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Interactive article

Crafting research communication in building history

ABSTRACT

This research is presented through an interactive application. A virtual reconstruction based on the remains from a medieval stave church is used as a case study to re-establish the historic building as a tangible place and assemblage. Augmented by virtual reality, the research focuses on the sensuous aspects of the stave church as a whole—where architecture, artefacts, light, and materials interact—through the movements of approaching, entering, and dwelling. The research output is a virtual reconstruction, or a virtual diorama, that “re-members” the stave church elements and re-contextualises contemporaneous religious artefacts that have been dismembered and diffused in various exhibitions and deposits. The contribution in this research is methodological, seeking to test and provide a case to discuss how non-traditional research outcome can be crafted to elicit the sensuous aspects of research and still attend to the rigor of science. We seek to methodologise the digital artefact as a research output but also as a means for testing hypothesis and observing the effects when enacting the environment. The connection to the craft sciences concerns both the empirical material, the wooden stave church as a crafted object, and the exploration of an interactive application as a research output or hermeneutic device in the research process.

Keywords:

Virtual reality, non-traditional research output (NTRO), virtual diorama, Hemse stave church

INTRODUCTION

The medieval church has been a frequent research topic in Sweden since the very beginning of the academic disciplines of cultural history. A persistent problem is that various aspects of the church have been more or less separately anchored in the emerging discourses of history of religion, art history, archaeology, architecture and craft research (Almevik 2017). Hence, the religious uses, the architectural space, the construction and building craft, and the images and artefacts are commonly delimited and studied separately. What is lost is the ‘presence effect’ and an intelligible sense of the ‘togetherness’ of peoples, buildings, and artefacts (Gumbrecht 2004; Hägerstrand 2009). How did these historic buildings originally frame the activities of people?

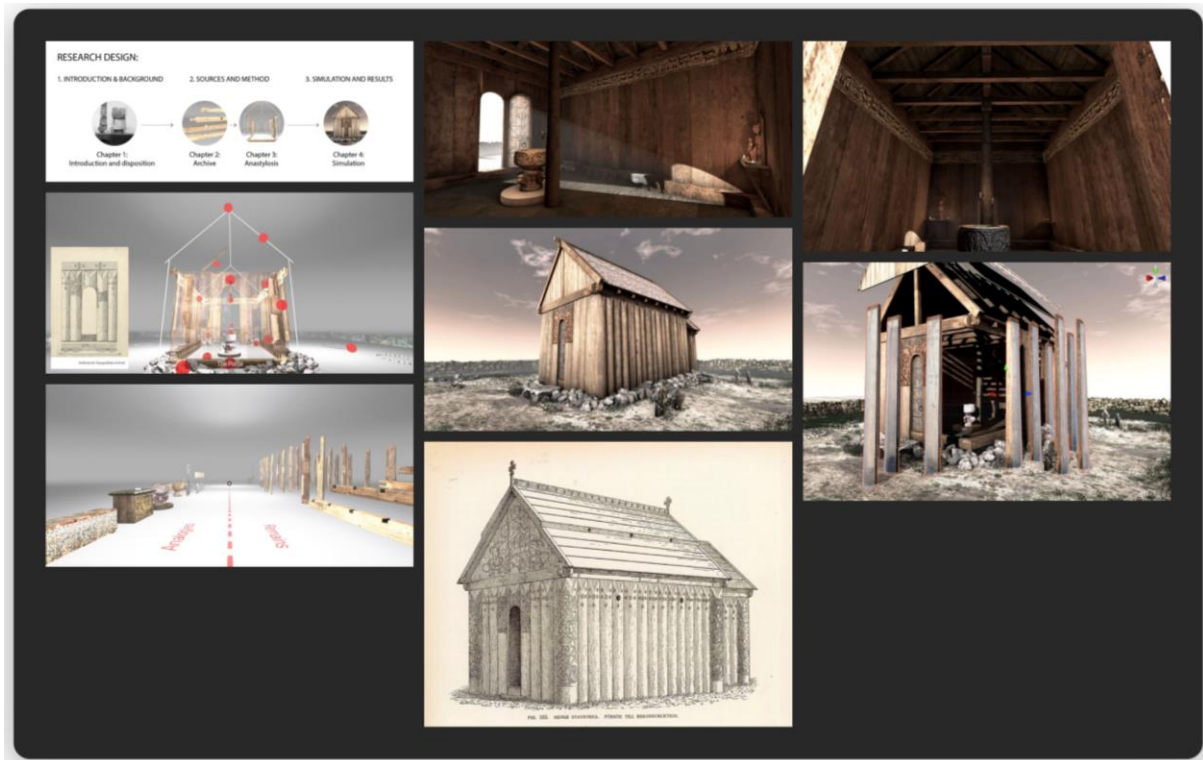


FIGURE 1. The research is presented through an interactive application. **To watch the the interactive application, click the picture**

The research is presented through an interactive application (Figure 1) and sets out from an in-depth re-examination and virtual reconstruction of the remains from a medieval stave church. The case which is used to re-establish the historic building as a tangible place and assemblage is an early twelfth-century wooden church, the remains of which were found in 1896 during a restoration of the Romanesque church in Hemse. In all, 67 pieces of the wooden church were brought from the island of Gotland to the National History Museum in Stockholm. Augmented by virtual reality, the research focuses on the sensuous aspects of the stave church as a whole—where architecture, artefacts, light, and materials interact—through the movements of approaching, entering, and dwelling. The outcome is a virtual reconstruction or a virtual diorama (Westin & Almevik 2017) that “re-members” (Landzelius 1999) the stave church elements and re-contextualises contemporaneous religious artefacts that have been dismembered and diffused in various exhibitions and deposits.

The contribution in this research context is mainly methodological, in seeking to test and provide a case to discuss how non-traditional research outcomes can be crafted to elicit the sensuous aspects of research and still attend to the rigor of science. We seek to methodologise the digital artefact as a research output but also as a means for testing hypothesis and observing the effects when enacting the environment. The digital artifact is used as an ‘historical laboratory’ (Almevik 2019). The connection

to the craft sciences concerns both the empirical material, the wooden stave church as a crafted object, and the exploration of an interactive application as a research output or hermeneutic device in the research process. The methodology could be applied to any crafted artefact or spatial environment. We argue that the full use of technology and visual media is particularly important in research on embodied craft skills and sensory-based judgements to reduce the loss of information in translations between modes, medias, and formats.

The primary source for the reconstruction is the archaeological remain of the stave church, safeguarded at the Swedish History museum (SHM 10 232:1–67). Guided by the remains, the ground plan can be determined to a rectangular nave of 7.85 x 5.30 meters and a chancel with a length of 3.40 meters. The height of the walls can be specified to 4.10 meters in the nave and 3.50 meters in the chancel. The remains do not inform us on all features of the building as a whole or its environment and furnishing, hence we have used other contemporaneous archaeological data and remains for analogies. An important finding is the ground and imprint of a stave church inside the nearby Romanesque church in Silte, discovered in 1970. This finding provides credible information of the foundation, church floor, roof shape, and height of the same type as the one found in Hemse. Together, these two sources provide the foundational grounds for our digital reconstruction, but multiple other sources have been used to fill the gaps. Analogies to these sources have been selected by the critical criteria of relationship in space and time. The basis for our reconstruction and the use of multiple sources has been presented in previous research (Almevik, Pärnsten & Sjöholm 2020; Almevik & Westin 2020; 2017).

All primary sources in the archaeological find of Hemse stave church have been reinvestigated, documented, and processed into digital 3D representations through photogrammetric triangulation. With the photogrammetry software Agisoft Metashape, a three-dimensional structure of each element is computed from a large number of photos captured systematically (see de Rue et al. 2013). Using the 3D documentation as templates for a digital reconstruction, each individual part of the structure has been modelled separately, piece by piece, simulating a real construction process (Almevik & Westin 2017). Other sources included in the reconstruction have been assessed and represented through either photogrammetry or computed manually with the software Autodesk Maya 3D.

To build our simulation of this space, and make it into a place, we assembled the model in Unity, a physics-based visualization and simulation engine that functions in the laboratory as an archive for heterogeneous digital material. Sound recordings, 3D models, photographs, and drawings can here be assembled in an interactive scene. While inherently interactive, the technology offers the opportunity to lead the audience through the different considerations taken in the research process, consider possible variants of constructive features and settings of artefacts, and compare their effect on the place. Existing in parallel space with the reconstructed structure, the documentation of the original stave church is incorporated as a reference layer, making it possible for the user to question and contest the reconstruction.

RESEARCH DESIGN:

1. INTRODUCTION & BACKGROUND

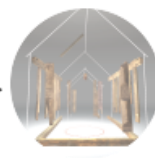


Chapter 1:
Introduction and disposition

2. SOURCES AND METHOD



Chapter 2:
Archive



Chapter 3:
Anastylosis

3. SIMULATION AND RESULTS



Chapter 4:
Simulation

FIGURE 2. Synoptic diagram of the interactive application.

The research output, the interactive narrated Virtual Reality application, consists of four chapters, each one with an interactive scene. The application consist of four chapters: (1) An introduction to the research questions, (2) a presentation of the archive material where the primary sources and analogies are accessed as 3D representations, (3) an ‘anastolysis’ of the remains that contextualises the sources and present the key interpretations to the reconstruction, (4) and finally a simulation of the stave church where the user can roam the reconstructed building and its nearby environment with photorealistic textures, light and shadow, in the various soundscapes and assemblages and settings of corroborating elements. The linearity and meta-narrative of the research is provided by short films as introduction to each interactive scene. By a navigation tool, accessed by looking at the feet, the user may wander back and forth to revisit and interrogate the features in the different chapters. Through focus points the user can access research references and information of the sources and its interpretation.



FIGURE 3. Hemse stave church reconstructed. Exterior context.

The epistemological premise from which the research is developed rests on long-standing traditions of thought in cognitive science, with a growing recognition in archaeology (Harris & Cipolla 2017; Kus 1992; Tarlow 2000). In line with Francisco Varela, Evan Thompson, and Eleanor Rosch, we acknowledge that “cognition is not the representation of a pre-given world by a pre-given mind but is rather the enactment of a world and a mind on the basis of a history of the variety of actions that a being in the world performs” (Varela et al. 1992). Another premise of our research is that real events can happen in real places in virtual spaces (Barsalou 2010). David Kolb states, “if places are perceptible spaces surrounding us, where our spatial movements and performances are regulated by social norms and expectations, then places do not have to be in physical space” (Kolb 2006, 71).



FIGURE 4. Hemse stave church reconstructed. Interior context.



FIGURE 5. The virtual archive of the digitized source material used in the reconstruction.

As recent studies have shown, there is a connection between embodiment and the sense of agency in virtual spaces (Zopf, Polito & Moore 2018). Drawing on embodied cognition, it is possible to acquire knowledge and understanding through senses and experiences in the enactive structures in which they arise (Bailey, Bailenson & Casasanto 2016; Varela et al. 1992). Establishing a spatio-temporal connection between a user's natural movements and the interactive elements of a representation is therefore

important for also establishing the representation as the simulation of a place that is the product of a performance of a space. The cognition emerges as affordances in situated environments (Gibson 2015).

The concept of affordance originates from John Gibson's theory of environmental dynamics, which implies that when we perceive an environment or object, we observe its affordances and not its particular qualities. The noun affordance pertains to the environment that provides the opportunity for action. Affordances require a relationship to the situated environment from which the contingencies of actions derive. The notion of affordance relates to Tim Ingold's thought of a "dwelling perspective", as opposed to a "building perspective". According to Ingold, "apprehending the world is not a matter of construction but of engagement, not of building but of dwelling, not of making a view of the world but of taking up a view in it" (Ingold 2002, 42).

Working with photorealistic and immersive environments requires an understanding that such visualizations are easily read as complete (Almevik & Westin 2017; Westin 2014). The empty spaces created from missing materiality, left out of the scene due to uncertainty or lack of information, become parts of the scene which are as equally defining as the materiality included. Consequently, there is a conflict between the desire to create a well-researched space only referencing what we know and the desire to create a place realistic in its composition and appearance, albeit more hypothetical.

The space is constructed partly through the building's form but also in conjunction with the artefacts and the way of enacting the space. The first version of the model of Hemse stave church was an unfurnished space. The incongruous emptiness evoked questions: Which artefacts were there, and where might they have been placed? Where were the sacraments stored—the missal, the incense, and the paten? Were these items freely located in the chancel, or could there have been a tabernacle or a coffer? Did the priest bring the chasuble or was it hanging on a hook on the wall? These kinds of questions may arise through reflection and logical reasoning without a construct, but new questions also emerge as a reaction to the affordances provided in the virtual space.

The digital application also offers tests of articulated ideas and questions. For instance, how does the natural light interact with the building and the artefacts with regard to alternative openings, time of day, or season? How does the light impact our perception according to position and movement? These kinds of tests are conventionally deductive; the outset is defined, the model is prepared for the test, the test is executed, and the results are observed and recorded. The tests could be comparative in operating alternatives. For instance, they can compare a construction with or without windows.

The phenomenological exploration of Hemse stave church affirms previous research on medieval architecture, but also expands the understanding of the presence effects and impacts that buildings and artefacts have on human bodies. The tower-like configuration of tall, leaning walls of thick oak, the anchoring to the ground by large boulders, the narrow doorway under the high portal vault, and the passing through this liminal zone to enter a massive enclosed space with a marble-like floor—all these properties augment conception and attunement to the Christian world. The feeling goes through you and at the same time binds you to the world. The research points a spotlight at previously unattended elements of building with both presence and meaning effects, like the large boulders that not only fix the staves to the ground but also alienate the building from the surrounding landscape.

The central column appears as a conspicuous social divider of space, locating people before and beyond, to the north and to the south of the nave, and at the same time suppressing all these locations and possible identities on the ground by the verticality to the open attic. The doorway's impact on the contained space is pervasive, forming a pillar of light. With closed door, the enclosed space is like being inside a crypt. Here, the artificial light controls the space and the flickering light causes the shapes of the artefacts and the building's construction to tremble.

An important lesson is that the virtual reality experience also evokes unexpected observations. The tests may draw attention to properties or phenomena that are known in principle, but which are not valorised. We know that daylight may have a strong impact on the interior space in a way that forcefully divides a room into light and dark zones, but more precisely how does this work in a particular space and setting? The use of the digital artefact offers a path from knowing that to knowing how, using Gilbert Ryle's well-known concepts of knowledge (Ryle 1946). An important feature is also the interplay of particular phenomena in a situated context, for instance natural and artificial light. The daylight is

somehow uncontrollable and may also reduce the strength of artificial light. In a small enclosed space like Hemse stave church, possibly without windows, the artificial light source is both impactful and easily controlled and is thus used to establish affective fields and direct movement to particular locations or artefacts.

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Standing buildings

Garde church, Gotland: Roof ridge

Hemse church, Gotland: Funt

Vänge church, Gotland: Funt and Sacristy door with forged fittings

Väte church, Gotland: Church door with forged fittings

Öja church, Gotland: Church wall

Archives

Heritage Visualisation Lab, University of Gothenburg (HVL)

- Unity project Hemse 22, 2018.06.29.

Swedish History Museum (SHM)

- Hemse stave church, SHM 10232:1-67 (include loans to Gotland Museum)

- Coffin from Ryssby, Småland, SHM 8963

- Font from Frustuna, Sörmland, SHM 3806

- Holy water stoop from Bjäresjö, Skåne, SHM 7136:4 A-C

- Madonna from Appuna, Östergötland, SHM 7890:2

- Madonna from Viklau, Gotland, SHM 18951

- Altar stone from Skälvum

- Antesemle from Broddetorp, Västergötland, SHM 4674:1

- Lily stone from Lugnås, Västergötland, SHM 9044

- Picture stone from Gotland

Swedish National Heritage Board's archive (ATA)

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- Primärmaterial för publicerade monografier Gotland F1ae, Vol. 8. 1961–1970

- Hemse stavkyrka, Hemse (vol. 131, Bd VI:3)

Emil Eckhoffs archive:

- Vol. 42, Svenska stavkyrkor, Anteckningar och excerpter, 1.

- Vol. 43, Svenska stavkyrkor, Anteckningar och excerpter, 2.

- Vol. 44, Svenska stavkyrkor, Anteckningar och excerpter, 3.

- Vol. 45, Svenska stavkyrkor, Anteckningar och excerpter, 4.

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