Documentation and Plausibility of Virtual Reconstructions

Establishing a culture of documentation with IDOVIR

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Introduction

In the context of architectural and urban research, virtual reconstructions have become widely established as communication and research tools (Münster, 2016). They often visualise architecture that no longer exists, but also historical construction projects that were never realised, earlier states of buildings or even entire cities. During a reconstruction process, a wide range of sources, some of which may well be contradictory or ambiguous, can play a role and be interpreted and evaluated in very different ways. The process of discussion and development cannot be seen in the final reconstruction model. For this reason, there has been a longstanding and well- underpinned call for reconstruction results to be accompanied by a documentation of the sources and, above all, a documentation of the decision-making processes that support them resp. led to them (Denard, 2013; López-Menchero Bendicho, 2013). Although there is now a consensus that research results should be available in a transparent, permanent and openly accessible form, this still tends to be the exception rather than the rule, and there is a real risk of losing the knowledge embedded in reconstructions (Münster, 2016; Wacker and Bruschke, 2019). To meet the demand for the documentation of research results in a practical form, the DFG-funded online tool IDOVIR was introduced. It has been set out with the goal to give a quick and easy possibility for all interested in digital reconstruction to come in the flow of parallel reconstruction and documentation with manageable effort and to clearly see and experience the benefits.

IDOVIR documents the research results in such a way that the decisions as to why a reconstruction was drawn up in the way it was, what sources it is based on, what other variants were considered, but also which conceivable variants were rejected and for what reason (traceable, transparent documentation of negative results), are documented and made accessible via the internet. At the same time, IDOVIR supports communication among the parties involved in the development of a reconstruction and is intended to help structure the process of reconstruction in a meaningful way (e.g., by storing work statuses and providing the several different types of comments such as source comments, model comments, argument comments).

The fundamental idea of IDOVIR is based on the Reconstruction Argumentation Method (RAM) developed at the TU Darmstadt and already used in ScieDoc as early as 2017 (Pfarr-Harfst and Grellert, 2016; Grellert, Pfarr-Harfst and Schmid, 2019). At the heart of the RAM approach is the subdivision of a reconstructed building into different areas (cf. Fig. 1). Each of these areas is represented by 1) renderings of the reconstruction, 2) images of the sources used, and 3) a textual argument explaining how the sources have given rise to the reconstruction. For each area it is possible to represent several variants within this triad of reconstruction – sources – argumentation (Fig. 2). IDOVIR picks up on the 3D approach of DokuVis (Bruschke and Wacker, 2016) and offers both 2D

and 3D representation. In 3D, camera positions to guide the user's eye to important details can be saved and accessed in the respective visualisation window. Individual uploaded 3D model parts can be combined into a larger one (e.g., for displaying the models in the subordinate areas in the parent area). The RAM approach is already adopted in other projects to establish methodological standards for the documentation of reconstructions (Kuroczyński, Bajena and Cazzaro, 2022).

Variants

The option of creating variants within the hierarchical structure is rooted in the realisation that architectural re-constructions rarely result in a single, unambiguous version of a building or complex, and that it is important to record the underlying discourse in its entirety. This means that further plausible variants, as well as those that may have been rejected, should be recorded and documented. If new findings change the factors that had previously led to the rejection of a variant, it is possible to refer back to those earlier discussions.

While it is easy to represent variants in reconstructions by means of two-dimensional illustrations based on renderings of the respective model variants, the representation of variants by means of 3D models is more complex and may entail uploading many similar models. Here it might be more practical to represent the individual areas and their respective variants in the documentation in the form of partial models. In combination, these partial models of the different areas then yield a specific variant of the overall model. For the presentation of further variants, the partial models can be removed and substituted as required. Thought through to its logical conclusion, this suggests that it may make sense (for this and other reasons) to have the same structure in the documentation and the model, i.e., the designation and structure of the areas in the documentation correspond to those in the modelling software. This would also make it possible to import the layer structure from the modelling software into IDOVIR and to automatically generate or update the structure of the areas and time frames – an additional incentive to lay down a sensible layer structure in the modelling software, which does not always happen in practice.

Evaluation of reconstruction results

A reconstruction process almost always entails the interpretation and evaluation of sources to provide a starting point for the creation of a (hypothetical) model. The plausibility of the reconstruction result depends not only on the informational value and nature of the sources used but also on subjective, conscious or unconscious decision-making processes, such as, for example, stylistic or aesthetic preferences. The evaluation of plausibility can therefore never be purely objective. Nevertheless, a subjective evaluation of a reconstruction can contribute to the assessment of the plausibility of the results or partial results. How such an assessment can be made and communicated has already been the subject of several studies that also include various structuring and communication strategies (Kensek, Swartz Dodd and Cipolla, 2004; Hauck and Kuroczyński, 2014; Apollonio, Fallavollita and Foschi, 2021; Heeb and Christe, 2019).

In IDOVIR, the evaluation consists of three categories. It combines the option of self-evaluation with regard to the (subjective) assessment of the plausibility of the reconstruction with an (objective) classification of the sources used. Corresponding to the structural division into areas, the evaluation refers to a single area of a reconstruction, for example the area "west façade".

The first two categories refer to the sources used. In the first category, a used source is classified according to its type. The following subdivision was developed in collaboration with Fabrizio Apollonio (Grellert et al., 2018):

- Architectural survey
    - Laser scan and/or SfM of architectural remains
    - Survey drawing
    - Photography
- Design
    - Final design
    - Initial design
    - Final maquette
    - Initial maquette
- Abstraction
    - Illustrative model
    - Drawn reconstruction
    - Reconstruction model
    - Contemporary drawing / sketch / painting
    - Relief / seal / coin / medal
    - Written / oral description

Here, the classification is usually unambiguous and made by the user while entering the source. Since sources are supplied for the entire project and remain available in a global directory, the type of source always remains the same. The automatic evaluation then shows which type of source occurs with which percentage frequency in the re-construction of the corresponding area. The representation is shown in a bar chart (Fig. 3).

The second category establishes the relation of the source to the reconstruction. It indicates whether the source describes the reconstructed object itself or whether the source represents (merely) an analogy. The following subdivision is proposed:

- Direct source
- Analogy to the object
- Analogy to another building / complex
- Analogy to a constructive / technical system
- Analogy to an idea

The third category is an assessment by the user of the plausibility of the reconstruction of an area subdivided into:

- Geometry
- Surface structure

- Colouring

It is possible to enter a rating for each of these three subsets. The user may take a default setting, which is structured as follows:

- Fictional
- Based on analogies
- Partly substantiated
- Largely substantiated

However, users are free to select both the name and the number themselves, for example purely numerically (e.g., 1–6 or less or more):

- 1
- 2
- 3
- 4
- 5
- 6

The evaluation is represented by a pie chart, in which the portion of the circle that is filled in rises with the user's confidence in the plausibility of the reconstruction (Fig. 4).

Conclusion

The sound documentation of virtual, hypothetical architectural reconstructions is an essential prerequisite for any scholarly debate. It has to record not only the sources that were used but also the interpretation and decision-making processes that ultimately led to the reconstruction result. IDOVIR is a platform that allows reconstruction projects to be documented intuitively and easily. A freely configurable structural organisation into spatial areas and time periods is designed to meet the individual and specific requirements of a wide range of projects. The classification of sources and the evaluation of (partial) results permit an overview and insight into plausibility and informational value.

IDOVIR has been available online (https://idovir.com/) since January 2023 and has been constantly updated since then. The fact that the platform is operated in collaboration with the Universitäts- und Landesbibliothek Darmstadt ensures its long-term sustainable provision.

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