

Reconstructing a historical temporary structure : Henry VIII's Pop-up-Palace

Using a 3D engine to recreate the temporary palace from the field of cloth of Gold 1520

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Abstract—Historic Royal Palaces (England) approached the University of Derby to re-create the temporary structure of Henry VIII pop-up-palace from Field of Cloth of Gold meeting in 1520 for a new exhibition. The sources of evidence for this were a painting (contemporary to the time), several chronicle manifests regarding building materials and first hand written accounts. Using these sources the most appropriate scale design and formation of the structure was theorized and a 3D model and animation created for exhibition. This project has the potential to progress further to use this design process to not only look at the outer structure of the temporary palace, but also to look at the interior areas and even further into the interior design and colours used by doing further research and resource collation.

Keywords—*in-tangible; heritage; field of cloth of Gold; temporary ; Royal Palaces ; games technology.*

I. INTRODUCTION

There is often a wealth of information available in museums, records and online about historical events, buildings and artefacts, but what if there are only a few remaining resources? What can be used to further knowledge, and engage them with the subject matter for such a unique historical event? This study looks at recreating a temporary palace erected by King Henry VIII at the meeting known as "The Field of Cloth of Gold" (1520) using 3D games technologies. With very little resources available on this building including some first-hand accounts, academic research and very few images, a 3D representation will allow for new perspectives to be viewed. This reconstruction will also be the first representation to collate all available resources into a single piece of research and create a model that displays all of these aspects.

II. METHODOLOGY

A. The historical event and designing the palace

The first step in recreating this grand palace is to gather the few available sources and compile them into a final design for the palace. In order to ensure full accuracy in the recreation it is important to be aware of potential bias and issues with sources. For primary sources, such as first-hand accounts, it is important to look at who wrote or created the piece, when it was made and why. Other aspects such as the intended audience and other information surrounding the document are also important to take into consideration.

B. Resources

The Field of Cloth of Gold took place on a site in Balinghem from June 7th to June 24th 1520. The meeting was arranged between King Henry VIII of England and King Francis I of France in an effort to end the bitter conflict between France and England and strengthen friendship between the two countries. Although no expense was spared to impress either monarch, the meeting did not end with a treaty or agreement. To get a better description of the event and create a better idea of what the temporary structures would have looked like for design purposes, first-hand accounts and historical records were examined. Halls Chronicle [1] describes the Kings arriving: "*Wednesdaie the. xiii. dale of June, the twoo hardie kynges armed at all peces, entered into the feld right nobly appareled, the French kyng and ail his parteners of chalenge were arraied in purple sattin, broched with golde and purple veluet embrodered with litle rolles of white satin...*". This gives us a good idea of the luxury of the event and what kind rich materials were used and available. This chronicle also gives us a confirmation of the date of the event and details about what occurred during the event which would be useful for further investigations and cross-referencing



Figure 1. Painting by Edward Edwards c.1545

[Fig. 1] shows one of the main images associated with the Field of Cloth of Gold meeting. This is an oil painting by Edward Edwards from 1545 [2] and shows a number of key events from the meeting. The monarchs can be seen wrestling in a tent made of gold in the centre of the image, the royal procession can be seen arriving on the left and King Henry's palace is shown in all its glory. This painting has been the subject of previous papers, one of which by Sydney Anglo, [3] determined the accuracy of this painting. This is crucial for this

study as it allows us to take details from this painting for creating a 3D graphical representation without fearing that the source material is unrealistic. During Tudor times, paintings were less about creating art as they were about recording events and this painting is a fine example of this.

Returning to the historical event, at the site of the meeting, extravagant tents were erected for the monarchs and their accompaniment. These provided temporary housing and sites for banquets, revels and jousts. Most of the tents were composed of similar materials and cloths meaning tailors were a key element in the process [4]. Heavyweight linen canvas was mainly used to create the base for each tent. This can be seen by looking at the inventory of Richard Gibson, a merchant tailor, who acquired “20 fardels (bundles) of Vitry canvas” for tent repairs alone [5]. Tents could be made from either a single or double layer of this canvas. This may well be more appropriate for Henry VIII’s palace in the Field of Cloth of Gold meeting. Other areas of the tent were also reinforced, right down to the eyelets which were “reinforced with leather, usually calf or neat’s skin.” [6]

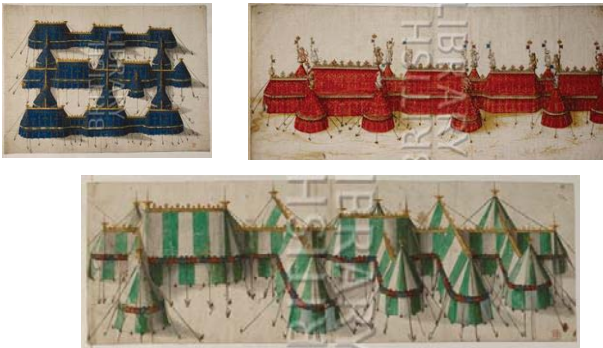


Figure 2. Tent designs contemporary to the time

The temporary palace for King Henry was made from timber, brick and waxed canvas. Although little exists on the actual palace from the meeting of The Field of Cloth of Gold, there is reference to a temporary banqueting house at Calais which may be the same structure. Even if it is referencing a different structure we can deduce that the structure at the Balinghem meeting is similar in style. In Halls Chronicle [1] it is stated that “for solas was builded a banqueting house, 80 foote round...builded upon Mastes of shippes”. The Chronicle also refers to the use of “blacke Veluet covered with cloth of gold...knottes of gold...spangles of gold like tuftes...clothe of crimosyn Satten...”¹ This description gives us a better idea of how such a large structure would be supported. We can deduce that the main support beams appear to be made from ships masts and the outer walls from velvet and satin.

C. Scale

By gathering all these resources, a design for the temporary structure can start to be constructed. One of the first things to establish is the overall size of the building. Even at this early stage there are discrepancies between sources. Halls Chronicle has this to say about the scale of the palace; “the palays was quadrant, and every quadrant of the same palays was 328 foote longe of a syse, which was in compasse 1,300 and 12

foote aboute. This palayce was sette on stages by great connyng and sumptuous woorke.” [1] Deciphering this can lead us to conclude that each side of the palace was 328 foot long and 12 foot high. Another source of scale for the structure can be based off of the painting by Edward Edwards. By looking at the size of sections in the image a rough estimate can be made which can be combined with the other written resources to make a more accurate design. Using the information from Hall’s Chronicle which states that the brick wall sections of the palace are 2 metres high, we can use this 2 metre “ruler” to estimate the overall height of the walls. This comes out at 12 metres. However if we use this estimation method for the length of one quadrant of the palace, we only get a length of around 12m again. These measurements can be seen in [Fig.3]. This does not correspond with Halls Chronicle as this states that each side of quadrant was 328 foot long (approximately 100m). Either Halls Chronicle is vastly over exaggerating or the painting is vastly underestimating the length of the structure. In addition, when looking at the height of the building, an excerpt of text from Glenn Richardson’s “The Field of Cloth of Gold” [7] states the walls reached to a height of 9.14m. Combined this with the 2.5m height of the brickwork base from the same writing gives us an overall height of around 12 metres.



Figure 3. Deducing the size of the Palace

In order to get a better idea of which is a more appropriate scaling we can again use deduction methods. By looking at similar Tudor style palaces we can get an idea of the scale of these buildings. The King would not want to stay in a residence that was vastly smaller than what he was accustomed to. This temporary palace was also a symbol of power and status so having a smaller structure than the French king would not have worked well for Henry. Obviously a temporary structure would not be the whole size of an entire brick-built palace meaning one of these courts may be an ideal size for the large tent used in the Field of Cloth of Gold. The measurements also align with the estimates given in Halls Chronicle if we take the 110x95m court. Other similar Tudor styled palaces include St James Palace with a picture gallery 130ft in length and Hatfield house with a long gallery of 170ft.

With various measurements from similar palaces, we can deduce that the correct length of the temporary palace was indeed the 100 x 100 metre length written in Halls Chronicle.

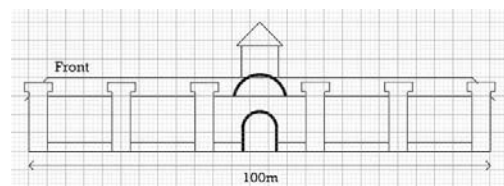


Figure 4. finalised size of the palace

D. Design Aspects

After deducting the scale of the temporary palace, the next step is to work on the overall aesthetic design and architecture of the building. Information stated in Halls Chronicle describes the palace as being built on a brick base. This base is the only solid part of the structure and the rest is cloth, canvas and timber frames, painted to look like stone or brick. [Fig 4] shows an overall design for the building as a whole. As the structure was a square, the front and side views will be practically identical with slight differences in numbers of windows or archways.

Most of the structure is made from wood with the main areas needing support being the windows and the actual wooden framework would need support to stay erected. The brick base around the bottom would easily support the main framework with bricks being laid around the posts as they were erected. This brick base was also used to stop the wood from touching the damp ground and rotting. One of the more interesting areas of the structure is the window sections. These were made from high-quality glass with a lead frame [7] which would have amassed to quite a large weight. In order to support these, more wooden beams would have needed to be inserted to support them. This is where more deduction is needed. By looking at other Tudor buildings and their use of wood frames, a better understanding of building construction of the time can be gained.

The majority of Tudor housing used oak wooden frames with wattle and daub or brick to fill in. This was more common in the lower classes with the nobility favouring brick built houses with expensive glass and decoration, however in this particular case, a temporary structure, brick would have taken too long to lay and meant the palace could not be removed after use, hence the use of a wooden framed tent. The following illustration of timber framing from "Lexikon der gesamten Technik", an encyclopaedia of architecture by Otto Leuger, published in 1894, shows a number of ways that timber frames could be constructed. [8]

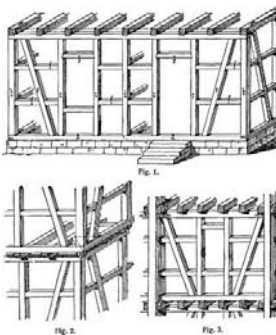


Figure 5

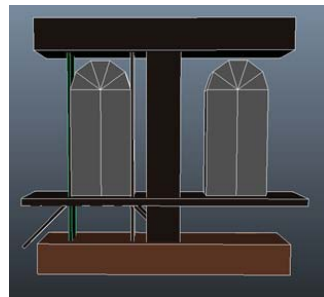


Figure 6

In order to get the best support for heavy glass windows, the weight should be evenly distributed. Simply having the window sit on top of one wooden beam would risk the beam snapping so adding these support beams in lowers this risk.

[Fig.6] shows the original plan for window support (right hand side) and the resulting block-out frame (left hand side) after further consideration.

After the construction of the brick base and the wooden framework, the next area to be constructed would be the fabric walls. This could either have been attached to the frame as it was constructed or rolled down over the top of the framework when it was complete. With either method, consideration is needed as to how this fabric would be attached to the frame itself. By returning to the information gathered in Maria Hayward's Temporary Magnificence [4], we can see that eyelets were used throughout tent construction. This may be a good explanation for how the fabric was positioned around the timber framework. If small eyelets were attached to the edges of the fabric, reinforced with leather and then attached to small hooks built into the oak beams themselves, this would keep the fabric from moving too much or even coming away from the structure all together. [Fig.7] shows a quick mock-up of how this could have looked.

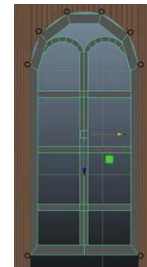


Figure 7 Window design with eyelets

E. Prefabrication

With all of this new construction design information it is also important to think about how the palace would have been constructed on the site itself. It seems reasonable to assume that parts of the palace were pre-made before being sent to the meeting place ahead of time as a building of this size would have taken a long time to construct. This partial prefabrication was used for other buildings of the time, for example, Westminster Hall's great ceiling was made off site then transported via carts to the location for assembly. By looking at how the palace was being constructed and transported, this will help with the animation of the final building model at the end of this process as it can be used to help understand the order that pieces would be laid down.



Figure 8. The completed basic structure

III. CONCLUSIONS

[Fig 9] shows a render of the final palace model using Unreal 4. The decision to import into Unreal 4 for this final image was made in order to get some realistic looking lighting implemented quickly and easily. It also demonstrates that the model can be used in various game engines and other rendering packages. This is good as it displays how this method can be applied to other projects that may want to construct temporary structures in 3D.

The model complies with all of the guidelines set out in the modelling and texture process and uses all the gathered research to create a model that is historically accurate.

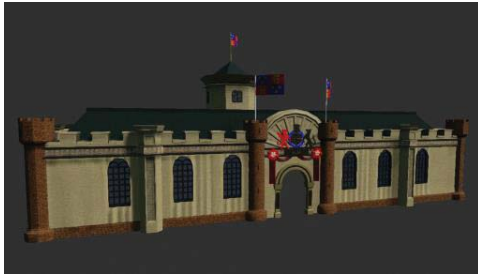
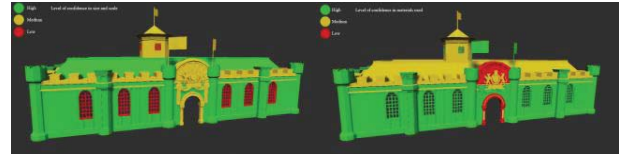


Figure 9

The main problem with this project came from the lack of sources and information surrounding the palace itself. A large amount of time was spent collecting and collating resources to create an overall image of the palace. This was one of the main reasons the interior area is not present in the final model. With more time an interior section could be added to the model but for the purpose of this investigation, simply having the exterior complete showing the structure of the timber frame gives enough detail to collect results from. Another study on this building may look at recreating the interior of the structure as data exists on the design of the four inner courtyards. This may well be a project in itself due to time, file sizes and program memory usage being too great if combined with the processing power needed for rendering and animating the exterior section as well.

To expand on this particular project would be hard unless taking other areas of the structure. This is due to the fact that new information about the Field of Cloth of Gold meeting will be hard to come by. As the structure was temporary, pieces cannot be continually excavated like a traditional site such as a castle and the only real information on the building is listed in Chronicles from the time.

Overall this project has achieved what it set out to do. A 3D reconstruction and animation has been created that has been shown to provide knowledge, create interest and can be applied to other buildings or digital artifacts.



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