

3D documentation of the monastery church St. Michael in Bamberg - process chains of a BigData project

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St. Michael in Bamberg

The baroque World Heritage Church of St. Michael in Bamberg was classified as collapsing due to structural settlement processes and other static problems in 2012. Since then, the church has been closed and is being generally refurbished as one of the largest church restoration projects in Germany.

Since January 2019, the church's interior is scanned in very high resolution and in the combination of different sensors by the cultural heritage specialists of ArcTron 3D Ltd. (Germany).

The high-resolution laser scanning takes place in sub-millimeter accuracies (Surphaser) and is combined to some handheld structured light scans (Artec EVA) and systematic high-resolution photogrammetry (Nikon D800/D850) with a total expected to be well over 180,000 photos.

The complete interior fitting with metal scaffoldings proves to be both a difficulty and a chance for the interior scans, as it can achieve scanning positions that would otherwise be achievable only with "flying" sensors.

The complex, often undercut as well as golden, silver or polychrome baroque objects with frescoes, stuccos, paintings, statues, furnitures, etc. creates different challenges during 3D object documentation. Methods for reflection suppression, color calibration, focus stacking and high dynamic range recording complement the recording strategies for selected objects.

In addition to standard photogrammetric data acquisition methods, some innovative recording techniques, such as cable cameras and indoor-drone flying have been realized.

Large amounts of data (probably >10 TB of raw data) were generated, which are used in various specific workflows and data fusion processes and are merged into high resolution photorealistic models.

The project is currently (as of June 2019) still in the data acquisition- and processing phase, but will already be very advanced in November. As part of the systematic use of 3D data, the initial aim is to use the 3D-data-sets for further tendering processes, cost estimations of the restoration works, damage mappings and damage analysis.

For the presentation and use of the 3D models, a comprehensive, geo-referenced 3D information system with PostgreSQL database based on the ArcTron software "aspect3D" is built, in which the various data in different documentation levels (eg 3D models in LoDs, orthophotos etc.) will be provided.

For the later public use of the data, a web-based presentation and a data download in lesser detail resolution will be exemplarily realized. Further multimedia use and editing will then take place in further steps.

An additional "Big-Data"-analysis is also carried out as part of a research project in cooperation with the Virtual Reality Lab of the Bauhaus University Weimar, in which the effective presentation and evaluation of such big data sets in collaborative VR platforms will be analyzed.



Fig.1. St. Michael (Bamberg, Germany).Drone shot of the large construction site in June 2019 (ArcTron 3D GmbH).



Fig. 2. 3D scanning with different technologies: laser scanning (Surphaser), handheld structured light scans (Artec EVA), photogrammetry, indoor drone-flying (ArcTron 3D GmbH).

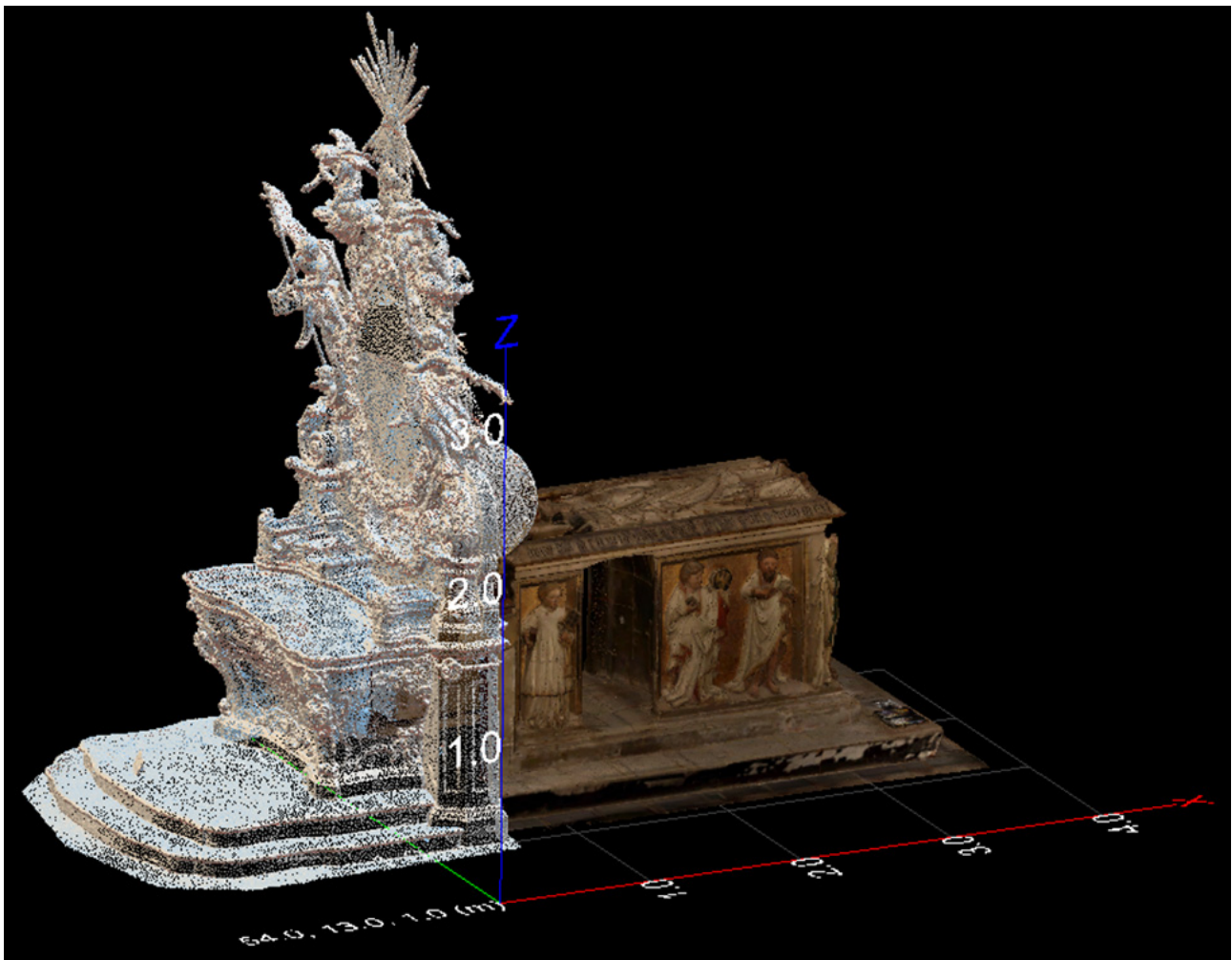


Fig. 3. Otto-Altar and Ottotumba. Example of 3D data combinations in different stages of data evaluation and processing (ArcTron 3D GmbH).

References

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