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Visualisation of Historic Village of New Lanark

Abstract

The existing historic city attracts the attention of architects and educators for its architectural value and history. In addition, many researches on visualisation of historic sites such as world heritage sites are in progress in order to represent the importance of preservation and restoration.

New Lanark is the best-preserved example of a cotton-spinning village from the early period of Britain's industrialisation, and is of international significance in terms of economic, architectural and social history. The village has also been nominated for inclusion in UNESCO's list of World Heritage Sites.

This paper aims to describe development procedure of virtual historic village of New Lanark for educating people about its significant social history and a unique type of building. A multimedia environment is useful for this purpose considering dynamic links among different kinds of resources such as text, images, 3D models and animations. Through this environment people can access from where they are to virtual heritage and navigate 3D space by animation with virtual guidance.

Resumo

Cidades históricas atraem a atenção de arquitetos e educadores pelo seu valor arquitetônico e sua história. Além disso, várias pesquisas de visualização de áreas históricas, como as de patrimônio histórico, são desenvolvidas para representar a importância de sua preservação e restauração

New Lanark é o mais bem preservado exemplo de povoado de tecelagem de algodão dos primeiros períodos da industrialização britânica. Ele tem uma significação histórica internacional em termos econômicos, arquitetônicos e sociais. O povoado foi indicado para ser incluído na lista da UNESCO de áreas de patrimônio da humanidade.

Este trabalho tem como objetivo descrever o processo de documentação virtual do povoado de New Lanark para transmitir sua significativa história social e inigualável tipologia arquitetônica. Um ambiente multimidiático se adequa a este propósito através de "links" dinâmicos entre os diferentes meios como textos, imagens, modelos 3D e animações. Através deste ambiente pode-se acessar, de qualquer lugar, este patrimônio histórico e navegar através do espaço 3D por animações guiadas virtualmente.

1. Introduction

This paper describes development procedure of the visualisation of the historic village of New Lanark. It shows how a virtual heritage has been developed for educating people and how the multimedia contents augment each other for better understanding.

New Lanark is located 54 km south west of Edinburgh in Scotland and was founded in 1785 as a cotton-spinning village. Waterpower from the River Clyde was used for manufacturing the cotton and the first mill went into production in 1786. Under the management of socialist Robert Owen, New Lanark was famous by his utopian social experiment. New Lanark is nominated as a World Heritage Site and building a virtual heritage on a multimedia CD-ROM will accelerate its conservation process.

2. The Project

The village of New Lanark covers approximately 16 hectares in which 20 buildings are divided into 3 categories: Housing, Community and Industrial. Most buildings have three or four storeys, which is unique as other Scottish cotton mills have two storey buildings. The New Lanark Conservation Trust is a voluntary body and its main duty is "The restoration and preservation of the historic village of New Lanark". The 3D representation of historic New Lanark will provide an important resource for the Trust that will be used to support the restoration and preservation of the village.

2.1. Modelling

Prior to modelling village, all the existing architectural drawings and photographic documentation were acquired from New Lanark Conservation Trust. However, owing to the long history and alterations to the village, certain buildings didn't have plans available. Therefore we needed to determine the scale of these buildings by comparison to the main buildings: Mill1, Mill2 and Mill3.

· Terrain

A 1:10000 scale map was used for creating the 3D topographical model. A terrain model with a 5m mesh was generated which covered an area of 20km * 20 km. However, to

accelerate the rendering of animation, the size and area of the mesh was reduced. Finally an optimum mesh size of 10m which covered an area of 600 m * 600 m was used to generate the terrain model.

- Buildings

The buildings that housed the original mill machinery had architectural drawings available and 3D models were easily built using this data. The buildings that didn't have detailed dimensions available were built by determining the scale relative to the main buildings. Several site visits were necessary to gather photographs to use as mapping material for walls, windows and roofs.

2.2.Animation

Once the models were generated, all the data was converted from FormZ to 3D Studio Max format for producing the animations. The key frames were generated to show the categorised buildings sequentially in accordance with the scenario agreed by the authors. The main intention of the animations is to experience a virtual guided through New Lanark. Finally 4 animations with 320 * 240 resolutions were generated.

2.3.Interface

In addition to making 3D models the authors created a vast digital archive of all the old photographs, drawings, historical documents and original artwork held by the Trust. The images were scanned at high resolution and textual records were supervised by the New Lanark Conservation Trust. Then digitised data are categorised by themes agreed with the Trust and hyperlinked smoothly via the interface.

3.Discussion

During the visualisation process of the historic village certain problems were encountered.

- 3D Model as an educational tool

The modelling process has been recognised as the most time consuming work in the entire digital process. A traditional virtual 3D model of a building is formed in a way similar to a physical building. 3D models are divided into many objects including walls, windows and roofs that are generated by numerous Boolean operations.

Significant technical developments have been made in making 3D models from photographic data taken on site. Smart software can quickly create 3D models from photographic data and generate mapping material that corresponds exactly to the 3D models. In certain cases they look better than detailed models generated from the drawings, but when it comes to educational purposes of 3D models, the models without mapping material clearly explain their structural scheme.

- Animation as Virtual Reality

Computer animation is becoming one of the essential presentation formats used in architectural and engineering professions. Computer animation has been used effectively throughout the design process to review the original plans as no designer can predict every aspect of his or her building. While browsing through the animation, designers can identify mistakes. Through the design review stage, animation is used as a design tool to describe the entire scenery showing the exact shape and also the atmosphere. An animated tour of a forgotten city or existing building, is useful tool for educating students and visitors. The virtual experience does not aim to replace the real experience as the tour is dictated for the viewer. The viewpoint of the animation is chosen by the authors rather than the user and is used to focus attention on certain key areas of the site. Augmenting the scene with hyperlinked digital media creates a powerful tool for educating viewers about the built heritage.

4.Conclusion

This paper presents the project to create a 3D visualisation of New Lanark. The results of this project will be published on CD-ROM and will be distributed by SCRAN (Scottish Cultural Resource Access Network) to primary and secondary schools in Scotland. The development of the virtual tour of New Lanark on a multimedia CD-ROM shows great potential for educating visitors to the historic village and publicising the conservation work carried out by the New Lanark Conservation Trust.

Keywords: Virtual Heritage, Animation, Multimedia, Computer Graphics and Visualisation

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