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DESIGNING PROCESSES – THE DEVELOPMENT OF DESIGN METHODOLOGIES FOR EVOLVING LANDSCAPES

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fig.1

fig.2

The increasing pressures of urban development, engineering challenges, and environmental change are generating entirely new scenarios in the design requirements of the built environment.

The profession of Landscape Architecture is uniquely placed in order to negotiate between these themes and actors, due to its mixture of environmental science, cultural history and projective design vision.

In order to address these challenges the Landscape Visualization and Modeling Laboratory - LVML has been developed under the guidance of Professor Christophe Girot of the Institute of Landscape Architecture, at the ETH Zurich. The lab was formed as an interdisciplinary partnership between the ILA and PLUS, the chair of Planning, Landscape and Urban Systems. The LVML has been further developed as incubator for design expertise, combining knowledge of landscape and design processes with the development of entirely new methodologies.

The structure of LVML has been conceived in order to be both grounded and mobile, with a fixed lab infrastructure based at the ETH, Zurich, as well as capabilities to scan and work within the landscape.

figure 1: Realtime UAV feedback on campaign status. Alterations to the site scanning procedure can adapt to the site conditions and research requirements.
figure 2: A single researcher can launch, control and process site data singlehandedly. Photos: Melsom

Field Work

A fundamental point of departure within the landscape design process lies in the humble 'site visit' – a direct confrontation with the design problematic and landscape context. The importance of this fundamental act of reconnaissance, and its role in the formation of initial intuitive responses to the site cannot be disputed. On the contrary, it is more often underestimated, and a missed opportunity. Traditional forms of site interaction available to the designer are important, yet nonetheless a limited set of tools and modes in order to experience and record the site and its relationship to the viewer.

The traditional site visit has always been restricted to the act of reconnaissance – a passive process of collection and observation. This mode tends to emphasize the easily accessible aspects of the site, restricting vantage points to those offered by existing site topography. The visible and sensory traces often take precedent, with subtle changes in weather or environment heavily influencing both the impression and route taken within the site. The resulting impressions of the site, rather than being described as subjective, could better be construed as 'limited' or abridged, excluding a huge potential of site traces and impressions.

In order to address the complexity of each landscape project, the concept of the 'site visit' has gone through an evolution. In contrast to previous models, it combines both active and passive modes of site interaction and contemplation.

The hardware and software infrastructure of at the Landscape Visualization and Modeling Lab addresses field work with its deployable mobile arm – facilitating speed of capture and on-site appraisal of data. This flexibility ensures the quality of the data capture and allows a single researcher to do much of the work singlehandedly – or a small team to cover a huge area of terrain.

The technique of site acquisition relies on both subjective or instinctive emphasis in data collection, but also reflects on the data as it is collected – detecting further traces and opportunities for observation or capture. Rather than record the site evenly, it is possible to vary the detail of capture, recording certain aspects of the site in minute detail, while evenly lowering the resolution of other site traces. In this manner, the more positive side of subjective comes into play, that of 'focus'. This process of detection and focus makes use of instruments that work beyond

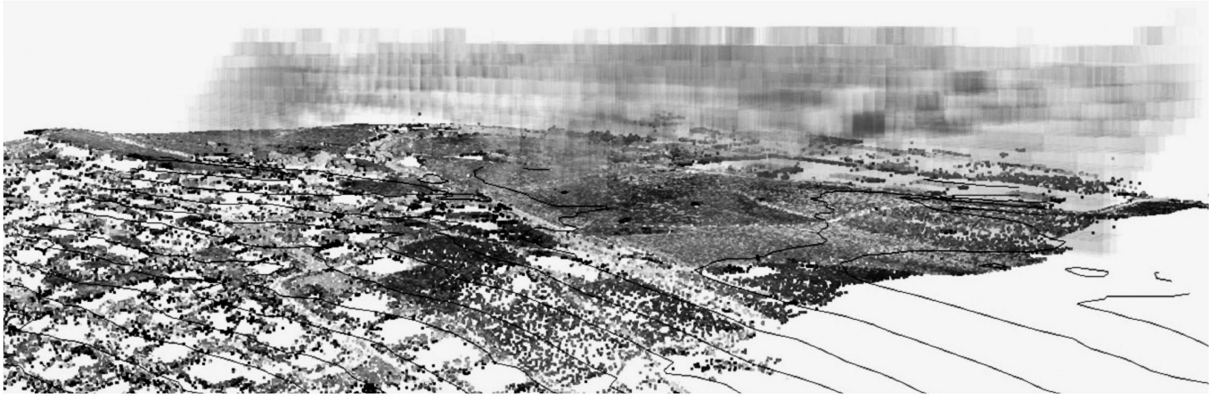

fig.3

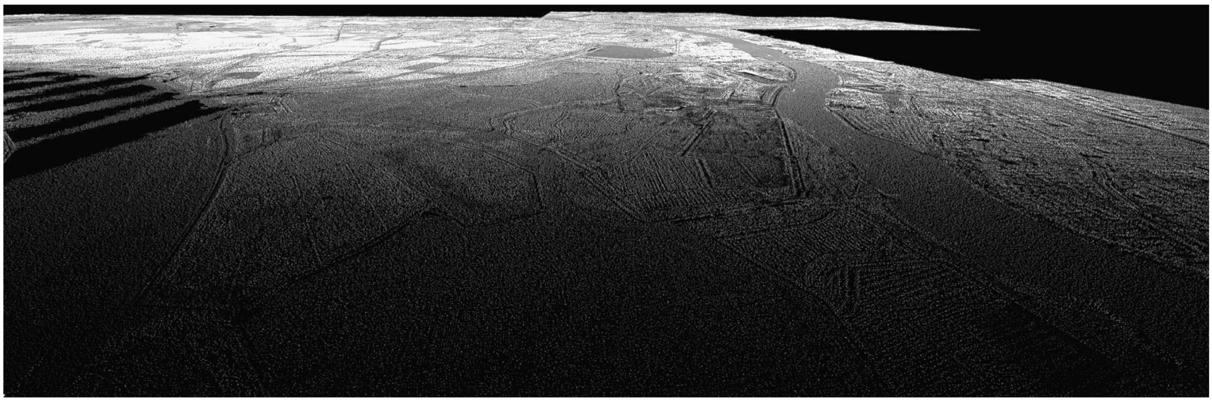

fig.4

fig.5

figure 3: Current exeriments into scanning the invisible site –
three diminensional mapping of temperature readings, Zurich, CH
figure 4: Full-colour pointcloud data of the full territorial scale
of Dordrecht, NL. Source: Drechtsteden
figure 5: The micro-topography of the site surrounding Dordrecht, NL.
A multi-scalar model allows certain areas to be displayed at a higher
resolution, and intelligent simplification of the model where appropriate.
Source: Drechtsteden, ETH Zurich

the visual spectrum, allowing traces to be recorded and investigated that would otherwise avoid detection entirely. The application of these techniques to dynamic landscape such as those under the influence of water, allow still greater opportunities for site appraisal and simulation.

Issues such as mobility and speed of site appraisal are paramount, in order to facilitate multiple site visits in order to record both subtle and major shifts in site dynamic – whether tide, vegetation, seasonal, or cultural use.

The critical approach to the site visit also generates a unique setting for the education of landscape architecture at the ETH. Due to the compressed 13 week studio schedule, architecture students must quickly develop skills in site comprehension and transformation. They are encouraged to combine their intuitive reactions with the precise empirical data generated through their site appraisals.

Lab Work

The work within the lab focusses on the synthesis of various site datas. The scale of these data sources varies between the human scale to the scale of the territory. The methodologies of the lab have been specifically leveraged to address multi-scalar applications to landscape comprehension and visualization.

A multiscale approach is essential for micro-topography sites such as Dordrecht, the Netherlands, where single flooding events occur over thousands of square hectares. In the case of Dordrecht and the Biesbosch wetlands, an area of 1200 hectares was under detailed study. 98% of this area has a local height difference of less than 2 metres, and a an overal variance of 10 metres. The impact of subtle topographical interventions in territorial projects cannot be simulated in the small scale alone. While such a site requires consistently detailed topographical data as a base, the generation of a multiscalar model allows certain areas to be reviewed at a higher resolution, or vertical and horizontal directions to be rendered in varying resolutions, facilitating speed of workflow with high accuracy and site comprehension. The Dordrecht project leveraged massive pointcloud data sets, captured through LIDAR airborne scanning in order to generate a multiscale model of the site ready for simulation.

When the site-data enters the lab, it goes through several stages of processing – categorization, filtering and identification – to enable efficient manipulation. The site-specific spatial data can then be combined with abstract site data, such as tidal water level measurements, weather and season variations. Historical data can be used to generate variations in the existing site data, not only allowing greater understanding of the existing site, but allowing landscape interventions to be appraised in an evolutional context.

Once processed, a site is ready for projection – a state in which various alternate futures can be tested on the existing topography. Through a process of direct juxtaposition of historical, existing and futures states, contradictions and and opportunities can be quickly identified.

The methodologies of the LVML are being applied to ever larger sites – such as the flood-prone watershed of the Ciliwung River in Jakarta, Indonesia. This city of close to 20 million inhabitants languishes in its inability to address rapidly evolving infrastructural changes. Such megacities invite entirely new landscape interventions and conceptual thought, as not only the scale of application is increased, but also the implications of the fundamental tenures of landscape architecture – those of raising the quality of open space and the wellbeing of the population. Only through the combination of spatial relevance with the engineering and cultural needs of urban landscapes in evolution can truly sustainable systems be developed.

fig.6

fig.7

figure 6: Scanning the Dam of Lago Lucendro near Gotthard pass height with a Terrestrial Laser Scanner Riegl VZ-1000. ETH Zurich, Photo: Werner
figure 7: The LVML drone in preparation for takeoff. ETH Zurich, Photo: Prescott