Visualizing the real world: Creating a virtual 3D historic representation of Oxwich Castle

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Abstract

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1. INTRODUCTION

Using the tools and techniques known as Geovisualization, short for Geographic Visualization, this paper will discuss and show a process for creating a 3D representation of Oxwich Castle within a historic setting. Although called a castle, it is in fact 'a grand Tudor house, built in courtyard style.'("Oxwich Castle," 2011)

'Geovisualization works by providing graphical ideation to render a place, a phenomenon or a process visible, enabling human's most powerful information-processing abilities – those of spatial cognition associated with our eye-brain vision system – to be directly brought to bear'(Aitken & Valentine 2014)

Only a portion of Oxwich Castle remains standing today, as large sections of it are ruins, since parts of the building collapsed in the 18th Century. The site is run by CADW and is open to visitors all year round.

This paper will discuss potential techniques while using the authors experience in Cartography and 3D software techniques to create a scene which returns the castle to its former glory. The project will show a visual walkthrough of the chosen process, clearly defining the steps involved, while identifying any issues and how they were overcome.

2. PROPOSED METHODOLOGY

The research methods for this project will be qualitative in nature. It is a creative practice paper using a practice-led approach to the research.

The research undertaken will be as follows :-

Analysing the existing workflows and process of Geovisualization techniques and how they can be applied to this project, through reading of existing research.

Analysing the hardware and software capabilities in relation to the workflow/processes.

Creating a piece of work on the computer, using the following software:-

- Adobe Illustrator
- Esri ArcGIS
- Trimble Sketchup
- Autodesk Maya
- Blender
- Eon Vue
- Unreal Engine

From basic research undertaken so far, Image-based modelling technique has been identified as the most suitable method for this project. This will use a combination of the scaled plan drawings and hand drawn pictures of the fully constructed house from the following website : http://map.coflein.gov.uk/index.php?action=do_details&numlink=19554 ("Coflein Mapping," n.d.)

Gather data and use suitable software to construct a 3D model of a building, starting with Spatial Data from the Ordnance Survey. Using the raw map data for a positional reference and combined with the set of scaled plans, a model of the building will be created.

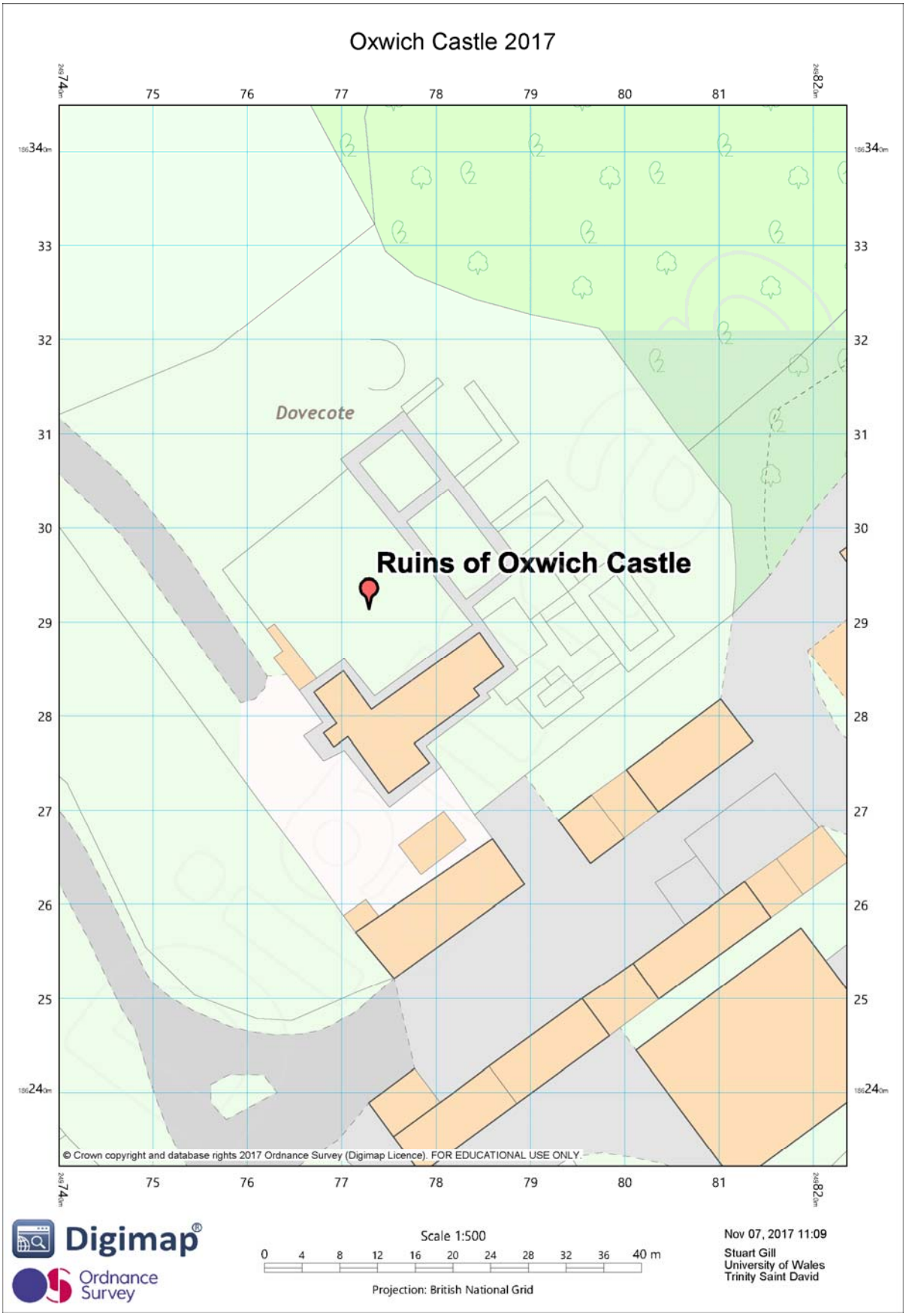

Figure 2: *Map of the Oxwich Castle site, created using Adobe Illustrator CC 2017 in conjunction with the Avenza MaPublisher plugin using map data from the Ordnance Survey accessed through the Edina Digimap portal located at https://digimap.edina.ac.uk.*

2.1 Suggested workflow

A simplified potential workflow will look like the following:-

1. Locating data
2. Processing any Spatial Data in a Geographic Information System software (ArcGIS)
3. Choosing suitable programs (Sketchup, Maya, 3DS Max, Blender, Vue, Unreal, Unity)
4. Converting the data for chosen programs
5. Importing the data
6. Building the model
7. Creating the remainder of the scene
8. Setup lighting and camera
9. Create camera movement
10. Render image or animation

2.2 Constraints

Although (El-Hakim et al. 2004) outline their approach 'for selecting the most effective technique for modelling large-scale heritage sites…' and discuss the different techniques and how they combine them to maximise their potential, the major constraint of this project will be the lack of certain equipment. Only a basic computer approach will be used at this time.

3. CRITICAL AND CONTEXTUAL REVIEW

4. PROJECT-SPECIFIC RESEARCH

4.1 Project Aims

The aim of this project is to attempt to create a virtual 3D scene depicting Oxwich Castle as a complete construction within its original historical setting. The intention is to use mapping and 3D techniques and software to produce a basic visualization.

The overarching objectives of this research project are:

- Examine the workflows and processes for creating virtual real-world historic environments.
- Explore the reasons for creating a CGI environment over using a real location.
- Create a photorealistic scene of Oxwich Castle in its original form within its historic 16th Century setting.

4.2 Existing research

El-Hakim et al. (2004) stipulate a set of motives for 3D reconstruction of heritage sites:

- documenting historic buildings and objects for reconstruction or restoration in case of fire, earthquake, flood, war, erosion, and so on;
- creating educational resources for history and culture students and researchers;
- reconstructing historic monuments that no longer or only partially exist;
- visualizing scenes from viewpoints impossible in the real world due to size or accessibility issues;
- interacting with objects without risk of damage; and
- providing virtual tourism and virtual museum exhibits.

El-Hakim et al. (2004) also mention a number of requirements that need to be considered when undertaking a reconstruction project, such as level of detail, geometric accuracy, capture of all details, photorealism, low cost, portability, application flexibility, automation levels and model size, and how their order of importance will be determined by whichever objectives listed above are chosen for a particular project. They add 'the ultimate goal of all 3D reconstruction methods is to satisfy all the listed requirements', which has yet to be achieved to a satisfactory level.

The techniques covered by (El-Hakim et al. 2004) are Image-based modelling, Range-based modelling and Image-based rendering.

- Image-based modelling :- Use a set of 2D images from different directions to create a 3D object, i.e. front, side and top of an object. The objects are created manually using suitable software.
- Range-based modelling :- Use of a light based system to detect the edges of objects, i.e. a laser scanner. Points are created, which have to be processed to create the shapes.
- Image-based rendering :- Use of arbitrarily located images which rely on knowing the position of the camera accurately in relation to the object. Image matching software is used to put the images together.

The intention of this project, based on the objectives above, will be to provide a suitable scene for tourism and museum exhibition purposes. The model won't be highly detailed but a satisfactory level of photorealism, using known 3D Animation techniques, will be attempted. The author hopes this paper could be the first step in the process of visualizing historic / heritage sites around the Swansea area.

5. RESULTS

5. DEFINITION OF PROPOSED OUTCOMES.

Following the completion of the project, the author hopes for the following outcomes :-

1. A better understanding of the workflow for 3D reconstructions using geovisualization techniques.
2. Why virtual 3D reconstructions are produced and what value they add to society.
3. A rendered scene or short animation of the chosen project site.

With more research, other suitable techniques may be found and those approaches can be considered, within the mentioned constraint above, and if viable, can be undertaken.

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