Virtual Museum as an Environment for Visual Representation of Urban Planning Concepts and Lost Architectural Objects

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ABSTRACT

Intensive development of the Web has significant influence on social communication processes. New trends of information distribution demand new approach as being involved in on-line communication. Social institutions, including museums and exhibition centers, aim to develop their presence on the Web, searching for ways to engage bigger number of visitors by offering them new experience.

A phenomenon of the virtual museum is studied in the paper as an online representation of a tangible museum collections and as an information resource that has no physical analogue. The target is to analyze the potential and relative advantages and disadvantages of virtual museums.

The main subject of the research is effectiveness of online tools for representation of large architectural and urban objects, unimplemented projects and lost monuments.

Virtual exhibition is often based on the products of virtual reconstruction. It is very important to formulate strict methods of this approach, to develop a methodology and establish a practice of visual distinction between true (and/or relatively true) parts of a virtual model and its authorial parts.

Keywords

Virtual, museum, urban, architecture, heritage, culture, reconstruction, exhibition.

1. INTRODUCTION

Intensive development of information technologies brings influence on all aspects of human being life, including art and culture. From a perspective of museology computerization and informatization of society have led to development of new methods of working with collections and exhibits as well as communication with museum audience.

On-line presence of museums obviously becomes a requirement for effective communications. Museums are interested to put their collections online not only for the purpose of preserving the cultural heritage, but also to make the information content accessible for potential visitors.

Recently, a number of surveys have provided compelling evidence that online museums actually drive physical museum attendance instead of discouraging physical visits [Mar07].

The information on the museum's website, is available to a wide audience (including professionals working in various museums), which brings museums possibility to associate with each other, to identify similarity and find partners. Virtual museums are beginning to form a new type of global virtual museum environment, accessible to everyone and customizable to the needs of each user. Therefore, it is important to study the methods of presentation of the museum collections on-line, the factors forming quality information content and the effectiveness of the instruments exhibiting objects in virtual reality.

2. VIRTUAL MUSEUM DEFINITION

According to ICOM definition, “museum is a non-profit, permanent institution in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of

humanity and its environment for the purposes of education, study and enjoyment" [Ico15]. Today museum is a social and cultural center for edutainment, pedagogic etc. purposes.

Definition and above-mentioned functions of physical museums are partly applicable to on-line museums.

The virtual presence of museums may involve a variety of forms, differing in their technology immersion but similar in their appeal to potential visitors. In general there are three main types of online museums:

1. Physical museum representation (digital museum) – the internet-based version of a collection that exists in the real world.

2. Virtual museum (online museum, electronic museum, web museum) – museum that can present either digital copies of works or works that have no tangible analog.

3. Virtual museum that shows works that exist only in the virtual space.

The first type of on-line representation supports and accompanies collections of a physical museum, implements representative, advertising and promotional functions. These web resources are actually data bases, where digital copies of exhibits, photo-, audio-, video materials and other corresponding multimedia products are stored and displayed.

There is no standard definition prevailing for the term 'virtual museum' [Syl09]. However, it is evident that virtual museum greatly differs from digital library, catalogue or data base. Following the research in this field, "only those websites, which are implemented in compliance with principles of museum exhibition design, can be called virtual museums. It means that virtual museum as a physical one should have scientific concept, architectural and art concept and exhibition scenery [Nic99]. Virtual museum shall be based on well-developed scientific concept and design solution.

Main criteria of virtual museums are as follows:
1. Representativeness and content completeness precluding distortion of facts, which causes misconception of history or a particular epoch;
2. Multiplicity and multi-layer structure of presented information to make it apprehensible for different audience;
3. Clear and user-friendly interface, strict structure, efficient navigation and quick search.

3. OPPORTUNITIES AND ADVANTAGES OF VIRTUAL ENVIRONMENT

Virtual museum with thought-out conception has certain features, which make it different from representative web site of a real museum. These features bring new opportunities for exhibits' displaying and for communication with museum audience. Virtual technologies enable qualitative development of museums as educational and social centers. Audience of virtual museums gets access to collections on-line, however, it does not decrease visitation of real museums – quite the contrary – it helps to attract new audience, especially young people: schoolchildren and students.

Today there are quite many examples of virtual museums on the Web, such as on-line collections of Vatican museum, the multimedia guide of the Louvre-Lens museum, on-line collections of the State Hermitage Museum and others. Comparing to real museum, a virtual one has several significant advantages, especially when we deal with large objects (for example, urban or architectural), which cannot be displayed in museum rooms at all, or it would be very complicated to place them indoors. It is also a challenge to exhibit decrepit objects, which require certain temperature and humidity conditions.

Virtual museums can provide access to exhibition from any space to all end-user groups including people with special needs (visual, acoustic, speech and other disabilities). In virtual environment exhibit can be observed from all angles, so user can obtain information that often cannot be shown in the physical museum [Syl09].

Virtual museums do not face a common problem of traditional museums - preservation of exhibits (reducing of natural dilapidation, protection from consequences of force majeure circumstances including natural disasters and disorders). Costs of making on-line collection or exhibition do not include expensive transportation and overheads. Virtual exposition can include exhibits from private collections and museums located in different parts of the world [Kis08].

Worldwide images posted on the Internet are protected by copyright laws. In recent years, the use of licensing terms and conditions to control access to and use of art images has been subject to increasing criticism, primarily when considering restrictions imposed on works that are in the public domain [Cre12]. Many institutions have changed common museum practice and have begun to make their collections available digitally, with the option to download a high-quality image suitable for

publishing (The Victoria & Albert Museum, the British Museum, the National Portrait Gallery, etc.).

Despite these developments, many libraries and museums continue to impose restrictive terms and conditions on their digital art collections, as well as assert their ability to control the use of digital reproductions of public domain artwork through copyright [Cre12].

Museum use different methods to protect their digital collections: exhibition of lower quality images or images with watermarks, protection against direct downloading of images, requirement to accept the terms of use for downloading high quality images.

4. VIRTUAL RECONSTRUCTIONS

It is a common situation when pieces of art and culture are partially or completely lost or significantly modified. In this case virtual reconstruction is an efficient tool. Results of reconstruction can be used as a basis for a new virtual museum.

The term virtual reconstruction implies that the representation takes place in a three dimensional space, which is usually called virtual environment and the final product is usually called a 3D virtual model. Virtual reconstruction is a technology for making models of different complexity. These can be small exhibits, pieces of arts and crafts, monuments, historical plans and maps, buildings and large architectural ensembles, city areas and suburban landscapes, etc.

3D virtual reconstructions significantly support studies for the eventual real reconstruction of the monument in the future. A virtual reconstruction would also enable the examination of various alternative solutions and help making decisions for the suitable restoration or reconstruction methods [Geo14]. Using this technology we handle digital copy of an object. It means that when we work with a piece of art or craft, or architectural object in virtual space, we do not bring any harm to its original prototype.

3D modeling has been originally used for buildings' designing. Up to the present moment it is especially efficient for handling architectural objects and their fragments. The result is a 3D model, which can be presented in different ways:
- 2d and 3d graphics;
- Interactive plans and maps;
- Interactive panoramas;
- Virtual excursions;
- Virtual game-tours;
- Mobile application using augmented reality technology (AR);
- Virtual reality (VR).

Interactive maps and panoramic views are widely used on web sites creating virtual tours for city exploration, tourism and sightseeing. A map as an element of interface makes user's interaction with website much easier and more efficient, especially if the content includes large architectural and urban objects.

Panoramic images and videos are a 360° representation of a certain scene. Video objects, dynamic 3D computer models, or spatial audio can be embedded in order to vitalize the scene. Interactive panoramas are developed to the extent of an excursion with a variety of routes and exhibits, which full descriptions are available for user just by clicking the mouse. Thus, large high quality environments can be created that enable the user to immerse into the virtual world.

Figure 2,3. Interactive maps of St.-Petersburg (1720th, 2010th). VM of the Neva river delta

Figure 4. Example of an interactive panorama. Palace embankment n 1720th in St.-

Multimedia products based on AR technology are supported by mobile devices and as well as the portable VR headsets can efficiently enhance and enrich the 2D and 3D representation of artefacts.

An example of AR application is Multimedia Information Resource «The Church of the Savior on Ilyina Street in Novgorod the Great», which represents lost painting of the church. In this project a basis for interactive multimedia product is a completed 3d reconstruction [Las13]. One of the biggest concerns is how [Den12].

5. ISSUES AND CHALLENGES IN VIRTUAL RECONSTRUCTION OF ARCHITECTURAL MONUMENTS

Despite broad experience in applying virtual technologies, methods of reconstruction are still not

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sufficiently developed from a perspective of standardization and scientific approach [Kis08]. The main problem is that all elements of reconstructed space are usually done in the same manner: with same detail design and of same hues.

Difficulties in virtual reconstruction arise from quality of documents, which are used as a basis for modeling, and interpretation of these documents. [Kis08]. The main principle of reconstruction is maximum conformance of a model with text description, illustrations and other information regarding original object. Available information from archive sources is often controversial and almost always incomplete. Researchers and designers have thus to make a decision whether to leave the model uncompleted as well or to finish the job using not only relatively accurate data from archives, but also analogues. Virtual reconstruction based on analogues allows several virtual models of one object, and all these versions are adequate, if they conform with any of available analogues. However, these models are not true copies of an object. For the purpose of supporting scientific approach, it is important to develop a method and establish a practice of visual distinction between true and/or relatively true parts of a model and authorial parts.

Figure 5. Winter Palace n 1720th in St.-Petersburg. Using different hue and references

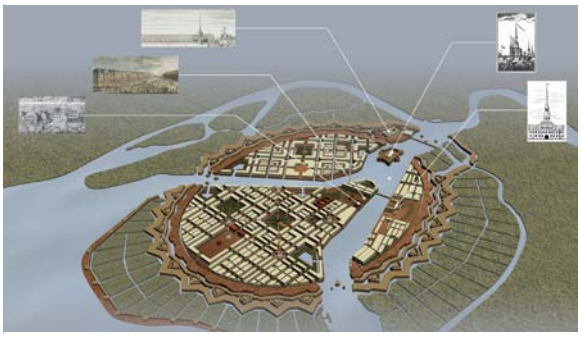

Figure 6. Le Blond's master plan for St. Petersburg. Unimplemented project. 1716-1717. Using different hue and references

Solutions to the mentioned problems are:
1. Distinction between visualization of authentic and fabricated parts of a virtual model:
- By different design technics;
- By different level of detail;
- By different hue;
2. Using a system of references to archival materials.
3. Using a video showing step-by-step sequence of developing the model.

Therefore methods of virtual reconstruction should be developed closer to methods of classic restoration, when particular attention is given to visual distinctions between evidence and hypothesis, and between different levels of probability.

6. CONCLUSION

Nowadays virtual museums have become very popular due to many reasons and their number is on the rapid increase. Virtual museum can act as a complementary and auxiliary service for physical museum, or it might show reconstructions that exist only in the virtual space. Distinctive feature of virtual museum is that it provides unimpeded access to digital exhibitions and gives almost unlimited room for large architectural exhibits, which cannot be placed indoors. Virtual museums do not face a problem of exhibits' preservation like protection from consequences of force majeure circumstances.

Virtual reconstruction is an effective tool for representing modified or lost objects in their original view, but methods and rules of implementation are still not fully scientifically unstructured and standardized. It is still unclear what is in priority for end users: photorealism of a model, its authenticity and accuracy or just general visual impression. But nevertheless 3d reconstructions and interactive tools are very popular among visitors and can perform traditional museum functions online such as: acquisition, preservation, research, communication and education.

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