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Time travel using 3D-methodologies

visualizing the medieval context of a batismal font

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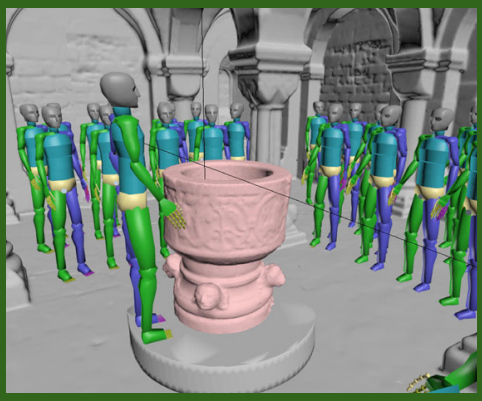
Chapter 2

Time Travel Using 3D Methodologies

Nicoló Dell'Unto, Ing-Marie Nilsson† and Jes Wienberg



The Archaeology of Time Travel

Experiencing the Past in the 21st Century

Edited by

Bodil Petersson
Cornelius Holtorf

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Chapter 2

Time Travel Using 3D Methodologies
Visualising the Medieval Context of a Baptismal Font

Nicoló Dell'Unto, Ing-Marie Nilsson† and Jes Wienberg

Abstract

Time travel is often associated with popular mediation. This article demonstrates how time travel using digital visualisation may also be a useful tool for research. The case study involves the medieval cathedral and monastery of Dalby in Sweden with a twelfth-century crypt and font. The crypt may have functioned as a baptismal chapel in the Middle Ages. Digital 3D techniques, including terrestrial laser scanner and image-based 3D modelling, are used to reconstruct the original architecture of the crypt and to conduct simulations of the use of the space during the liturgy.

Keywords: Middle Ages, digital time travel, 3D methodologies, baptismal font, crypt

Introduction

The metaphor of time travel may describe a wide range of techniques to explore the past and the present. One of these techniques is digital visualisation, which makes it possible to transgress both time and space and to investigate now-lost relations between architecture, sculpture and human actions. This case study from a medieval cathedral in Sweden focuses on the relationship between a font and a crypt. Three dimensional methodologies make it possible to unite what has been separated by centuries of modifications and by a thick stone wall as well as to move the font back into the crypt again. Furthermore, this methodology allows simulations of how the space may have been used during the liturgy.

Dalby – 'locus celebris'

In the first decades of the twelfth-century Dalby in Scania, Sweden (which was part of Denmark before 1658), the English chronicler Ailnoth described the cathedral as *locus celebris*, meaning the 'famous location'. The contemporary church in Dalby (Figure 2.1) is known for many reasons: as the oldest still-standing stone church in Scandinavia; as a bishopric for the German Bishop Egino in the 1060s; as a Benedictine monastery, which was transformed into an Augustinian monastery; for its relatively well-preserved monastic buildings from the Middle Ages; for the excavated remains of a royal palace for King Sven

Figure 2.1. Dalby in Scania, Sweden (Photograph by Jes Wienberg 2010).

Estridson and his sons in the 11th century; as a burial place for King Harold Hen in 1080; for its presumably nearby royal hunting park; for its estates at the reformation comprising roughly 450 farms; and finally for the so-called Dalby book and early Gospel book created in the monastery.

However, recent research on Dalby has revised and elaborated the history of the site (cf. Borgehammar and Wienberg 2012). For example, Dalby was the bishopric for Bishop Egino in the 1060s but then probably became the cathedral for the diocese of Lund from *c.* 1070 until the first decades of the 12th century. It then served as the cathedral of the archbishopric for a few years until the status was transferred to a new cathedral in the nearby city of Lund. This might explain the rather large size of the basilica in the 11th century. The so-called royal palace of Sven Estridson and his sons might rather have been the palace of the (arch) bishop or the monastery buildings. Contrary to previous thoughts, Dalby has never been the location for a Benedictine monastery. The convent of probably 12 canons took part in the gradual creation of the order of Augustinians. Historical analogies indicate that Harold Hen was probably buried in the nave in front of the Holy Cross and underneath a chandelier, from

which a fragment was rediscovered among finds from earlier excavations. Because monasteries also used hunting parks, it is possible that the park was not associated with the royal palace. Arguments have also come to light that suggest that the Dalby Gospel book cannot have been written in Dalby, and probably derives from Hamburg-Bremen and possibly was brought by Bishop Egino. New research has also discovered a possible small medieval town at Dalby called 'Norrby'. Finally, the crypt may have functioned as a baptismal chapel with the font located at the centre of the room.

Time travelling with a font as luggage

Documentary evidence demonstrates that the baptismal font of Dalby has been located in the nave at least since the 19th century. However there are reasons to believe that the architectural context of the font from the beginning in the 12th century was in the western crypt of the church. Attempts have been made to envision in words and pictures how the font may have functioned both practically and symbolically in this context (Nilsson 2012). These theories will be expanded further in the following text since they function as the theoretical basis for the reconstruction. As the font is a heavy piece of carved stone and still in weekly ecclesiastical use, it cannot realistically be moved in order to answer research questions.

Could it be possible to travel back in time with the font? If so, what would the font then have looked like when placed in the crypt instead of the nave, and how would it have been perceived by people who used this space in the Middle Ages? One solution to this problem is to introduce a new 3D computer visualisation based on accurate 3D models acquired by means of 3D acquisition technology. The models processed in the frame of this work were generated to simulate a virtual environment where different scenarios could be assessed. For this reason, once processed, the 3D high-resolution models were optimized in order to be merged and visualized in the same virtual space. This operation allowed a 3D scene to be used to address a number of specific research questions. The creation of a very high-resolution model (due to the limited computational capacities of the machines) would have prevented the possibility of running the simulation; instead optimizing the models allowed us to merge several different models at a sufficient resolution.

The crypt

The crypt in Dalby, or anteroom as it is sometimes called, is a square room in the western part of the church (Figure 2.2). The floor of the crypt is now partly below ground level, just as it was in the Early Middle Ages (Anjou 1920:19). The church in Dalby has undergone many changes throughout its history, but the crypt is relatively intact. There are fairly few additions to the room that are

Figure 2.2. The crypt in the church of Dalby (Photograph Ing-Marie Nilsson 2010).

later than the 12th century, and they are easily discerned. This makes the crypt well suited for a terrestrial laser scanner, an instrument capable of collecting 3D coordinates of an object's surface automatically and in real time (Böhler and Marbs 2002).

In the Early Middle Ages, there were no less than five entrances to the crypt. The portal facing west seems to have been the most prestigious one. This entrance originally lead to an adjacent building complex that may have been a royal palace, a bishop's palace or an Augustinian monastery. This is the only portal with figurative sculpture. A tympanum above the door shows a man with braided hair wrestling a lion; in all likelihood a representation of Samson, the great hero of the Old Testament. The crypt was also accessible through two entrances in the eastern part of the room. The southern portal is still open today, whereas the northern one was closed off, probably already in the Middle Ages. During this period the cloister was located north of the church, and the portal may have been sealed in order to restrict unauthorised access to the monastery. There are also two entrances from the nave located on either side of a central niche. Both these portals were closed off in the 19th century

but were reopened in 1919 (Anjou 1930:60; Sjöborg 1830:pl. 45). With so many entrances, the crypt cannot be viewed as an enclosed space. On the contrary, it could be said that the layout of the room emphasises access and movement. It has been suggested that these portals may originally have been used for processions (Anderson 1926:15f).

The central niche in the eastern part of the room now contains an altar. This is not a medieval feature but a reconstruction from 1936. In the later part of the 19th century the original back wall of the niche was pulled down, and a new staircase connecting the nave with the crypt was installed (Rydbeck 1941:222f, 232f). The niche has from early on been interpreted as an altar niche (cf. Åkerman 1981:84), and this seems to be a likely explanation. If this interpretation holds, it means that the room would have had a distinctly liturgical character.

Another important element is the well that is situated in the north-eastern corner of the crypt. This feature seems oddly out of place, since it partly obstructs the northern (now blocked) external entrance. It is however an original item and may even be older than the present twelfth-century crypt. Wells and water reservoirs are sometimes found in important Romanesque churches and cathedrals and have not without reason been associated with baptism. In this respect Dalby may well be compared to the cathedral of Lund. This nearby and contemporary cathedral also has a crypt with a well in it, and the main altar of the crypt was consecrated to John the Baptist in the year 1123 (Rydén 1995:53). The argument has also been put forward that the crypt altar in Dalby may have been consecrated to John the Baptist (Cinthio and Mogensen 2010:107). Fresh water was an important element of the liturgy of the Mass. The well therefore seems to further underscore the ritual character of the space.

There is in this context one last architectural feature that is worth highlighting. In the western part of the crypt, the inner walls are provided with ledges, approximately 0.5m high and 0.25m wide. These ledges may possibly be viewed as seating places. Wall benches of stone are a feature that has been observed in several Scandinavian Romanesque parish churches. In these churches the benches occur mainly along the walls of the nave, but they are sometimes found in the chancel too. Ledges of almost the exact same type as in Dalby are also present in Lund cathedral, where they can be found along most of the free wall spaces in the crypt. If the ledges were used for seating purposes, this is a function that may not be primarily liturgical. In the Middle Ages people would have been expected to stand up and face the altar during the celebration of the Mass. It has, however, also been suggested that these wall benches may have been used in connection with religious or secular meetings (Holmberg 1990:29ff).

The closest architectural parallel to Dalby is the crypt in Lund cathedral. The two spaces share a close bond not only when it comes to the layout of the building, but also in regard to decorative sculpture and iconography. The two monuments were most probably constructed by people that belonged to the same building workshop. Functionally, however, the crypt in Dalby may also be compared to many ordinary South Scandinavian Romanesque parish churches. These buildings generally had two main entrances to the nave, which were located on the northern and southern sides. Sometimes there was also a western entrance, and if so, this portal was usually the most elaborate. As in all churches the main altar was located in the eastern part of the building, in the chancel. The main focus of the nave was the baptismal font. This item occupied a central position in the western part of the room, and along the walls of the nave there were sometimes stone benches. This outline recalls many of the basic features of the crypt in Dalby. In a sense, this space might be described as a church within a church.

There was probably a symbolic significance attached to the layout of the crypt. The crypt is a perfect square covered by nine cross vaults that rest on four central columns. The number four may in this context denote the four apostles. The symmetrical building may also be a reference to the idea of paradise in the shape of the Heavenly City, a theme explicated both by the prophet Ezekiel and the Book of Revelation (Ezek 40–48; Rev 21, 12ff).

The font

The baptismal font in Dalby is in many respects an exceptional piece of work (Figure 2.3). It is the product of a highly skilled stone carver with a good knowledge of the international Romanesque style (Liepe 2012). It is among the oldest stone baptismal fonts in Scania, and has been dated to the period 1140–1150 (Liepe 2012; Roosval 1916: 227f; 1918; Rydbeck 1936:94f). This is approximately a quarter-century older than the beginning of more widespread production of stone baptismal fonts intended for use in parish churches. Like the crypt, the font displays many similarities with Lund cathedral. It is probable that both crypt and font originated from the same Lund-based workshop (Roosval 1918:104f; Rydbeck 1936:94f).

The Dalby font stands out not only because of the quality of the craftsmanship but also for its sheer size. It is a very large item measuring 1.07m high. It is very unusual that fonts from the Early Middle Ages are this large. In Scania and Denmark the average baptismal font height is 80–90cm (Mackeprang 1941:37; Solhaug 2000:191; Tynell 1913–1921:147). The font consists of two parts: a cylindrical bowl with relief decorations and a circular base with four protruding corner sculptures. The bowl is large and cylindrical and quite deep (43cm). The baptismal water would originally have been let out through a central drain hole that would allow the sacred water to flow directly into the ground below. There is an extra square opening in the base of the font that is connected to the central drain hole. This may have been used as a drain for holy water (a piscina). The

Figure 2.3. The baptismal font of Dalby (Photograph Ing-Marie Nilsson 2010).

font would probably also have been painted in bright colours. Some traces of what seems to be an original reddish hue are still visible to the naked eye, but this aspect still has to be thoroughly analysed. Recent studies have however established that much of the now bare Scandinavian stone sculpture would have been covered with paint in the Middle Ages (Haastrup 1995, 2003).

The central image on the font, covering about a quarter of the bowl, is a large narrative scene that depicts the baptism of Christ. Jesus is shown naked with water welling up around him, with John the Baptist on his right side and an angel on his left. The importance of this motif is further underlined through a text in Latin around the brim of the bowl, which when translated to English reads: 'Here is the reality that once was foretold when on the cross a flow from Christ's side-wound welled'. The remaining three quarters of surface space is decorated with relief-

carved medallions with figurative and non-figurative content. The two medallions next to the baptism scene show plant ornaments that seem to represent grapes and the tree of life, and thus relate to the theme of the blood of Christ as the redeemer of mankind.

Other medallions depict hybrid animal figures, griffins and horned lions. There are also two medallions that seem to be a rendering of a hunting motif. A man with a hunting horn, holding a dog on a leash, is seen to be in pursuit of a deer. This may be interpreted as a metaphor for the human quest for salvation, but deer hunting is also a recurring theme in several saints' legends, for example the legends of St Giles, St Eustace and St Hubert. In this context it is perhaps the St Giles legend that is the most relevant since one of the side altars in the crypt in Lund cathedral was consecrated to St Giles in 1131 (Rydén 1995:53). The hunting motif is also interesting since it may relate specifically to Dalby. It has been argued that Dalby hage, a woodland area close to Dalby, may have been used as a deer park in the Early Middle Ages (Andrén 1997).

The base of the font shows four figurative corner sculptures: two lion heads and two human heads, which are placed so that they diametrically oppose one another. The expressions of these figures are also diametrically opposed. One of the lions seems strong and dynamic and has an open mouth that shows off a set of menacing teeth. The other lion has a closed mouth and a much meeker look. One of the human heads has long, braided hair and a wide smiling mouth. The other has cropped hair and a much sadder appearance where the corners of the mouth points downward. In the Middle Ages, these figures would probably have had several layers of meanings attached to them; it has been argued that one of these layers may be referring to the story of Samson (Nilsson 2012:231). The vigorous-looking man with long hair then should represent the powerful Samson that is favoured by God, whereas the man with the shorter hair would represent the Samson that has sinned and thereby lost his strength. The font is at present arranged so that the 'powerful side' (with the roaring lion and smiling man) is placed directly underneath the central baptismal scene on the bowl. If this was the original placement, the two motifs can be seen as reinforcing one another. The interpretation would then be that the figures underneath the baptismal scene are strong because they have embraced the grace of God (the grace that is offered through baptism), but the figures on the opposing side are weak because they are still trapped in sin.

The crypt as a baptistery

There is little factual evidence to support the idea that the crypt was used for baptism in the Early Middle Ages, but there is quite a lot of circumstantial evidence. For example, it is possible that the well in the north-east corner of

the crypt was not originally intended for the present crypt but is a remnant from an earlier structure. One important reason to have wells within or in close proximity to important churches in the 11th century was the possibility to perform baptism. In this period this would primarily have meant adult baptism in tubs or wells. If the well in Dalby was used for baptism in this time, as has been suggested by several scholars (Anjou 1930:69; Borgehammar 2012:82; Lindblom 1908:196; Lundberg 1940:214; Nilsson 2012:234), then the placing of the twelfth-century baptismal font in the crypt may represent a direct functional continuity. There is also archaeological evidence for a subterranean drain outside the crypt, the purpose of which may have been to divert water either from the well or the baptismal font. Further, the art historical material suggests that the font and the crypt were the result of the same building campaign. This may indicate that they were intended to function together. There are also some noteworthy iconographic connections between the font and the crypt. Lion representations are, for example, present both on the font and in the crypt. One of the central columns in the crypt has a base shaped as two lions, and the tympanum on the western portal depicts Samson wrestling a lion. As previously argued, the base of the baptismal font may also be a reference to the Samson legend. Finally, there is the comparative evidence from many Romanesque parish churches for the original placement of the font. Remains of elevated podiums for baptismal fonts have been found in Denmark, Sweden and Norway. In Denmark, the fonts generally seem to have been placed centrally in the western part of the nave (Hansen 1995; Olsen 1967:250ff; Solhaug 2000:68f). In Dalby the font may have occupied a similar position: in the middle of the room, between the four central columns. If so, the decoration on the font may give some further clues as to how the font may have been oriented. The decoration on the font has one main motif, the baptismal scene, covering one-fourth of the bowl's surface. Evenly spaced medallions cover the other sides. There is in this respect an interesting correspondence between the font and the crypt. This room also has three sides that are more or less uniform and a fourth side, the eastern side, which is distinctly different. We therefore propose that the font was placed so that the main scene faced east. There is a strong symbolism in that the most significant motif on the font faces in the most important direction, the direction of the Holy altar. There are however also practical arguments in favour of this placement. If the baptism scene faced east, it would have been clearly visible both to the priest at the altar in the crypt and to people passing through the many portals in the eastern part of the room.

Research questions for the 3D Model

This is as far as the theoretical argument regarding the relationship between the crypt and the font can be taken. The plausibility of the hypothesis of the original placement of the font has hitherto been difficult to gauge because the layout of the

crypt has changed since the Early Middle Ages, and the font is difficult to move. Both these obstacles are however possible to overcome with the use of a 3D model. With a 3D model, we can explore and assess different possibilities relating to this proposed placement of the font, and different questions having to do with perception and movement in space can be considered. For the purpose of this experiment we have chosen a phenomenological perspective in that we focus on the basic properties and faculties of the human body (Tilley 1994). We want to examine the characteristics of the crypt via the human ability to physically occupy and through the senses experience a defined space (Paliou and Knight 2013).

In order to accomplish this, we have decided to focus on two principal themes: congregation size and visibility, and visual perspectives; and these themes can be broken down into three main questions:

How many people could have sat on the wall benches in the medieval crypt?

How many people could have attended a baptism in the crypt?

How would different font podium arrangements affect visibility and visual communication in the room?

It is however important to take into account that a virtual interpretation is the result of the combination of fragmented information, and for this reason it cannot represent an exact replica of the historical environment. It can however shed some light on whether a particular scenario is plausible or not (Baracchini *et al.* 2004; Forte *et al.* 2010).

Acquisition and 3D modelling

The reconstruction of the diachronic sequence characterising relations between different materials, shaping the actual aspect of historical structures, has always been considered of critical importance in historical archaeological studies. The contemporary remains of ancient buildings represent only the end of a transformation process, and the investigation of why and how this metamorphosis took place is often the result of different research approaches and methods.

In the last decade the exponential employment of visual technology has allowed the development of new research methodologies, which are able to describe and investigate with high precision and detailed accuracy the geometrical features characterising historical architecture. Specifically, tools such as a laser scanner or image-based modelling techniques allow the virtual simulation of historical interpretations of the past and open up new research questions and perspectives (Yastikli 2007).

Acquisition campaign

During a master course in digital archaeology organised by the Department of Archaeology and Ancient History at Lund University, the indoor environments of the church of Dalby were partially recorded in three dimensions combining different typologies of digital acquisition techniques. The digital acquisition was performed to teach the students how to execute a 3D acquisition campaign of an ancient building for the documentation, study and analysis of archaeological structures. Due to the complexity of the building, the documentation campaign was performed using different acquisition techniques. The environments of the church were acquired using laser scanner technology, while the architectonical features were documented using image-based modelling techniques. Once acquired, the data were processed to create a virtual simulation of the space with the aim of visualising an environment that does not exist any longer.

Laser scanner campaign

After an analysis of the building we started the acquisition from the crypt and then extended the campaign to the rest of the church. The campaign was performed using a Faro 3D scanner. This instrument is a high-speed terrestrial laser scanner that allows acquiring in few minutes detailed and accurate clouds of dense points. This technology measures 976,000 points per second and provides a 360-degree description of the surrounding environment in a range of 0.6m/120m.

In order to obtain a complete geometrical description of the spaces, the building and its geometrical features was studied with the aim to plan a sufficient number of scan positions for a full documentation of the environments. Because of the geometrical characteristics of the building we did not employ any markers for the automatic alignment of clouds of points, but instead we decided to postpone this operation during post-processing activities. Historical buildings are often characterised by complex geometrical features such as architectonical decorations or structural components, that in order to be studied need to be acquired to a sufficient resolution and then aligned into the same virtual space. Unfortunately, the management of high-resolution data is not an easy task, and often it is necessary to plan the acquisition campaign to acquire different geometries at different levels of detail.

To conduct such an operation it is important to have good archaeological and historical knowledge of the monument in order to establish which parts of the building require higher resolution and which elements can be represented with a lower number of points. Despite the possibility to use the instrument to its maximum capacity, for the acquisition of the crypt we decided to lower the resolution of every single scan to an average of 7.000.000 points (one-fourth of

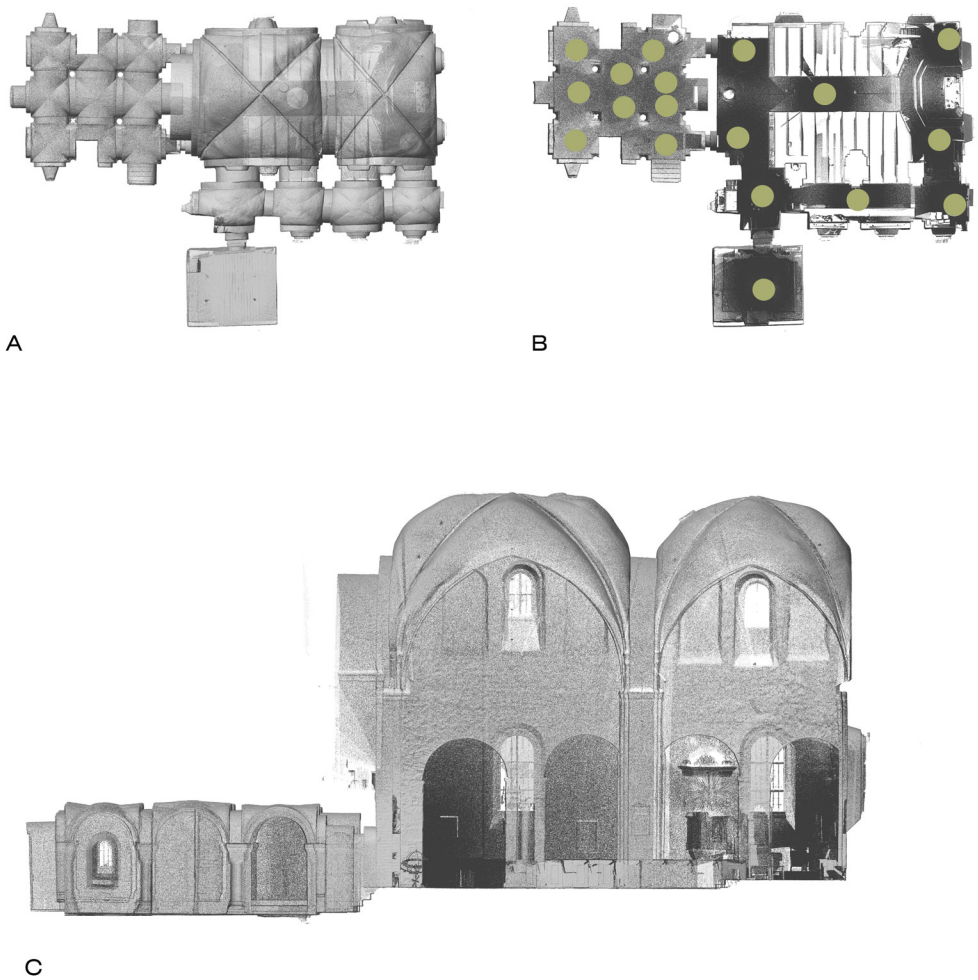

Figure 2.4. A) Orthographic top view of the interior of the church; B) Top view of the cloud of points with the position of the scans (in green); C) Section of the virtual model of the church (Rendering and digital models Nicoló Dell'Unto 2013).

the maximum resolution possible as declared by the company that produces the instrument).

By the end of the campaign we had acquired a total of 18 scans – 9 for the crypt and 9 for the main body of the church. Due to the fact that our main focus originally was the acquisition of the crypt, we used the same number of scan positions for two environments of different sizes (crypt and church body). When completed, we tried to get a sufficient number of scans from the main body of the church in order to create a model able to show and highlight the relations among

the different parts of the building. Even though the scanner allows recording colours, we decided not to use this information to simulate the original aspect of the crypt since the lack of light inside the building did not allow us to record a sufficient quality of information to be employed in our simulation (Figure 2.4).

Image-based modelling techniques

We decided to use image-based modelling techniques for the acquisition of all the architectonical elements that would have been difficult or impossible to acquire with a laser scanner. The use of this method allows generating 3D models

Figure 2.5. 3D models of the baptismal font of Dalby using image-based modelling techniques: A) Top view; B) Front view; C) View of the font with the colour projection; D) Decoration detail (Rendering and digital models Nicoló Dell'Unto 2013).

starting from a set of unordered images. This method is based on the combination of algorithms of *structure from motion* (SFM) and *multi-view stereo reconstruction* to build an accurate 3D model of a scene starting from an uncalibrated set of images. The software extracts and matches common features between each pair of images, estimating the camera parameters associated with each picture and calculating their corresponding positions and orientations in space. Then, using the pre-estimated camera parameters, a detailed model of the scene is created (Verhoeven 2011; Verhoeven *et al.* 2012).

This technique was used to acquire the medieval font of Dalby. Even if the scanner probably would have provided a more accurate description of the geometry, the use of such technology would have been extremely time consuming in this context; in fact, a large number of scanning positions would have been necessary to obtain a complete description of the font. Instead the use of digital images to produce the 3D model allowed recording of the object within a few minutes.

Post-processing and model construction

Once acquired, the data was elaborated following different workflows. The cloud of points recorded by the laser scanner was completely processed using MeshLab, which is an advanced 3D mesh processing software system oriented to the management and processing of unstructured large meshes. This software provides a set of tools for editing, cleaning, healing, inspecting, rendering and converting these kinds of meshes. Once acquired, the clouds of points were cleaned and aligned together in one project file in order to be processed as one single mesh. Despite the efficiency of the instrument in acquiring the data in a very short time, the post-processing was very time consuming, and the final result was the production of several models at different resolutions of the internal environments of the church. The post-processing of the images acquired for the generation of the 3D model of the medieval font was instead completely developed using Photoscan, Agisoft. The use of this product allowed us to easily and quickly process large sets of images in a very short time. Using this technique resulted in the creation of several virtual replicas of the font at different resolutions (Figure 2.5).

In order to build a new 3D model of the medieval crypt, we created a library of virtual architectonical elements to simulate the space as it could have been constructed originally. Although the crypt is a fairly well-preserved example of twelfth-century architecture, some alterations were done after this period. The northern portal is now closed off, and this was probably done at a fairly early stage. In the reconstruction (Figure 2.6), the portal has been reopened, and the stair arrangement from the south side has been copied. There are also two large rectangular supporting pillars in the middle of the northern and

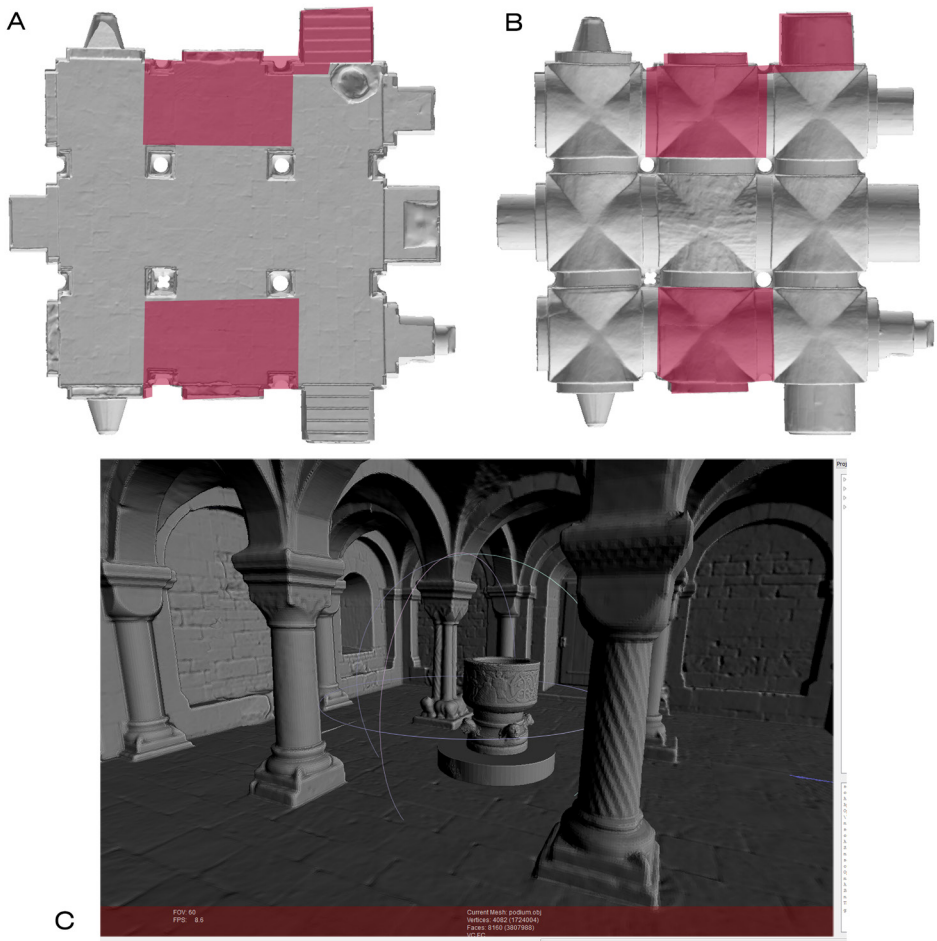

Figure 2.6. Virtual model of the interpretation of the crypt during the 12th century: A) Plan of the crypt – in red the modified area; B) Plan of the ceiling of the crypt – in red the modified area; C) Rendering of the virtual interpretation of the crypt with the font located in the centre (Rendering and digital models Nicoló Dell'Unto 2013).

southern walls. These pillars were added in the middle of the 13th century when the upper part of the tower was rebuilt (Cinthio 1992:7f). They have therefore also been digitally subtracted from the reconstruction.

Rebuilding the medieval crypt

Once the environment was reconstructed, we decided to virtually place the medieval font in the centre of the crypt. Performing such an operation in a virtual environment was easy by merging the two elements (crypt and font). The font is a large and heavy object that would have needed a firm surface to

stand on, especially because about a hundred litres of water periodically would be emptied out into the floor below. Unfortunately, no proper archaeological excavations have been carried out inside the crypt, so we have no leads regarding the foundation beneath the font in Dalby. A reasonable supposition is, however, that the font would have stood on some kind of sturdy base, either a simple stone slab at floor level or an elevated podium.

Podiums for baptismal fonts have been documented archaeologically in a number of churches in Denmark, Norway and Sweden. On the Swedish island of Gotland several font podiums, plinths and stone slabs have been preserved. The podiums are generally circular and have one or two steps. The older podiums (from the first half of the 13th century) seem predominantly to have had one step, whereas the younger ones (from the middle of the 13th century) have two (Fåhraeus 1974:83, 172f). In England late medieval font podiums could have had up to five or six steps (Solhaug 2000:58). In many other parts of Sweden Romanesque font podiums with one or two steps have been discovered. At Götene in Västergötland, for example, a two-step podium from an early twelfth-century church has been uncovered (Dahlberg 1998:233f, 272). In Denmark several podiums from the 12th and early 13th centuries with either one or two steps are known. These podiums have been circular or semicircular, and in some cases there is even evidence for an elevated walkway between the font podium and the chancel (Hansen 1995; Olsen 1967:252ff).

In view of this we have chosen to reconstruct the font podium in Dalby as a circular structure with one step. Even if early two-step podiums are known, the unusual height of the Dalby font makes it less likely that such an arrangement would have been present here. The circular form is selected because it seems to have been the most prevalent, and it is also in accordance with the shape of the font itself. We have chosen a step height of 20–22cm, a height that has been confirmed in some Danish churches (Olsen 1967:253). The breadth of the podium is more difficult to assess, since the material gives only few and sometimes contradictory clues, and is of course ultimately dependent on the size of the font. Some podiums appear to have been designed with ample space around the font, while others seem be very narrow. In this reconstruction we have decided on a width of 1.4m. This would give the priest a reasonable amount of working space around the font.

The placement of the font is of central importance both regarding how the environment was perceived visually and in terms of functionality. We therefore wanted to test what implications the two possibilities would have had for the perception of the room: the baptismal font placed directly on the floor and the font placed on a podium.

An experiment of virtual time travel

Once rebuilt, the crypt was used as a platform where different historical events could be simulated. Specifically we wanted to gauge the approximate number of people in the crypt during different occasions such as a baptism or a community meeting. To run this experiment we imported the model of the crypt – complete with podium and font – inside 3DStudio Max. This instrument belongs to the family of 3D modelling software and allows building characters and animations. Since the goal of this experiment was an approximate estimation of how the crypt could have been used during the Middle Ages, we decided to use virtual characters (Paliou *et al.* 2014) with a height of 1.7m without any specific characterisation.

In the first scenario we simulated how many people could sit on the stone benches of the virtual crypt. To run this test we performed several recreations with the aim of having a general estimation of the functionality of the reconstructed space during specific events. Originally the crypt had 6 stone benches that – according to our simulation – had a maximum capacity to host 4 people each, giving a total of 24 seating places. However, without wooden furniture it is reasonable that each bench in the crypt was used only by two people in order to leave enough space for books and documents. This suggests an ideal situation of 12 seating places, one for each canon (Figure 2.7A).

Another simulation was run to achieve a general understanding of the visual perception of the rebuilt space during specific events. This second part of the modelling was performed by placing virtual cameras on top of the head of the characters sitting on the benches. This was done both with the font placed on a podium and placed directly on the floor. This allowed us to notice that if the font was placed on a podium in the centre of the room, it would have disturbed the visual connection between the opposing sides of benches and prevented any direct dialogue between the people sitting there (Figure 2.7B). However, if the font was placed directly on the floor, this problem was solved. This placement meant that top of the font was lowered, allowing a direct visual connection between the two sides (Figure 2.7C).

In the second scenario we tried to estimate the number of people able to follow a baptism in the crypt. Also in this case we conducted the procedure both with a font podium and without. In the first case the priest was placed on top of a podium, and the people were distributed in the spaces along the three sides of the central vault of the crypt. The eastern area of the crypt (the space between the altar and the font) was left empty. Virtual cameras were placed on top of the heads of several characters in order to understand what the limits were (in terms of the visibility) inside the crypt during the event. The simulation showed that in these specific conditions, an approximate number of 50–60 people would have had the possibility to visually follow the actions of the priest standing on top of the podium. In the

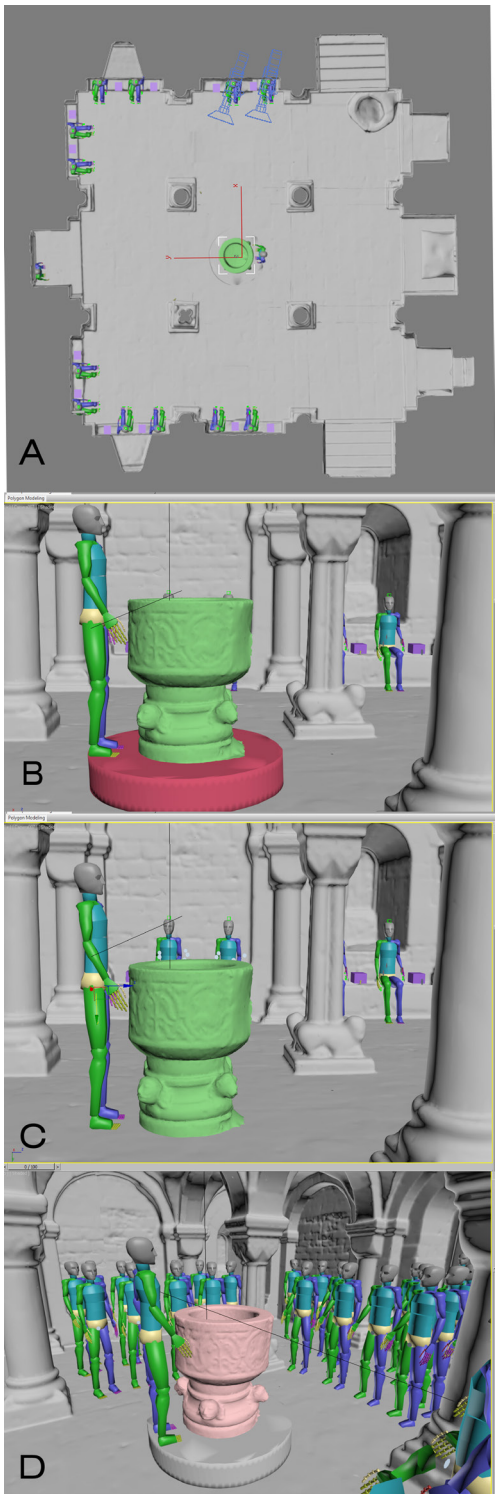

Figure 2.7: Simulation of the space functionality using virtual characters: A) The distribution of the characters on the benches; B) The font on top of the podium from the point of view of a virtual character sitting on the reconstruct east bench; C) The font without podium from the point of view of a virtual character sitting on the reconstruct east bench; D) Rendering in perspective view of the Crypt during the hypothetical celebration of the baptism (Rendering and digital models Nicoló Dell'Unto 2013).

second case the font and the priest were placed directly on the floor, which meant that both were approximately 20cm lower. It became obvious that this would have had a significant impact on the number of people having visual access to the event. Now only about 30–40 people would have had a good view of the priest performing the baptism (Figure 2.7D).

Conclusion

Time travel using digital visualisation is often perceived as a popular tool in mediating the past. In this case study we attempt to demonstrate that 3D methodologies may also be a useful instrument for addressing research questions. In the case study of Dalby, new technologies allowed us to recreate a medieval space, to edit out later changes, and to refurnish it with a baptismal font. The experiments hitherto conducted have explored questions regarding the placement of the font and how different people might have perceived the room.

It became evident that the use of a podium to elevate the font would have significantly changed the perception of the space inside the crypt. In the first scenario it was demonstrated that a podium would have represented an obstacle in terms of visual communication, and in the second scenario it was clear that the use of a podium would have increased the number of people that could have followed the baptism. This is an interesting result since it has further implications for the interpretation of the overall function of the room. And as the church of Dalby at present is planning to recreate the crypt as a baptismal chapel, these simulations may actually one day be transformed into reality.

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