Facilitating Researchers with Visualizations of a Digital Cultural Heritage Site

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ABSTRACT

Here we report on efforts that are ongoing in the development of software infrastructure, digital content and software applications for a cultural heritage site in Ireland. This is part of a larger multi-faceted effort to develop the site for both tourism and research purposes. One goal of the project, addressed in this poster paper is to support a range of scientists and scholars interested in or carrying out fieldwork on the site. To this end we developed a searchable digital repository and interactive visualizations.

General Terms

Cultural heritage, Visualization

Keywords

Cultural heritage, Visualization, Digital Repository

1. THE SPIKE PROJECT

The site is Spike Island, a small island (0.42 km^2) that lies off the south coast of Ireland [2]. The site has a rich and varied past and has, at various times, been farmed, used as a military fort, convict depot, and prison. It is also the site of a mediaeval church and burial ground. Ownership of the island transferred from an Irish government department to Cork County Council in 2009 to develop its tourism and heritage potential, opening as a tourist attraction and for cultural events in 2011. It is envisioned that Spike can become a popular small island tourist destination akin to other better-known examples such as Ellis Island, Robben Island, Angel Island and Alcatraz. Similar ongoing heritage site projects include the Virgin Islands Heritage Collection, and Scottish island heritage preservation and digitization projects.

Participants in the overarching Spike Island project include Cork County Council, the Irish Prison Service, Irish Naval Service, Irish heritage and tourism bodies (Fáilte Ireland) and University College Cork. University College Cork's participation involves multiple departments and centres including the Coastal Martine Research Centre (CMRC) and the multimedia group of the School of Computer Science and Information Technology.

Digital Cultural Heritage can be defined as the use of Information and Communication Technology for Cultural Heritage purposes and best practice is guided by international projects such as Europeana and CULTURA [1][6]. We were also influenced by emerging trends in digital cultural heritage and digital preservations such as information in context, and the employment of new technologies such as HD video, 3D, virtual reality, and mobile access. These trends can lead to richer interactions and broader participation.

2. DIGITAL REPOSITORY

A key element of our involvement in the project was the development of a digital asset repository that stores or links to all digital assets associated with the site[5]. These include existing materials and newly generated content. Both to be placed in context through apps and visualization. Existing content is from multiple sources such as the National Archives of Ireland, National Library of Ireland, Irish Prison Service archive, and Irish Military Archives. This is to support scientists and researchers, who are interested in aspects of the site such as the natural marine and horticultural landscape, history and archaeology. For example, recently the UCC Archaeological Department carried out a new field study of the site[1].

The repository was built using scalable open-source database and Web technologies, and is part of the software infrastruc-

[1]Institute for Field Research, Ireland - Spike Island http://www.ifrglobal.org/programs/eu/ireland-spike-island

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Figure 1: A selection of visualizations. A demonstration can be viewed by scanning the QR code.

ture that other applications can connect to using HTTP requests and the JSON data format. Media viewing for video and 3D models is by means of dedicated content delivery and playback modules. The Lucene API is used for search functionality and content accessible through content harvesting (OAI-PMH).

One of these other application areas is mobile apps, developed for guiding visitors and aiding researchers [4]. An Android app facilitates researchers with on-site object identification, GPS information, video recording, and an upload feature. A second Android mobile application supports 3D model rendering (using AndAR toolkit, Wikitude API and OpenGL ES). Another mobile application (for iPhone) provides an on-site mobile augmented reality interface, and an annotated maps-based interface (Google Maps API).

3. VISUALIZATIONS

Latest efforts from the multimedia group have focused on visualizing the main features of the site in a fully-interactive 3D environment, including a fort on the on the high ground of the island, and the pier and arrival area[3]. The landscape is modelled from ordnance survey information. Features such as water and fog are modelled as animations, which cycle through texture sub-images to provide the necessary effects. All buildings, perimeter and internals were modelled accurately from CAD drawings with detailed texturing added from photographic information. For example, the battered limestone walls are digitally rendered. Lighting is a combination of point lighting and global illumination. Some internal spaces are also modelled, again surfaces have rendered effects, in this case moss, mould and damp. Ambient sound effects are included in relevant spaces.

Autodesk 3ds Max was used for creating the models and animations. These were imported into Unreal Engine, a professional quality game engine that has integrated rendering. The 3ds Max ActorX plugin was used to export meshes and animations into Unreal Engine. The Unreal Landscape Editor was used to create the heightmap (maximum elevation of 24 metres) with 127 quads per section, with 4 sections per component, Unreal's base unit of rendering. Examples of the visualisation are shown in Figure 1 and video grab of system can be viewed by scanning the QR code[2].

It is planned that artifacts and locations in the 3D environment will be made interactive, both searchable and linked to objects in the digital repository. This ongoing effort is to place digital ids for repository objects in the environment. For example, providing direct access to important historical documents such as the Ceremonial Order for the handover of Spike Island by the British[3], census information for houses[4], and photographs.

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5. REFERENCES

[1] C. Hampson, M. Agosti, N. Orio, E. Bailey, S. Lawless, O. Conlan, and V. Wade. The cultura project: supporting next generation interaction with digital cultural heritage collections. In *Progress in Cultural Heritage Preservation*, pages 668–675. Springer, 2012.

[2] M. Martin. *Spike Island: Saints, Felons and Famine.* The History Press, Dublin, 2008.

[3] L. Mellett. *A Virtual Heritage Project for Spike Island, MSc thesis.* 2013.

[4] A. O'Riordan, Y. Liu, C. Hoare, and D. Murphy. A mobile asset sharing system for digital cultural heritage. In *Borgman, CL eds. Libraries in the Digital Age (LIDA)*, 2012.

[5] A. O'Riordan and D. Murphy. Spike: A digital cultural heritage case study. In *ASIS&T European Workshop (AEW)*, 2011.

[6] J. Purday. Think culture: Europeana. eu from concept to construction. *Electronic Library, The*, 27(6):919–937, 2009.

[2] http://vimeo.com/m/96240791

[3] http://www.cs.ucc.ie/~adrian/spike/CeremonialOrder.pdf

[4] Available from National Archive, http://bit.ly/W6LMz7