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# An art and design perspective: The development of a 3D interactive Saltaire UNESCO world Heritage site.

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## Abstract

*The aim of the short paper is to present the first stages of a unique project to develop historically accurate human characters and period clothing using art, design and architecture techniques and experience. We are designing and modelling 19th Century buildings and 3D virtual characters according to the original photographs, drawings, paintings, cloth samples, leather and other materials. The characters are programmed to interact in the 3D Saltaire environment to demonstrate life and working conditions in the 19th Century textile factory know as Salt's Mill.*

## 1. Introduction

The relation between art and technology is an inherent and essential component in the study, conservation and protection of cultural heritage. 3D laser scanning and 3D modelling packages, animations and virtual reality simulation are the main contemporary tools in the capture, visualizing and analysis of cultural heritage artefacts and sites.

Berndt, & Carlos, [BC00] characterized two main target groups in the context of experiencing cultural heritage. The first, a broad target group primarily consists of the general public, educational professionals, administrators and investors. The main focus for this group is on presentation. A second target group consists of the experts (art historians, historians, archaeologists, restorers, etc.), who are directly involved with the exploration, collection, preservation, and mediation of our cultural heritage. Our focus and background and experience fit with the first group defined.

3D interactive Saltaire UNESCO world Heritage site project is intended to build an interactive educational exhibition space for interactive play via the web and is also planned to be located on site at Saltaire. The international and UK visitors to Saltaire receive limited educational cultural or historical engagement in Saltaire.

“Saltaire has become the Mecca for thousands of visitors who spend hours trawling through the pristine streets, trying to imagine life as it was 100 years ago and the inspiration behind this extraordinary development.” [CHR09]

A synthesis of authentic accuracy, actualization and interactivity in the human experiencing of artefacts and sites is of vital importance to enable society to truly understand their heritage and to become engaged by the richness of both the physical and virtual data. Highly realistic and convincing results can be achieved, particularly if interdisciplinary collaborations between archaeologists, scientists, historians and computer graphics artists and designers are encouraged and take place in cultural heritage research projects.

This paper presents an art and design approaches focusing on the research, concept development, design and 3D visualisation of Saltaire buildings and a number of human characters. Project stages presented in the short paper are:

1. Modelling of important key buildings in Saltaire.
2. Modelling and population of 3D rigged virtual human characters.
3. Texture mapping of 3D virtual human characters with clothing and materials.

## 2. 3D interactive learning experiences

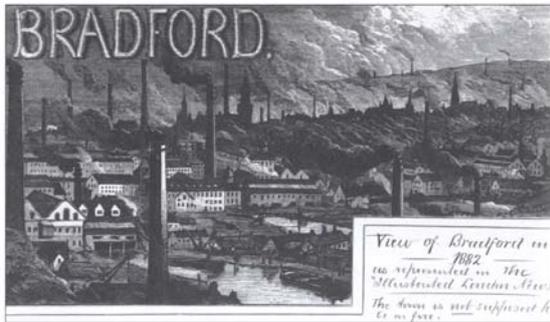
Interactive 3D Gaming is extremely popular with everyone. Online virtual worlds, shared multi-user functionality and interactive Wii-motes are embedded in our social culture as friends and families are playing and learning together through Wii, Nintendo DS, PlayStation3, Second Life and more. Museums, art galleries and heritage sites have also successfully installed multi media and audio information systems to enhance the visitor experiences. [WAIC04], [US05], [JL07]

## 3. The creation of Saltaire industrial model village

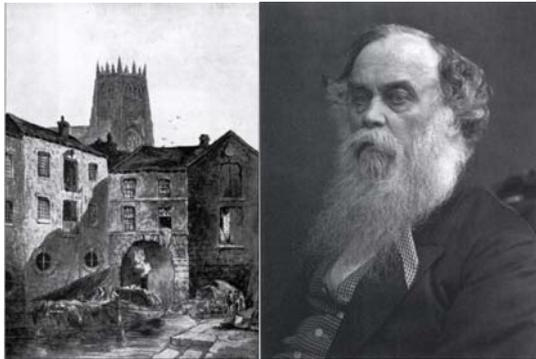
Salt's Mill was the first development built by Sir Titus Salt a 19<sup>th</sup> Yorkshire socialist, philanthropist and cloth industrialist in 1853. Titus Salt pioneered the development of innovative worsted fabric and other fine yarns from a combination of alpaca and wool. Salt owned five mills in the city of Bradford and employed thousands of workers. [FIR01]

In cities such as Bradford people were suffering the degradation of living in crowded, unhealthy streets where sanitation was poor, disease was rife, alcoholism prevailed and crime was out of control. Titus Salt had a vision inspired by other model industrial villages he had visited in Britain. He worked with local architects to design and create a model village for his workers as he was concerned about conditions in the overcrowded and polluted city of Bradford. The main mill was opened in

1853 and the village was largely completed in 1871. At Saltaire Salt had created a utopian urban village and provided his everyone on his workforce with model housing according to their status in the mill. He setup a hospital, school, churches, an institute and library, a canteen connected to the mill by an underground tunnel, almshouses, public bath and washhouse, but no public houses as he was a devout Congregationalist. [BS03]



**Figure 1:** View of industrial Bradford in 1882.



**Figure 2:** Bradford, c. 1840 **Figure2:** Titus Salt, c.1876

#### 4. Saltaire UNESCO World Heritage Site

Saltaire was awarded UNESCO United Nations educational Scientific and cultural organisation World Heritage site in 2001. The state party report in application for UNESCO inscription clearly states the unique significance of Saltaire: “The settlement of Saltaire is of outstanding universal significance in three ways. First, it encapsulates the maturing of industrial society and the industrial system. Secondly, it represents an important stage in the development of a formal land-use planning system. Thirdly, in its unified architectural style, its construction quality and its building hierarchy, it exhibits mid-Victorian society’s pre-eminence in European imperialist and technological domination, and the paternalistic, moral and practical philanthropy that was characteristic of that society. All this exists in a remarkably complete physical entity, which continues to operate as a living and working community.” [UNE01]

In 2009 the Saltaire urban plan and architectural shells of mills, meeting places, churches etc. are intact. The focus of the area is now tourism supported by intensive residential and retail culture. The mill has a permanent exhibition of the art of David Hockney as well as a range

of Hockney art themed restaurants and designer shopping outlets.



**Figure 3:** Saltaire Village aerial view. [UNE01]

#### 5. Art and design and historical research methods

A diverse range of information has been located and is being sourced and recorded from local heritage archives. Design, styling and modelling of 19th Century 3D virtual characters is supported by original photographs, drawings, paintings, cloth samples, leather and other materials. Textile machinery will be modelled from a library of glass plate negatives at University of Leeds International Textiles Archive and the Cloth workers Digital Archive, University of Huddersfield archive, the Bradford textile archive, and the Bradford Industrial Museum contain worsted sample books from the period.



**Figure 4:** Textile sourcing from local archives.

Illustrated News and the Saltaire Journals, Saltaire history club are additional sources of text based reference both locally and in context with life in the British Empire.

#### 5.1 Art and Design concept development

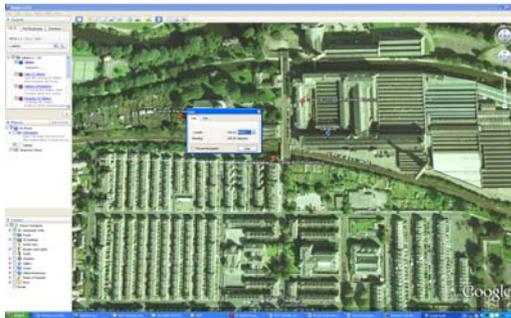
Art, design & Architecture practioners in education use a range of CG software to originate and produce 3D art and products. The team has experience in different 3D packages. Polygon based modelling in these packages is traditionally used for modelling objects, characters. Although this technique in 3D Studio Max is relatively easy and flexible with experience, however it is also time consuming therefore Poser and Quidam are also being evaluated and used.



**Figure 6:** Illustrated London News, Textile Machines

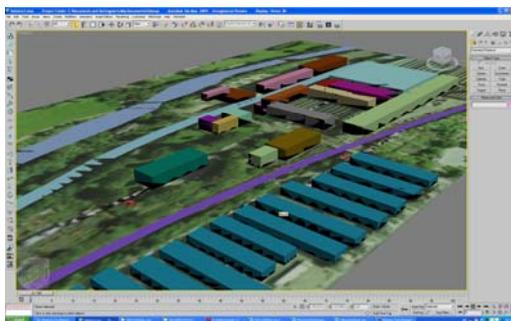
### 5.2 Plan layout and modelling of the Saltaire site

Basic modeling of the Saltaire site started with a search of plan images from Google Earth (GE). GE satellite images are the most updated visual record, as Saltaire is a grade 2 listed village, all architecture is accurately preserved.



**Figure 7:** Google Earth Saltaire site measurement

GE satellite images and tools are used to measure location and dimensions of the approximate sizes of buildings, river, canal and roads. See Figure 7. Original data from the architectural plans and pictures of individual buildings are also obtained.



**Figure 8:** Modelling of buildings and areas

Figures 7 and 8 shows the GE image used as a template in 3DS Max. The first stage is to use the reference image to scale the overall dimensions of the area applying exact measurements in metres from Google Earth. 3D primitive blocks are created to represent the individual rows of houses and mill buildings in the area. The river, the canal, train line and roads are also added. (See Figure 8).

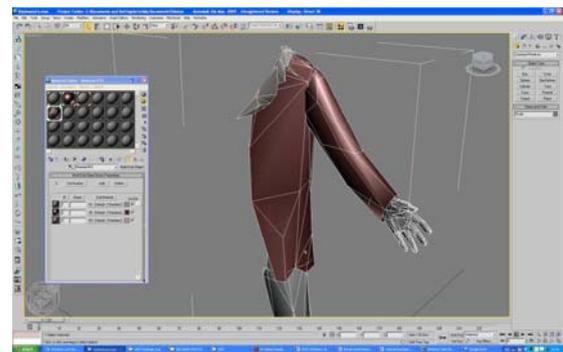
## 6. 3D character modelling and texturing

A number of characters need to be acquired or modelled to populate the area.

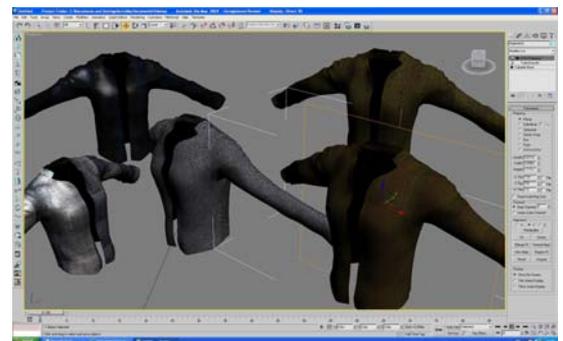
At a later stage these characters will be programmed in an interactive VR environment to simulate the work/life conditions.

### 6.1 Polygon modelling technique

Low Polygon modelling technique is generally used for modelling 3D objects especially for game development. [AEU\*08] The images 10 and 11 show the 3D garment modelling process in 3DS Max.



**Figure 9:** Low polygon character modelling



**Figure 10:** Polygon character modelling with textures

In computer graphics, animation and virtual reality applications after characters modelling completed bones or biped skeleton are used to link the appropriate part of skin of the character to the relevant biped part. This method makes the mesh of a character easy to animate and to simulate movements with clothing objects attached.

To create historically realistic characters and rigging the clothing easily Quidam software (Image 12) was evaluated for easy manipulation of 3D characters and rigging. The data then exported to 3D Studio Max where animations and motion capture data to be added. This Character and motion data will be exported to Virtools VR environment for creation of 3D interactive environments. The image 13 shows characters created using poser models. This method offers large selection of human and animal models which can be scaled and exported to be used in 3D software where further rigging and styling required.

Using Quidam and Poser application methods enabled us to easily add and customize character models already rigged with textures. But Polygon modelling functionality of 3DS Max modelling is also used to create modelling of relevant clothing.



**Figure 11:** Quidam model **Figure 12:** Poser Model

## 7. Conclusion

Currently there is very little historical or cultural physical or online archive is available to the public or education this indicates there is a need for research and technological input development in the area.

In art and design we believe that 3D environments should be created for a purpose and also be functional. Art, design outputs usually demands intellectually stimulating visual exhibitions; our team evaluated and used technology where ease of use and speed was available.

The project team are building 3D interactive Saltaire UNESCO world Heritage site for online and public exhibition where culture, social heritage, history of Industrial revolution in the Victorian era can be experienced, observed and communicated in combined physical and virtual realities.

Creating 3D models and characters for 3D interactive Saltaire site is only the first stage research, and concept development of the project. We are planning to present the results to date and potential ideas for future work to regional and national historical organisations for future collaboration and funding as this project requires a team of specialists in different subject areas to contribute to its development and production.

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