Virtual Reconstruction of Synagogues

Systematic Maintenance of Modeling Data

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Computer-assisted reconstruction of no-longer existent (architectural) objects and their surroundings practically amounts to a "virtual comeback". Irreversible destruction having removed identity-establishing buildings from the urban surface for all times is the principal cause for the attempt of renewed imaginating. Following the destruction of the so-called "Reichskristall-Night" of November 1938 the synagogues of the Jewish community in Vienna surely are to be considered for a virtual reconstruction. 60 years later, in the commemorative year of 1998 the first synagogue reconstruction was initiated. The medium-range goal, however, aims at the reconstruction of at least ten further synagogues within a project to be carried out in stages to be pursued over a period of several years. Fluctuations concerning the people involved in handling also call for a structure to be tracked down later on. This contribution deals with handling of modeling in a systematic manner aiming at a traceable data structure being of utmost importance for subsequent use and following-up work.

***Keywords**: 3D-Modeling, Virtual Model, Computer-generated Reconstruction, Digital Patrimony*

Introduction

The basis of reconstruction work proves to be well-founded archive material determining the validity of virtual reconstruction to a high extent and moreover, the majority of the present reconstructions concern synagogues dating from the second half of the 19th century. Due to the "thoroughness" of the Building Authorities in Vienna and the thus resulting requirements governing submission plans and alteration planning (1:100 scale) this source is be considered highly reliable. This amounts to the fact that submission planning and execution generally correspond in most particulars. These plan documents, however, usually do not give any indications as to any fixtures and furnishings. It really is amazing that a substantial number of plan documents have been filed despite the fact that others are missing. Loss of archive material amounts to limitations affecting three-dimensional representation whereas speculations – e.g. with reference buildings – will gain in importance. A substantial number of sections of buildings, however, will increase the degree of authenticity of the reconstruction.

A search as to possibly archived records of execution and detail plans at design studios turned out to be in vain. This does not come as a surpise as practically a century has passed since completion of building activities and, moreover, many a planner chose to leave the country due to the changed political situation. The technical journals dating from the time of completion of

building, however, issue relevant building descriptions for some cases. Photographs also represent an essential information source as they depict an actually realized situation. Therefore, research focused on stocktaking shots always bearing in mind that the Viennese synagogues were part of the urban image for no longer than half of a century. Any such pictures stored in the various archives mostly are black-and-white shots showing the exterior. The major part thereof are picture postcards not to be regarded as unique specimens, whereas the number of interior shots is rather pretty low. The few works of art in form of depictions in oil or water paintings are to be taken with a pinch of salt, but also represent supplementary source material.

Modeling Conditions and Setup

Continuing developments in the field of computer-assisted modeling techniques as well as the implementation of knowledge acquired in cooperation with art historians led to advancements concerning modeling procedures. Modeling, moreover, is tackled by different people (individuals and teams) and in differing frame conditions (workshops, diploma theses and commissioned projects, etc.), very easily resulting into considerable confusion regarding data organization. Generally speaking, the structure principle of separation of building members within a simple floor structure will not prove adequate for keeping "track". Parapets with applied ornaments e.g.- mostly modeled in several vertical layers – can only be filed in a traceable way by means of structured data organization. In order to provide sufficient vision to a reconstruction it is essential to develop structuring relying on the available sources prior to commencement of producing the virtual model to be based on the CAD-program used. The aspect of usability at a later time doubtlessly is an essential prerequisite for subsequent modeling procedures.

First of all, planning documents of the reconstruction object to be dealt with are be structured according to constructive criteria. Wall structures in their differing functions (interior and exterior walls) are to be identified and supplemented by supporting pillars, ceilings, intermediate ceilings, staircases, roof constructions, roof covering, framework (roof truss), facade elements, ornaments, furnishings etc., in order to ensure the required overview within the data organization for the changing user community at all times. In any case coherent (geometric) elements within the respective level (layer) are to be documented in form of an individual three-dimensional representation. Specification of levels and the graphic representation of the specific contents should determine the building components in a suitable manner. Representation of the layer contents should preferably be shaded. A wire mesh model does not lend itself to this form of documentation as all clarity is done away with as soon as a great number of building elements within one layer are involved.

The implemented software package ArchiCAD® as basic set already provides a number of functions meeting the demands as to required geometry modeling, floor administration and layer allocation. Moreover, the subsequent steps of material identification, texture verification and light simulation can be performed not involving any complicated additional efforts. Furthermore, compatibility with other CAD-programs makes for data transfer to other software applications without any major information loss.

Example of Implementation: Synagogue Kluckygasse

In the course of the project work the frame conditions for the structured data model generation were determined. It not only is the geometry defining this structure but also any related (object-specific) parameter, such as materials and textures. What is assumed is that the story man-

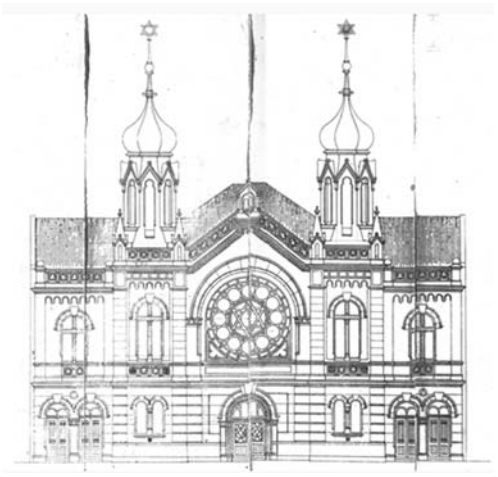


Figure 1a-b. Archive material (Comparison plan and photography)

agement makes up the "horizontal structure", the layer management, however, the "vertical structure" of the building. The terms "story" and "layer" in this context refer to the software "ArchiCAD". Below the systematics is described step-by step:

Research work concerning plan documents, picture material and descriptions –

This information pool is of basic importance and so possible plan documents should be available at the beginning of computer-assisted reconstruction work. The more high-quality archive material available, the exacter a reconstruction of synagogue will be.

Comparing plans with photographs -

In order to determine differences between planning and execution plans are to be compared with photographs and any discrepancies are to be spotted. Moreover, first analyses concerning the constructive building structure (e.g. grids, sections of facades, etc.) are to be made.

Definition of a story structure –

Every building element with a virtual reconstruction is to be assigned to a story. As many stories as desired can be introduced which do not have to be identical with the story structure of the plan documents. It might even prove wise to work with intermediary stories if a great number of ornaments or ceiling elements occur above the ideational "1-meter-section". Particularly when several individuals are involved in the course of project work the story structure helps figuring out correct positioning of building parts within the three-dimensional space.

Determining a layer structure –

Now the number of layers to be associated with the matching building parts is to be specified. The criteria for allocation of building elements are to be selected according to constructive aspects. It might be possible that building elements of one layer might fall below or exceed the imaginary horizontal boundaries of the story management.

After completing the reconstruction all layer contents is to be documented by means of shadow-marking. Therefore, first all layers are to be faded out and subsequently the contents of each single layer is to be rendered

Compiling materials used –

Each element on one layer and in a story provides of a specific surface color (corresponding to the

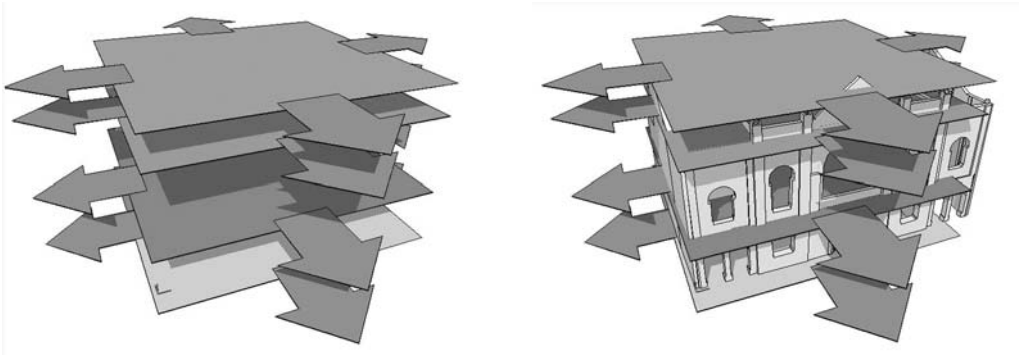


Figure 2a-b. Story management in the Synagogue Kluckygasse

material). This color is related to the single geometric faces and thus can differ within one object. The element as such, however, is not split up between the various layers.

Determining textures –
A further step regarding classification is the material texture assigned to the specific surface color. A texture is the graphic rendering of a building material, which is projected to the geometry of the building element when a photorealistic rendering is being generated. Special effects of photorealistic rendering possibilities of a CAD-software may also issue additional light, gloss or reflecting effects, influenced by various light sources within and/or outside the building model.

Compiling library elements and modules –
The construction of project-related building elements is achieved by implementing all ArchiCAD-standard tools available. Building parts stored as library elements are to be stored as so-called "modules" in a specific directory. This procedure enables any following alterations of individual library elements.

Archiving of project files –
Finally, all project data are to be stored in a clearly laid-out directory structure. An expansion by individual directories can be furnished whenever required (e.g. regarding textures).

Compilation of materials used and specification of textures can be carried out at a later stage, so required information is missing. An impression of the reconstruction of the Synagogue Kluckygasse is issued below.

Conclusions

This paper provides a contribution in terms of relating an increasingly used technique in architectural history to a more rigorous process of data

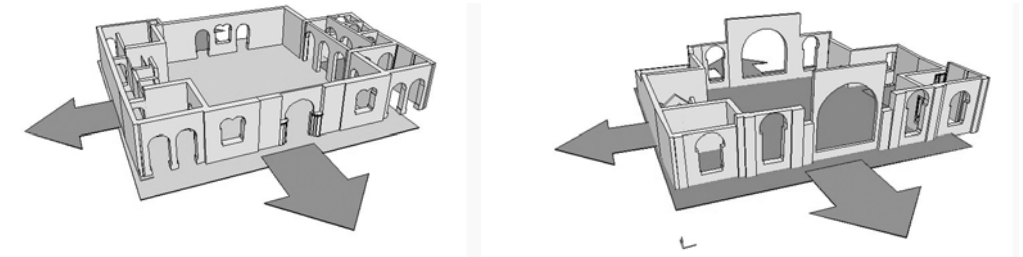
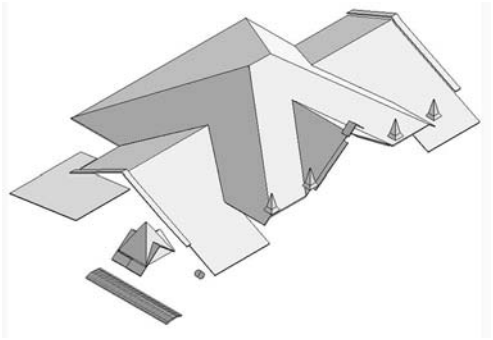


Figure 3a-b. Layer "exterior walls" per story at the Synagogue Kluckygasse



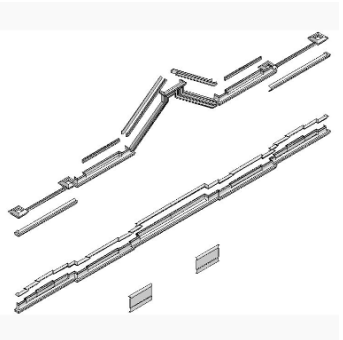


Figure 4a-b. Layer documentation Synagogue Kluckygasse (detail)

analysis and authentification. CAD is often employed with less care than the authors propose. What is to be considered is that reconstruction work furnishes the specific levels of detail, i.e. continuing art-historical findings are to be included subsequently. We might be dealing with longer periods of time where the initial team is no longer involved in modeling work. Moreover, it is difficult to specify if a certain CAD-software package will still be available in the years to come. These reasons might really cause great difficulties for advancement of work and therefore investing in systematic maintenance will be beneficial and pave the way for further utilization – possibly also in a different CAD-environment.

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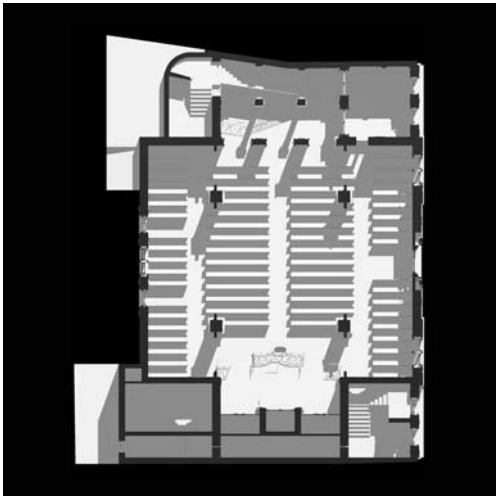


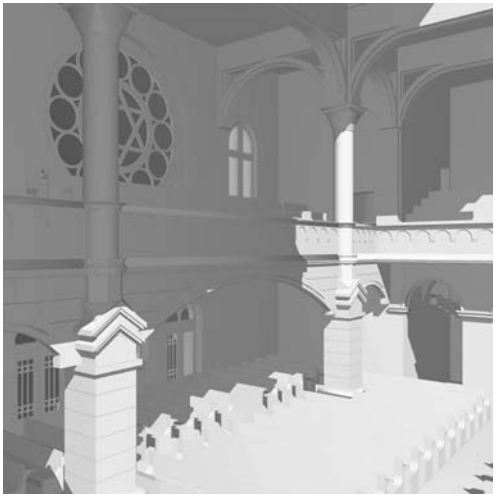
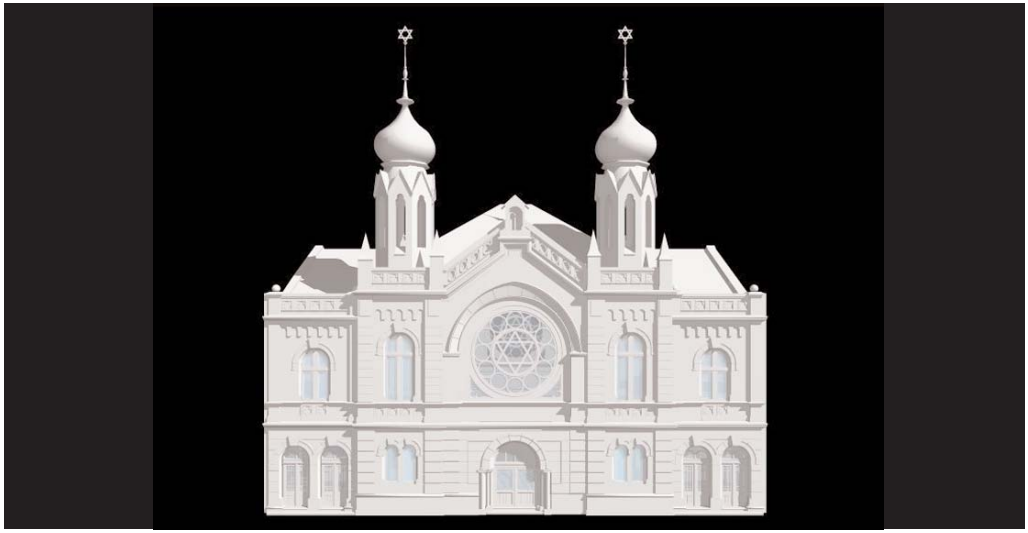
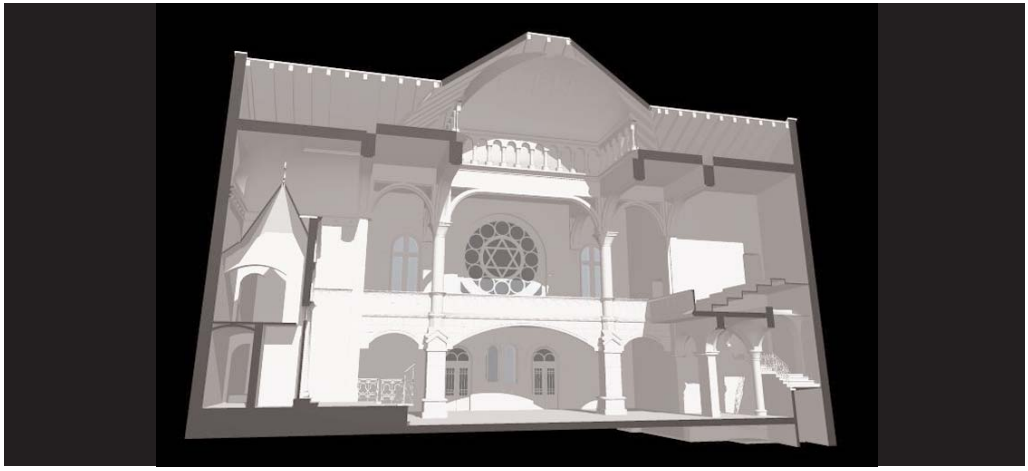


Figure 5a-d. Renderings of reconstruction work





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