The Technical Session

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At the end of the Pantheon Conference a technical session was held at the Karman Center, with the aim of presenting different approaches and projects connected to the Bern Digital Pantheon Project and discussing the experiences of other projects that are having to deal with large amounts of digital data in relation to topographic situations and the measuring of large architectural objects.
Because of the workshop nature of the session — extended discussions, the use of large images, animations and the presentation of techniques and huge amounts of data — we decided to give a short overview of the contributions presented rather than extract «papers» from the contributors to the four presentations. Readers interested in finding out more should contact them directly for additional information about the projects.
The session, which was moderated by Bernd Nicolai, Professor of Architectural History at the Institute of Art History, University of Bern, was well attended and comprised participants from the conference as well as guests from the departments of Archaeology, Art History and the History of Science, many of whom took an active part in the lively discussions during and after the four presentations. First, Nikolaos Theocaris gave a demonstration of the 3D Bern Digital Pantheon Model; this was followed by Marina Döring-Williams from Vienna, who spoke about her experiences laser scanning large and complicated archaeological sites, namely the Theatre of Epidauros and a residential house in its vicinity. Geoffrey Taylor then talked about the Vatican Topography Project, carried out between 1998 and 2005 at Harvard University's Graduate School of Design. The technical session ended with the presentation of a program for integrating laser scanning data with stereo-photogrammetric measuring systems given by Frank Henze (Cottbus) and Gunnar Siedler (Leipzig).
The discussions covered several subjects — from the technical means used to produce, reproduce or visualise the data gathered from the objects, the different approaches to their accessibility (over the Internet or in closed networks limited to project participants) and to questions about open and commercial licences and data preservation. In addition, we looked at why and to what ends such digital data could be used in actual research. It is hoped that these aspects will be discussed in greater depth at a Bern Digital Pantheon Project workshop planned for 2008, at which the main topic will be how to deal with large amounts of 3D data and their usage in archaeology, art history and monument preservation.

Demonstration of the 3D Bern Digital Pantheon Project and the Interpretation of the Measurements by Nikolaos Theocharis (Bern):

Although Nikolaos Theocharis had already shown how the 3D Bern Digital Pantheon

Model might help scholarly research in his presentation of answers to two of the «nagging» questions that Lothar Haselberger had brought up in his contribution to the conference, his presentation at the technical session gave him the opportunity to provide the conference participants with a more in-depth account of the project's technical aspects and its (already realised) prospects as well as to elaborate on plans for the future.
Nikolaos Theocharis, who was involved in all the phases of the project, from the scanning and recording of the data to their evaluation, merging and the generation of images and plans, demonstrated how he went about making the data useable for non-architects. He also explained some of the methods that were employed to generate the data during the different scan periods and revealed the results and conclusions that have already been drawn directly from the initial set of raw data and their visualisation. (A second volume from the series of publications by the Bern Digital Pantheon Project Group will be dedicated to the information generated from the visualisation techniques).

The surveying of antique architecture (the Basilica Maxentius in Rome, the Theatre of Epidauros and a residential house in Epidauros) with the help of modern laser techniques by Marina Döring-Williams (Vienna):

Marina Döring-Williams used 3D laser scanning techniques on several occasions when she and her team took part in excavations at Epidauros and, as part of a monument research campaign, at the Basilica of Maxentius (Constantine) in Rome. A particularly interesting aspect of her presentation was the establishment of interrelations between the results generated from different measuring methods and the merging of these results in order to gain specific information about the building and the building ensemble, its possible relationship to surrounding buildings or the urban space and even details of its construction. At the monumental Basilica of Maxentius, for example, they were even able to reconstruct the structure of the largely lost surface of applied precious stones and marble plates. But in all these interesting cases the usage of these huge amounts of data, often generated during the course of several campaigns over the years, requires high-level computing techniques and expensive hardware, which in some cases has only recently become available for non-commercial research.

Three-dimensional modelling of complex historical architectural structures: Vatican Topography Project by Geoffrey Taylor (New York):

From 1998 to 2005, the Vatican Topography Project of Harvard University's Graduate School of Design created a large and complex 3D digital ‹image› of the Vatican Hill area through the centuries. Geoffrey Taylor, who as the research associate led the project, demonstrated the impressive abilities of this model: documents, sources and images (in digital form) can, for example, be linked with any special point or area in the graphical model, allowing the user to browse over or even below the surface of the Vatican Hill at any given time and find all the available information that exists on a place, object, building, archaeological artefact, and so on, in that area. Unfortunately, because of technical and also licensing restrictions, for the time being the interactive usage of the model is only possible inside a closed network: at least the problem of transferring large amounts of digital data between the server and user computers over the Internet can soon be expected to be solved.

Integrating laser scanning data into a stereophotogrammetric system for archaeology and building research by Frank Henze (Cottbus) and Gunnar Siedler (Leipzig):

Scanning techniques are becoming more and more important when it comes to recording objects in the fields of archaeology and build-

ing research. The scale and size of the objects to be measured range from the small single parts of a building and its ornamentation to large building ensembles of high structural complexity. According to a researcher's specific field of enquiry and the size of the objects to be scanned, different technologies are available. Besides primary scanning techniques such as laser scanning, there are ways of determining automatically 3D images from stereoscopic images by calculating plane object points via correlation techniques from the associated image points. But the pre-condition for this is a sufficiently textured surface, as can be found in many natural materials. In addition to extracting geometric information from the stereoscopic images, these images can also be used for image-based object documentation, as is common in archaeology and building research.

By integrating laser scanning data into a stereoscopic system for analysis, the advantages of both techniques can be combined. While laser scanners provide discrete surface points in a very short space of time, the stereoscopic analysis of images provides a continuous presentation of the object's surface and allows for an image-based spatial presentation of the objects. In addition, structures that cannot be derived from the geometry of the scanned data, because they lie below the scanner's resolution or can be recognised only through changes in colour or material, can also be recognised and/or captured.

The Leipzig-based company fokus GmbH and the Department of Surveying of the Brandenburg University of Technology at Cottbus (BTU) have together developed a user-oriented software system for archaeology, building research, preservation and restoration work that allows analysis of the combined techniques of stereo-photogrammetry, laser scanning and tachymetry. The integrated techniques for automatised image orientation and the reconstruction of objects facilitate interactive stereoscopic image analysis and provide high accuracy when it comes to determining the (measured/scanned) points. In addition to the gathering of single measurements and the creation of 3D object maps, complex object models for reconstruction, research and visualisation can be generated automatically from the measured profile and surface points.