Introduction : what's the point?

INTRODUCTION

What's the Point?

Maite Bravo, Dennis Häusler, Magdalena Kaufmann, Matthias Vollmer

The point is a coordinate. The point is a measurement. The point is information. The point is a pixel. The point is a color-code. The point can be edited. The point can be manipulated. The point can be precise. The point can be defective. The point is a way of thinking.

In more than one way, this issue of the series Pamphlet is about probing. It is about the thorough exploration of a site, about accurately measuring its spatial situation, and about seeing through matter to reveal what is hidden. It is about illuminating one aspect to comprehend the whole, about connecting the dots. Finally, it is about a specific technique and technology for probing, with its opportunities, promises, and limitations.

For more than a decade, Prof. Christophe Girot's Chair of Landscape Architecture at ETH Zurich has explored the use of point cloud models as a means to probe reality, with the goal of representing, understanding, and altering an environment. *Probing Zurich* reflects on student projects and case study sites addressed during the elective courses in topology at the ETH Zurich Department of Architecture. The courses focused on spatial perception, understanding and design, using point cloud models in the context of the city of Zurich.

The structure of the city, founded in the time of the Celts, is defined by the lake, the rivers, and the topography of the surrounding hills. Traces of the Roman and medieval times up to the eighteenth century are still visible and form the lower layers of the city. Political and economic factors also shaped the city in the following decades, leaving their traces on top of each other. Infrastructure, public institutions, or public spaces were planned, constructed, objected to, and reclaimed, leaving fragments behind – an urban palimpsest of sorts. Today, many places are a patchwork of different times, functions, and topographies. This is what makes Zurich interesting and particularly suited for this research method. By investigating in depth and probing one site at a time, students and faculty were able to identify the particularities that constitute a place and reveal the traces from different times and uses.

Fig.2 Künstlergasse, Zurich 2018.
Horse chestnut tree, elevation.
By Cherry Yang, Reishan McIntosh

The Elective Course in Topology: A Journey through Zurich

Each semester was structured around a specific task, ranging from topological analysis and design collages to the representation of space in interactive digital models. Students from the department of architecture at ETH Zurich were asked to interact with the sites and address the task at hand through three-dimensional point cloud models. The goal was to explore different techniques and methodologies of applying point cloud techniques to urban design, landscape design, and architecture. The students participated in a complete workflow from on-site data acquisition with various short- and long-range laser scanners, photographic and acoustic tools, modification of and interaction with the models, all the way down to the rendering, animation, and building of interactive applications. The questions posed to the students continually demanded adaptation to the workflows, modeling methods, and forms of representation. For instance, the latter range from illustrations as shown throughout this issue to multidirectional spatial projections, interactive user-based exhibitions, or on-site virtual reality applications.

Fieldwork represented a key aspect of the teaching method and usually constituted the starting point of the workflow. Due to their high value in understanding space at a particular location, site visits remained a constant throughout all courses. During kick-off sessions, the students gathered most of the data themselves, not only learning the functionalities of various scanning platforms and acquisition methods – which have evolved rapidly over the past five years – but also, crucial to the course, understanding the spatial configurations of a site and obtaining a personal relation to the place. The modeling methods developed just as rapidly, which required students to constantly incorporate new technologies, scanning platforms, and their corresponding file formats and software tools. Previously untrained students had to be introduced to the latest software quickly. Some of the software that was applied was initially still in its infancy or in beta versions, but over time the software became stable and turned into an indispensable component of the workflow. This can be regarded as an additional challenge, but it is also a consequence of pioneering new workflows and thus can turn into a motivational factor for students and the teaching team alike.

Techniques and Methods of Point Cloud Modeling

At the core of these experiments lies the point cloud model, which has been a central field of research at Christophe Girot's Chair for Landscape Architecture for many years. A point cloud model as it is used here is a measured digital model – a digital replica of the three-dimensional space of the city. Metrically highly precise models are recorded on site through laser scanning and enriched with georeferenced visual or acoustic information. These models form the basis on which the students can interact with various spatial configurations in the city. The specificity of a point cloud model differentiates it from conventional digital models in multiple ways and therefore leads to different workflows and realizations. Particularly interesting for landscape architecture is the fact that there is no explicit distinction between architecture and landscape, nor between the object and its environment. The point cloud model does not differentiate between vegetation, terrain, object, or architecture. All opaque and motionless surfaces are recorded with the same resolution and precision, which allows for a more holistic approach to a site. Regardless of some challenges along the way, the models reach a level of detail that is difficult to achieve with conventional digital modeling, particularly in the context of urban design, architecture, and landscape architecture. This opens completely new possibilities for analysis, design, and spatial communication, particularly in situations where complex forms, vegetation, or constructions require a high level of detail. In such areas, point cloud modeling reveals its true potential and surpasses conventional surface-based modeling techniques.

For complex and subterranean configurations, the point cloud bears yet unexploited potential in illustrating and communicating spatial relations. Due to the structure of the point cloud – an accumulation of points rather than continuous surfaces – the visual impression is one of transparency. This property allows for a particular visual perception through layers of space. It enables us to understand and modify the model in a different way, and to interact more holistically with spatial forms. This mode of perception not only reveals new insights for the designer or planner but also facilitates communication beyond established professional boundaries. The characteristics of point cloud

modeling hint at new possibilities for design and communication through digital models that need to be further addressed by research.

Probing Zurich

While the student projects and their respective sites define the structure and provide the inspiration for this issue of Pamphlet, its core consists of six essays authored by experts in city planning, landscape architecture, architecture, engineering, geomatics, and point cloud technology. Each essay refers to one of the six sites, providing insights from a different perspective and reflecting on the site, the student projects, or the applied technology.

Probing Zurich is a compilation of contributions by various authors who provide their distinct perspectives on the described technologies and approaches to understanding, design, and communication. Each of the texts functions as a reference point to position the student work within a larger theoretical and disciplinary framework. Eventually, each article can be understood as a self-standing piece of critical investigation, similar to the way each recorded point in a point cloud model is a response to the emitted light impulse – it relocates and situates the recording device in its surroundings. This collection of texts and images may be explored as a whole or individually in a non-linear sequence, so that the reader can experience the essence of each point.

Fig.3 River Sihl, Zurich 2019.
Sequential cross sections along the River Sihl, from the Sihlbrücke to Sihlcity (top to bottom).
By the teaching team