Erstellung einer internetbasierten, virtuellen Umgebung zur Darstellung des Palastes in Żagań

Building an Internet-based Virtual Environment representing the Palace in Żagań

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Abstract:
Die als touristische Attraktionen geltenden Orte erfahren andere Herausforderungen im Bezug auf die Rolle, die sie traditionsgemäß gespielt haben. Neue Medien bestimmen die Notwendigkeit der Anpassung neuer Technologien an die komplexe Aufgabe, die Vergangenheit zu verstehen. Das durchdringende Erfordernis des Einsatzes von Netzwerken und Computern hat die Annahmen der Öffentlichkeit übertroffen. Die ansteigende Übertragungsrate im Internet hat die Erwartungen der Menschen hinsichtlich des uneingeschränkten Zugriffs auf Informationen geändert. In dem Beitrag wird der Aufbauprozess einer virtuellen Modellumgebung diskutiert, die für die Internetdarstellung des Palastes in Żagań (Polen) erfolgreich realisiert werden kann. Es handelt sich um eine Fallstudie über die Anwendung neuer Technologien im Bereich des virtuellen Kulturerbes, das auch in anderen Projekten über Modellierung komplexer historischer Objekte verwendet werden kann.

Abstract:
Historic places presented as tourist attractions face various challenges to the role they have traditionally performed. New media mean new technologies to be adapted to the complex task of the understanding of the past. The pervasive networking and computing have changed expectations of the general public. The increasing speed of the Internet has changed expectations of how and when people are to access information. The paper discusses the construction process of an Internet-oriented virtual environment model of the Palace of Żagań (Poland). As a case study in virtual heritage it can be used in other projects involving virtual modelling of complex historical artefacts.

1. The challenges facing historic places and tourist information

Historic places provide information about accessible artefacts to the general public. Generally this has been done by printing book guides, maps and folders showing the most representative images alongside with explanation of appropriate historical background. Also the places of historical interest are specially prepared for the visitors with direction signs, posters, artefact displays etc. Also centres for knowledge about a particular subject area are being built. Keepers of collections and research staff help in the conservation and storage of the artefacts and build up information such as when and where they were recovered from. Today's technologies force such institutions to withstand with new demands. There is a tension between people who see a visit to historical places as an educational experience and those who see it as a pure leisure. The so called edutainment blurs the boundaries between entertainment and education. The whole way in which heritage is viewed is undergoing a change. Providing on-line information is a "must to" for internationally recognized institutions (www.tate.org.uk). The pervasive networking and computing have changed expectations of the general public. The increasing speed of the Internet has changed expectations of how and when people are to access information.

2. Virtual Environments

2.1 Visualisation

The main goal of visualisation is to bring understanding of data. The task is to present complex information in the most comprehensive manner. Considering architectural artefacts the visualisation process is mostly focused on the understanding of spatial relations and on the recognition of particular style and form. The most natural way to convey this information is to build a three dimensional model. The construction should be seen as an intentional activity based on thoughtful well informed and inventive decision-making. Such construction is best seen as the construction of meaningful forms and experiences close to the real world impressions. However, to give the spectator feeling of immersive environment one should support him with visual cues such as shadows, photorealistic rendering, texturing that mimics natural materials and physical based motion. Unfortunately photorealism is based on powerful yet demanding technologies such as ray tracing and radiosity that are too slow for real time applications [5]. Pre-processed textures incorporating shadows and ray tracing effects when applied to virtual objects may result in similar impressions with much less calculation effort (www.superscape.com). Physical modelling plays important role in the animation process, motion of the models should be coordinated and give impression of their weight and flexibility.

2.2 Conceptualisation

Conceptualisation concerns the application of theoretical models to dataset and applications. The emphasis is on explanation, simplification and modelling. The underlying process of conceptualisation is segmentation, which takes a data as its input and defines its elements corresponding to real world meaningful entities. There is an extensive literature on segmentation including the discipline of image processing and computer vision especially in the field of 3D data acquisition and retrieval [5]. Generally automated segmentation of data remains an unsolved problem. Most of this process is usually done manually. There is a clear need for tools to build conceptual models from various sources of data. The number of ready to use 3D models is still growing and may sometimes reduce total effort of construction process, but when one deals with representation of unique objects it is very often necessary to build the model from the scratch. The requirement of for virtual reality raises data reduction as important issue. Low-end workstations are unable to support real time rendering of very large virtual environments. Data reduction methods can be divided into two broad categories of geometric model based and image/texture based approaches. An important example of geometric model data reduction is mesh decimation [6] that reduces the number of triangles in the model mesh. It has been shown that human perception of shape is strongly influenced by texture and this can be utilised to replace complex and finely detailed geometry with flat textures [7].

2.3 Virtual Reality Modelling Language

VRML is a scene description language that enables the construction of interactive, animated 3D objects and environments on a Web page [1]. It theoretically allows unrestricted virtual environments to be built. The geometry of a virtual world in VRML is not constrained to be orthogonal. The viewer of a VRML environment usually described as an 'avatar' is similarly unrestricted in the direction of travel through the environment. With VRML it is easy to create interactive virtual worlds where one can navigate through three-dimensional scenes can meet other users and influence behaviour of many objects. Virtual worlds can be linked together and can have links to other standard Web services as HTML or FTP. Also sound, video and complex two-dimensional graphics can be incorporated into virtual scenes. To access VRML worlds (**.wrl*) the popular Web browsers (*Netscape* and *Internet Explorer*) with appropriate plug-ins (such as *CosmoPlayer* (www.cosmosoftware.com) or *Blaxxun* (www.blaxxun.de) are necessary. Recently there has been a marked increase in the use of the Internet for multimedia content and 3D interactive graphics [3]. Three-dimensional representation of complex data and spatial relations is more natural to humans [2, 4]. Virtual environments technologies are still evolving and currently most concepts of VRML 2.0 are included in new standards such as MPEG 4.0 (www.mpeg.org) and X3D (www.vrml.org).

3. The Palace in Żagań project

3.1 The objectives

Visualisation of architectural objects was not a simple case. The project investigated how information about the Palace in Żagań could be displayed in a more intuitive fashion, allowing for interactive exploration of its spatial properties. A number of objectives were defined:

- To investigate the process of creating a virtual artefact based on different information sources,
- To provide alternative ways for visitors to access virtual object and to visit its most representative elements,
- To put a stress on maximum realism of the virtual representation of the Palace in Żagań,
- To convey the mood of that historical place,
- To offer navigational help (guided tours) in order to make visiting more comfortable for the fist time users,
- To keep the model files small for Internet accessibility.

3.2 Development

One of the main criteria used in deciding on a possible artefact was that the information should require as little interpretation as possible to be turned into a virtual model. In order to model a building accurately, information was needed about the plan of the Palace. Also photographic data would be needed for every surface of the Palace. At practical level, to avoid overloading of details the model was constructed to provide identification of elements larger than one meter. More detailed elements of the Palace were presented by flat texturing in the most representative places. General floor plans and regular walls were constructed form scaled boxes. The roof and walls with windows were constructed as polygon surfaces. Doors were created as a combination of simple geometrical shapes- boxes and polygon meshes representing doorknobs with sensors that could trigger user actions such as "opening" or "closing". The Palace in Żagań contains a lot of repetitive elements such as windows or architectonic details (Figures 1.2.3.). To create a window nine boxes were used. Even with such a simple construction more optimised code was needed to support flawless navigation through the Virtual Environment. Level of Detail (LOD) was used to optimise the whole construction. While viewed from the distance larger than thirty meters all the windows were simple flat texturing. When viewer approached the building flat images are exchanged with three-dimensional models. Without the LOD it would be necessary to display concurrently over 1000 scaled boxes (over 100 windows) thus remarkably slowing down the VRML browser performance.

3.3 Tools

The Virtual Palace in Żagań was constructed using VRML 2.0 language as it was an industry standard for Virtual Environments in the Internet. Development of the model was carried with tools working in MS Windows 98 environment. The main editor used for VRML coding was SitePadPro (www.modelworks.com) offering *.wrl syntax checking and debugging. Some parts of the model were built in 3DStudioMAX (www.autodesk.com). Unfortunately while exported to VRML format, 3DS objects had increased geometrical complexity and needed further manual simplification. That was done mainly for purposes of the Level of Detail control and for minimising the total volume of the virtual object. Texture files were created with the help of Photoshop Image Editor (www.adobe.com), allowing for export to JPEG, GIF and PNG formats recognised by VRML browsers. For texture mapping and debugging, the Community Place Constructor (www.community-place.com) of Sony was used.

3.4 VRML application

The virtual Palace was separated into a number of smaller world components: the background area (lawns, paths, etc.), surrounding elements (fountain, stairways, trees), the main structure of the building and the most representative rooms of the palace (the main hall, the wedding

chamber). All the components are linked to provide visual cues for the visitor (i.e. one must be able to see the trees through the window in the appropriate part of the palace).
To ensure wide access to the virtual artefact it was decided to minimise project size. Total size of the VRML world was finally reduced below 1.3MB. It was also decided not to assume the availability of special hardware devices as head mounted displays or six degrees of freedom control units. The application was to be viewed properly in CosmoPlayer, a VRML plug-in for MS Internet Explorer or Netscape Navigator.

4. Conclusions

Virtual Environments based on the Internet can play important role in supporting tourist promotion centres. The paper has begun to outline a methodology for developing virtual model representing historic artefacts. It is not simple since it relies on the simplification of the detailed building construction, during the process some of the information may be lost or misgiven. Despite immature VRML technology the project has proven that it is possible to create the model with a glimpse of authentic real place. Such a model makes it possible to sight-see historic artefacts via the Internet.

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References:

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Illustrations

Virtual **Natural**

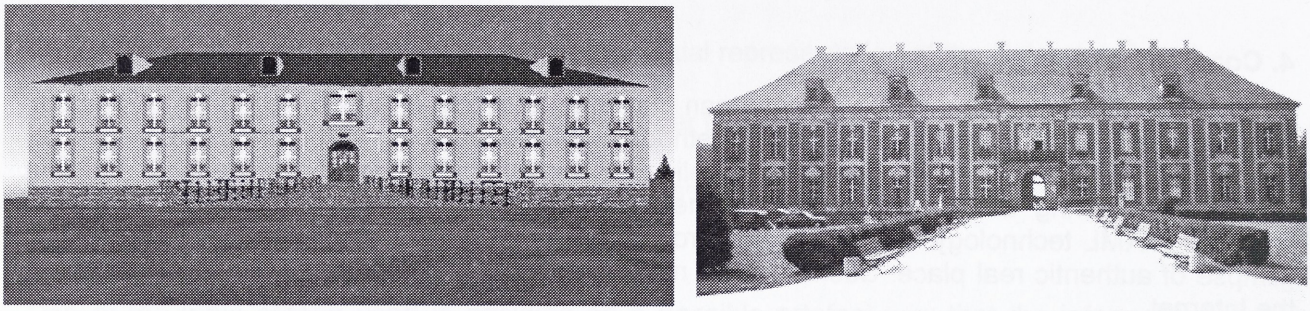

Fig.1 A view from the front of the Palace

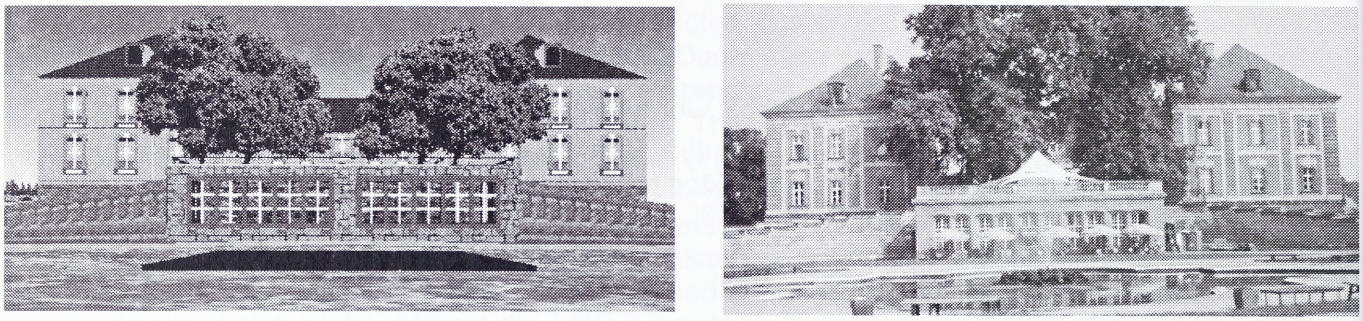

Fig.2 A view from the gardens

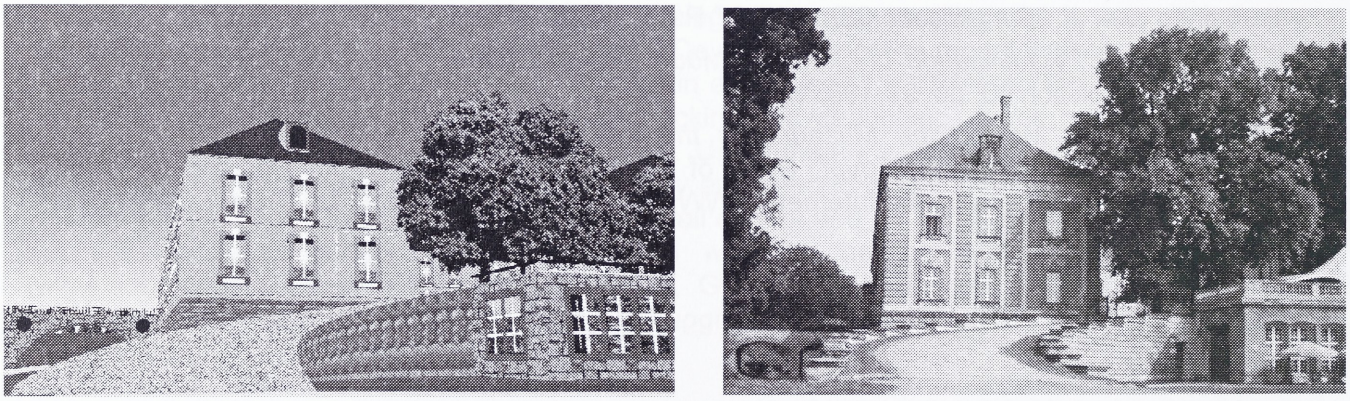

Fig.3 A view from the gardens to the left