

Participatory co-creation of a public sculpture incorporating 3D digital technologies

Karina Rodriguez Echavarria¹, Karin Janzon² and Jonathan Wright

¹Centre for Secure, Intelligent and Usable Systems,
University of Brighton, UK
²Hove Civic Society,



Figure 1: Co-created artwork *Constellation*, by Jonathan Wright on the Hove Plinth, Brighton & Hove, UK. ©Tony Mould My Brighton and Hove.

Abstract

This paper presents a interdisciplinary project between artists, civic groups, heritage organisations, technical experts and communities to co-create a piece of artwork for the community. Constellation is the name of the sculpture, and Jonathan Wright, its creator, used a co-creation approach to develop both the design and fabrication of the artwork. To be installed in the Hove Plinth in Brighton & Hove (UK) and commissioned by the Hove Civic Society, this sculpture was envisaged as a celebration of the community's heritage. As such, the mechanical model was designed as a solar system and instead of planets, the most iconic heritage objects in the city were selected to orbit the system. In collaboration with communities, the artist selected these icons which were later 3D scanned in collaboration with technical experts and local heritage organisations. The icons were then manufactured using digital fabrication technologies, and installed in the sculpture. The inauguration of Constellation took place in April 2018 with very good reception from the public. Hence, this paper illustrates the advantages of co-creative approaches which incorporate digital technologies into their workflow.

CCS Concepts

•Computing methodologies → Mesh models;

1. Introduction

Nowadays, the combination of co-creation approaches and digital technologies allow for more participatory experiences. This is be-

cause a variety of communities can get involved to co-produce interpretations of heritage which represent a mixture of views. This paper describes a project in the city of Brighton & Hove in the UK which experimented with a co-creation approach for the develop-

ment of a public sculpture incorporating 3D digital technologies. The project was done by an interdisciplinary group of artists, civic groups, heritage organisations, technical experts and communities.

Hove Civic Society developed the Hove Plinth community project in 2017. This cultural attraction on the Hove seafront was partially crowd-funded to bring public art to the city and showcase a changing programme of the best in modern day sculpture. The idea is that major artworks will stay on the plinth for up to 18 months, after which some will be moved to permanent sites in the city. The inaugural sculpture was selected from a national call to artists which received 70 submissions. A key consideration for the first commission was that the proposal should respond creatively to the criteria of 'helping to reinforce a sense of place and identity'.

Constellation, by Jonathan Wright, was selected as the first sculpture to be displayed on the Hove Plinth. This artwork was envisaged as a celebration of the community's heritage. As such, Wright designed a mechanical model of the solar system. Instead of planets, the model was designed to feature the most iconic heritage objects in the city orbiting the system.

The selection of the icons to populate the sculpture was done involving different communities in the city. In addition, local heritage organisations and experts in 3D digitisation and digital fabrication technologies collaborated with the artist to co-create the artwork.

The following subsections will describe the process to design and create the artwork. As such, section 2 describes the engagement with communities to collect ideas of the most iconic objects in the city. Section 3 describes the digitisation process of the selected objects. Then, section 4 presents the fabrication of the objects using digital fabrication technologies. Finally, section 5 presents conclusions and further work.

2. Design of the artwork using a participatory approach

In order to select the most iconic objects in the city, a participatory-based approach was used. These approaches can be used for co-designing assets and/or heritage experiences [AM16, LZKN17], which can contain digital and/or physical elements, with the aim to incorporate a more heterogeneous view of the people's interpretations of a place's heritage.

As such, local residents and civic groups were involved in order to identify and select a set of iconic objects. This was done through six half-day public workshops.

The objective of the public workshops was twofold. One objective was to make a relevant selection of objects for the sculpture. The second is more expansive, the workshops were used to evidence an evolutionary process in which the artwork becomes part of the 'urban grain', or a point of reference that means many things to many people.

The public workshops took place in September and October of 2017 in the Brighton & Hove local museums. The workshops were facilitated by the artist. They were also attended by an expert overseeing the digitisation of the icons as well as a professional photographer who documented the process.

People who came to the workshop brought with them images,

photographs, stories and other material which represented historic or present locations, objects and ideas. Anecdotally, participants had in common that many of them had lived in Hove for a considerable amount of time and had strong memories of different locations. As shown in Figure 2, the workshops involved exchange of ideas amongst the participants based on the visual heritage material.



Figure 2: Participatory workshops for the design of the sculpture. ©Matt Rowe

After the workshops, a selection of icons was made along with visual material, including images and objects brought by the public. From this short-list, a final list of icons was compiled. These icons were a mixture of place, people, objects and activities, including:

- | | |
|-------------------------------|---------------------------|
| 1. Queen Victoria | 6. Cricket |
| 2. Hove Seafront | 7. Skateboarding |
| 3. Cinema heritage | 8. Ship in the Hove crest |
| 4. Elm trees | 9. Amber cup |
| 5. West Blatchington windmill | 10. Wind turbine |

After selecting the icons, the next step was to identify objects for each item. For some of the locations, such as the seafront (item 2), two particular elements were selected to represent them: a seagull and a beach hut.

Moreover, the local museums contributed various of the objects of their collections as representative of specific persons and activities (see Figure 3). For instance, artefacts from the fine arts collection, including a bust of Queen Victoria (item 1) and a cricketer (item 6) were selected. Other artefacts from the archaeological collection were selected, including the amber cup (item 9), which is a significant archaeological find in Hove. For the cinema heritage item (item 3), a special effects cinema camera from the cinematography collection was selected.

Moreover, to represent the activity of skateboarding (item 7), the artist selected a skateboarder who regularly skates at the seafront. Some of the objects brought by the public were considered, such as a miniature model of the West Blatchington windmill (item 5) and a wind turbine (item 10).

Finally, as illustrated in Figure 4, a physical representation of the Ship in the Hove Crest (item 8) was modelled; along with an elm tree (item 4) and a beach hut (item 2). For this, the physical models

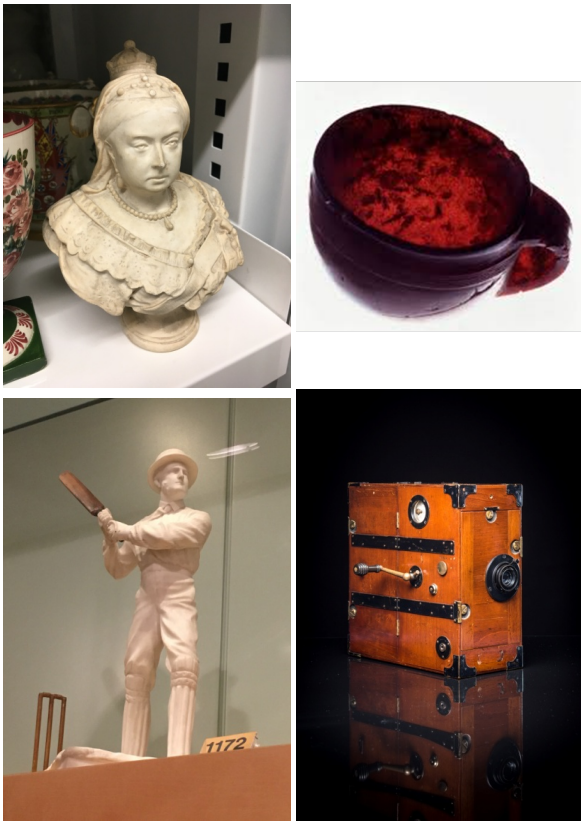


Figure 3: From top left to bottom right: bust of Queen Victoria, amber cup, batsman cricketer, special effects cine camera ©Royal Pavilion & Museums, Brighton & Hove

were carved and modelled in a soft material. A miniature model of a seagull was also used (item 2).



Figure 4: Crest ship on panel and physical 3D model

3. 3D digitisation of selected Hove icons

Once the objects for digitisation were selected, the next step was to create a digital model for each of them. Due to the variety of materials presented by the objects, different scanning techniques had to be employed. Most objects were 3D scanned using a structured light scanner, the AICON SmartScan (see Figure-5). The skateboarder was 3D scanned using a body 3D scanner.

Museum's artefacts were scanned at their facilities. Usually, each item was done in between 2 or 3 hours. The most challenging item to 3D scan was the special effects cine camera (see Figure-5).

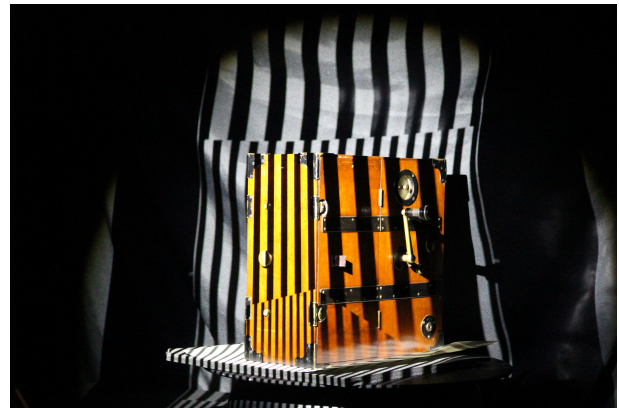


Figure 5: 3D scanning of special effects cine camera at the Brighton Museum and Art Gallery

Furthermore, a combination of 3D scanning and 3D modelling were used for various objects, including the West Blatchington windmill, the Ship in the Hove Crest and the special effects cine camera. This is either because some parts were very reflective or because they were geometrically simple (e.g. a cylinder). Hence, it was decided instead to take measurements of items, such as blades, posts, and then use 3D modelling software (e.g. 3Ds max) to combine and generate the final geometry.

The ship in the Hove crest was scanned in 2 separate sections: the ship and the sail. This process allowed to capture the majority of the items, removing some occlusions which occurred whilst the sail was in place.

The beach hut and seagull were also scanned separately. They were later joined after the objects were printed.

All 3D models were post-processed either to fix holes and missing information from the scanner, or to make modifications required by the artist. For instance, the camera required of a measured hole where Wright planned to fix an actual lens on the printed model. All models were also re-scaled to a uniform size of 1-1.2 meters.

Time for post-processing range between 1 hour to a few days. For instance, the special effects cine camera (see 3-bottom right) was the most time consuming to post process. This is because all of the information missing from the scanning process.

An interesting aspect of the project is that accuracy was not required from the scanning process. As this was considered an art project rather than a documentation project, 3D modelling software was used where information was missing from the scan to complete the mesh. For instance, repetitive geometry in the artefacts (e.g. the corner brackets in the camera) was copied to fill-in missing corners. The back of the handle was also filled-in and any transparent parts were filled with a flat plane.

Furthermore, an audio file which collects content from each icon

and provides more information to the public was also created and a web platform was created to deliver this content on a mobile on site (<http://callhove.uk>).

4. Digital fabrication of Constellation artwork

The selected icons were not produced using a traditional artistic technique. Instead the project used digital fabrication. Digitally fabrication technologies, such as 3D printing, are typically used in Cultural Heritage to create objects that refer to or depict heritage artefacts. As such, this domain has proved to be a valuable field for interacting with heritage audiences as the interest from different organisations is drawn towards experimenting with these technologies [SRSE17].

The use of 3D printing allowed for an immediacy of realisation that is not normally associated with the sculptural process. Any form of figuration will normally involve complex mould making and specialised modelling techniques. This immediacy allowed for a much broader approach to the project as a whole.

The printing process involved post-processing each individual 3D model to break it into sections which could be individually printed. Some of these were nested into 7 or more parts. The joins were made with different methods, some had rebated edges, some dovetail joints and others a simple flat surface to flat surface.

The technology used was SLS prints in Nylon PA 2200. Each icon was then assembled with the various parts by pasting them using two part resin glue (araldite). Some strengthening was added using stainless steel threaded bar to act as an armature and provide firm fixing for the prints to the support structure, this was fixed in place in the model by using two part fast cast polyurethane resin as a cement.

Gilding was then applied to the object by traditional use of timed size varnish. Each object measured approximately 500mm in its longest dimension. Figure 6 illustrates the oak tree icon.

This modern process was then recombined with formal traditional ones, welded steel and stone plinth. The resulting sculpture on the plinth is illustrated in Figure-1. The elevation of these objects by the steel 'Orrery' structure created a new relationship between the objects and their support.

The historical significance of the Orrery connects the printed objects to the allusion that they were planets in the solar system. The gilding similarly brings the objects back into a traditional sculptural language that affects their meaning. Gilding implies that an object be venerated, it becomes more valued.

Elevated by the plinth and the Orrery structure, the whole work is framed by the sky; the audience experience being akin to star gazing. Thus the combination of old and new processes allows for the development of new orientations, new meanings prompted by the bringing together of all the elements in the artwork.

5. Conclusions

This paper has presented a collaborative project to co-create a public sculpture. It has described the process for design and fabrication of the *Constellation* sculpture.



Figure 6: 3D printed and gilded oak tree icon

The objects proposed by the public workshops did not need to be edited for formal reasons to do with the difficulty of producing them. Instead, the 3D printing process meant that the artist could consider a much wider range of subjects than is possible when only using traditional processes.

The sculpture was therefore made in a very direct response to the public input meaning that the final work was very accurate in reflecting the interests and desires of the local community.

The inauguration of *Constellation* took place in April 2018 with very good reception from the public. This illustrates the advantages of co-creative approaches which incorporate digital technologies into their workflow.

6. Acknowledgments

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