining elements) and appearance (e.g. colour, texture, lighting) of spatial elements in the composition determine the relation between design and perception (Nijhuis, 2014). This type of research addresses the form and functioning of three-dimensional landscape space, which creates a certain spatial dynamic. Here digital tools are employed to study the framing of a view or urban panorama, or the construction of a spatial series along a route, making a pictorial landscape composition.

There are six predominant digital methods for exploring the spatio-visual characteristics of landscape:

1. Compartment analysis: considers the visible landscape as a set of concave compartments (mass) and maps the distinguish and relationship between space and mass from a vertical perspective.

2. 3D landscapes: identifies a visual landscape from an observer's point of view, which utilises three dimensional visualization and addresses spatio-visual characteristics horizontally.

3. Grid cell analysis: manipulates the landscape subdivided into spatial features that are represented by raster cells or grid-shaped polygons, and concludes the precise findings of landscape characteristics .

4. Visibility analysis: is a three-dimensional visibility calculation based on raster, which shows the geographical area visible from a given position from the observer's perspective.

5. Landscape metrics: operates spatial analysis of land use patches in landscape ecology, quantifying potential metrics of landscape composition and configuration vertically via raster or vector.

6. Eye-tracking analysis: is a system that records eye movements and fixations while observing scenes which has a big potentiality in interpreting the spatial and visual characteristics, such as way finding, affordance, visual queue, and dominant elements etc.

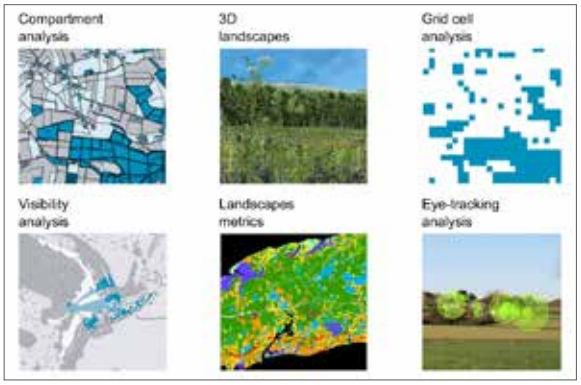

Figure 1. Figure 1 Diagram showing six predominant spatio-visual landscape mapping methods. Images from Nijhuis, Van Lammeren, and Antrop, 2011; Nijhuis, 2017; Palmer, 2004; Dupont, Antrop & Van Eetvelde, 2014.

These digital methods for mapping landscape space can be characterised according to their horizontal-vertical dimensions, and qualitative-quantitative approaches. The horizontal dimension perspective explores the landscape from an observer´s point of view (from the inside out) and addresses the visual space and characterises spatial attributes or patterns from eye-level perspective. The vertical perspective considers the landscape from 'above' – the map, or the view from the air – and is about horizontal referenced

analysis of spatial patterns and relationships (Nijhuis, 2015). Tools, platforms, and data for analysis that can be used for application of these methods are shown in Figure 2 and Table 1.

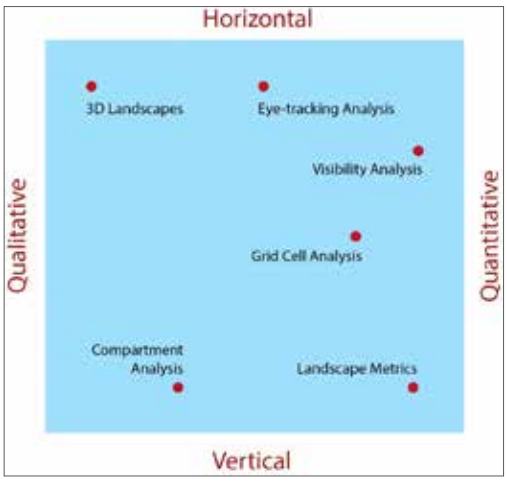

Figure 2. Diagram showing the characters of spatio-visual landscape mapping methods

As found, these digital methods and tools are applied to explore spatio-visual landscape properties complementally based on various data types, mapping dimensions, and disciplines. Therefore, in order to get more comprehensive understandings of landscape space, they are better to be used together instead of working individually.

Contribution in landscape architecture education

The above-mentioned methods help to think about and visualize landscape space in qualitative, quantitative and combinatory ways. They show enormous potentiality for integration and implementation into landscape architecture education by:

• Expanding the digital toolbox for landscape practitioners and students to interpret landscape spaces. The overview of the mapping toolbox creates opportunities for landscape architects to describe and understand known and unknown aspects of landscape space. Employing digital methods for mapping landscape space provides alternative perspectives and integrate disciplines. It also connects qualitative and quantitative approaches for revealing spatial relationships and visual organisation of landscape in unprecedented ways.

• Introducing advanced analytical mapping methods in landscape education is indispensable for new generations of landscape architects. Digital mapping methods advocate a multidisciplinary approach towards landscape design while, extracting, translating and adapting theories and technologies from the fields of urban morphology, visual landscape study and landscape ecology, employing them to gain new insights of landscape spaces.

• Adapting these data-based mapping methods and tools into education helps to develop research by design and design by research approaches. On the one hand, the developed mapping methods can be applied in multiple steps in the design process, as analytical, evaluation and design tools. It also enables to integrate research into the design process. On the other hand, designs produced by students in different projects can supplement to the body of spatio-visual landscape knowledge.

The research and education of digital mapping methods is important for landscape architects for understanding, designing, and communicating about landscape space. It opens a way to visual landscape characterisation supporting multidisciplinary approaches towards landscape design. With the development of this toolbox, designers can engage in issues of the landscape development, transformation, and also preservation while providing realistic and instrumental clues for interventions in urban landscapes.

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Table 1. Tools, platforms, and data for analysis that can be used for application of these methods

	Compartment analysis	3D landscapes	Grid cell analysis	Visibility analysis	Landscape metrics	Eye-tracking analysis
Tools & Platforms	Pen, sketchbook, Depthmap	Pen, sketchbook, camera, SketchUP	SegNet, Excel, ArcGIS	ArcGIS, Excel	ArcGIS, Fragstats	Eye-tracking glasses
Data type	Field survey, CAD map	Field survey	Google map, GIS data (vector)	GIS data (raster)	GIS data (raster)	Photograph