The 3D Scanning of the Mantua Ark

Moshe Caine
Hadassah Academic College
Hanevi'im 74, Jerusalem, Israel
mosheca@hadassah.ac.il

Andreina Contessa
Nahon Museum of Italian Jewish Art
Hillel Street 27, Jerusalem, Israel
contessa.a@italianjewishmuseum.org

Zvi Grinberg
Caliber Engineering and Computers Ltd
P.O. box 3230, Herzliya 46131, Israel
zvi@caliber.co.il

1. INTRODUCTION

With the growing accessibility and technological advancements in the field of 3D imaging, its use in the scope of cultural heritage conservation is becoming more popular and diverse. Nevertheless, 3D representation of heritage artefacts is often still a daunting task.

This paper describes the background, rationale and technical challenges involved in the creation of an interactive 3D online/offline display of the Mantua Synagogue Ark. This extraordinary wooden Ark, decorated with original delicate gild carvings, is one of the oldest Holy Arks in the world and an outstanding representative of Italian Renaissance furniture. It is the most important testimony of the history of the Mantuan Jewish Community in the Renaissance period, whose treasure was lost and dispersed.

2. TECHNOLOGY

Despite the great advances in 3D imaging, certain things have not changed and several barriers remain, nearly irrespective of the technique used. These barriers include amongst others:

- Line of Sight
- Shiny surface Textures
- Large Objects at High Resolution.

The scanning of the Mantua Ark involved all the above difficulties.

- The topography of the ark is extremely complex, presenting multiple occlusions.
- The Ark is coated in gold leaf which is smooth and shiny.
- The texture is very symmetrical and the pattern repetitive, complicating the aligning and blending of the multiple scans.
- The size of the Ark, especially its height (over 3 meters) made the scanning process very difficult indeed.

In all, 78 separate scans were made of the Ark with a hand held Artec Eva scanner. The final scan before reduction yielded a total count of 17.8 Million polygons which, while finely detailed proved impractical from a processing point of view. The scan was therefore decimated proportionally. For display purposes and UV mapping considerations, the file was exported as an OBJ file which weighed in at just over 400 MB and contained nearly 7.4 million faces.

Post-processing included:

- Fine tuning and mesh corrections.
- Addition of a back wall and floor
- Further decimations. The final file size came to 112 MB, comprised of the OBJ file at 73 MB and UV Texture maps at 39 MB. The polygon mesh was comprised of 721,000 faces.
- Image processing of the Texture map as well as colour correction.

3. THE INTERACTIVE DISPLAY

For the web display, online hosting on the *Sketchfab* web service was chosen. This provided excellent control over the display parameters such as size, lighting, background, compression and streaming. For the kiosk display, the Adobe Acrobat 3D PDF format was chosen. Through the use of Java, interactivity could be greatly extended and enhanced to include interactive buttons, hotspots, embedded text, etc.

4. REFERENCES

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Nahon Museum (n.d.) *Holy Ark from Mantua-Sermide, Mantua, 1543*. <http://ijamuseum.org/holy-ark-from-mantua-sermide-mantua-1543/> (retrieved 21 February 2015).

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Figure 1: The Mantua Ark

Figure 3: Decimation. Detail.

Figure 4: Interactive Web display with hotspots

Figure 2: The scanning process