

Analysis of methods and technologies for creating virtual museums

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Annotation. The article considers the relevance of creating virtual museums, as well as the goals and objectives required for their creation both for a particular audience and for general accessibility. The methods for virtual museum implementing using computer technology are defined. Visual perceptions of information presentation to the visitor, tours and expositions, a unique three-dimensional museum created on the basis of virtual reality technology are described.

Keywords: virtual museum, methods and technologies, database, 3D-panorama, virtual reality, modeling.

Technology for creating a virtual museum

Currently, virtual museums are becoming more and more popular every day. They are very common both in Russia and abroad. Today, virtual museums have become a popular repository of cultural texts. Such museums are created by both individuals and legal entities: administrative units, educational, public, scientific organizations, commercial structures, medical and cultural institutions. They have made great progress in classical models of the museum and the museum world as a whole, and often their format practically does not resemble the traditional type museums characteristics.

Virtual museums are widely used in education as an innovative educational tool used at all levels of education, such as e-learning and distance learning technologies. The creation of virtual museums is one of the forms of public initiatives and creative self-activities of citizens to popularise the historical and cultural heritage. Virtual museums are widely represented on the Internet, and they are also gradually conquering the «mobile Internet» – tablets, smartphones, etc.

First of all, to create virtual museums, it is necessary to understand clearly the purpose and the final results that the developers want to get from their project. The word «mission» or «task» is often used as synonyms for the word «goal». Despite the variety of declared goals, they can be classified according to «the degree of interest in the audience» into four groups:

- the goal is the creative self-realization and self-expression of the virtual museum developer. In this case, the virtual museum is not considered as a means to attract the attention of users and/or as a way to promote concepts, goods or services, etc.;
- the goal is an image project. The virtual museum is a self-sufficient resource, a kind of decoration that is not a socio-cultural tool;
- the goal is education;
- the goal is to actualize any issues (cultural heritage popularization, raising interest in the history of their people, fostering patriotism and the development of domestic tourism, etc.) or promotion of certain products\ services (for example, virtual museums are often based on online shops). In the latter case, the developers need to think through to compete for visitors and create a virtual museum that is popular with users.

The developers of virtual museums aim to show the public the exhibits of various live museums. But the task cannot be solved only by digitizing the exhibits or by publishing them on the website. The developer should try to get users to visit the site. Otherwise, the virtual museum website will lose interest and its purpose, and all publications will be wasted.

The main task of the virtual museum as a socio-cultural tool is to promote the concept to a wide or specific audience of users. The ways of museum concept promoting differ from the ones of other websites by attracting attention, advertising publications, methods of publications in education.

The virtual museum developers should acquaint with the basic of how images and colours affect the human psyche.

Thus, although the symbolism of colour changes over time, being conditioned by particular culture traditions (for example, in India the colour of mourning is white), in modern Russia the majority of the population perceives black as «mournful», «sad», «funeral». Creative techniques need to be carefully applied to this, so as not to alienate users. And similarly, when selecting sound options, consider the emotional impact of music on people. Sad and sorrowful melodies should be avoided, even if they are from classical music composers.

Getting acquainted with the virtual museum should be joyful, set a good mood and show interest in the exhibit or story scene.

In a virtual museum, the text should be simple, adequate enough to be read in any foreign language by means of software translations (such as the Internet translators, Yandex, Google, and others) that not only countrymen, but also foreign users can perceive the information. Also, the simplicity of the presentation should not mislead the reader. In a virtual museum, text blocks should be purposeful and informative. They should contain information, interesting facts in order to interest users. The text should not contain scientific terms and statements that tire the reader. Links to additional information or an exhibit, or a scene and video, or musical accompaniment can also be placed in the text. Key information should be placed in the first sentences of the text.

Methods of creating a virtual museum

Today there is an excellent opportunity to realise the ideas of a virtual museum on the Internet. This is an effective and, most importantly, easy way to access information resources. The technical basis of the virtual museum is applied by the method of forming an electronic collection and an informative concept. This technique makes it possible to form and distribute a presentation of data for access.

When using the electronic paper method, virtual museums acquire various types: a database, ideographic information of books and notes, documents and photographs images, audio information and video materials, model data and lists of information. This method is a catalog, which is similar in technology to an online shop. It allows you to use database searches, sorting and filtering by exhibit parameters or

textual information. Such tools are used by various institutions and organizations. It is used to a greater extent as a digital library.

When implementing the server component of a virtual museum, it is recommended to use open-source solutions that have a large community of developers and are widely used on the Internet.

Examples of such technologies are:

1. Databases:
 - MySQL,
 - PostgreSQL.
2. Server programming languages:
 - Java,
 - PHP,
 - Ruby,
 - JavaScript.

When implementing the client component of a virtual museum, in order to ensure maximum simplicity of the virtual museums for users and to unify the user experience of interaction, it is recommended to use a set of technologies for creating Internet pages: HTML, CSS.

A virtual museum must work properly in the following browsers on the operating systems listed below:

1) Internet browsers supporting HTML5 and CSS3 specifications: GoogleChrome 34+, MicrosoftInternetExplorer 10+, MozillaFirefox 18+, AppleSafari 6+, Opera 15+.

2) Operating systems:

- desktop PCs: MicrosoftWindows XP SP2+, AppleMac OS X 10.6+, Linux OS;
- Mobile PCs: Apple iOS 6+, Android 4.2+.



Figure 1 - Russian Museum "Mikhailovsky Palace"

One of the effective visualization technologies of the museum exposition is the method of forming panoramas: 3D panoramas, or 360-degree photo panoramas as it is called. This method allows you to show three-dimensional space photos. This method differs from ordinary photo that can be framed or printed in a book or magazine in that a virtual panorama can be viewed on a monitor screen. On the monitor screen, you can see a part of the image that the human eye sees in reality when approaching, and with a smooth blur of camera moving to the right or left side by 360 °. This method of technology is called a circular panorama. The peculiarity of this technology is that it is possible to make U-turns on a horizontal plane. Such panorama is widely used by public or private enterprises, supplemented as a model of the real world into virtual reality. It is enough to control a mouse or keyboard to admire the surroundings or exhibits, also to interact with areas that give out additional information. The 360° panorama is a camera, and it cannot move freely. The camera moves at a specific point which are marked on the tour map or on a plan of the terrain, building and site.

This technology and method are widely used in virtual tours or excursions.

They include:

- Animated objects;
- Multimedia elements;
- Soundtrack.

This form allows you to get closer to a realistic sense of presence in the halls. Even if panoramas are made up of various objects, they are presented to the viewer as a whole hall.

A lot of attention is required to this method and technology. There are limitations in the organization of virtual tours: information search and filtering, the use of large amounts of data, the systematization of elements according to different characteristics.

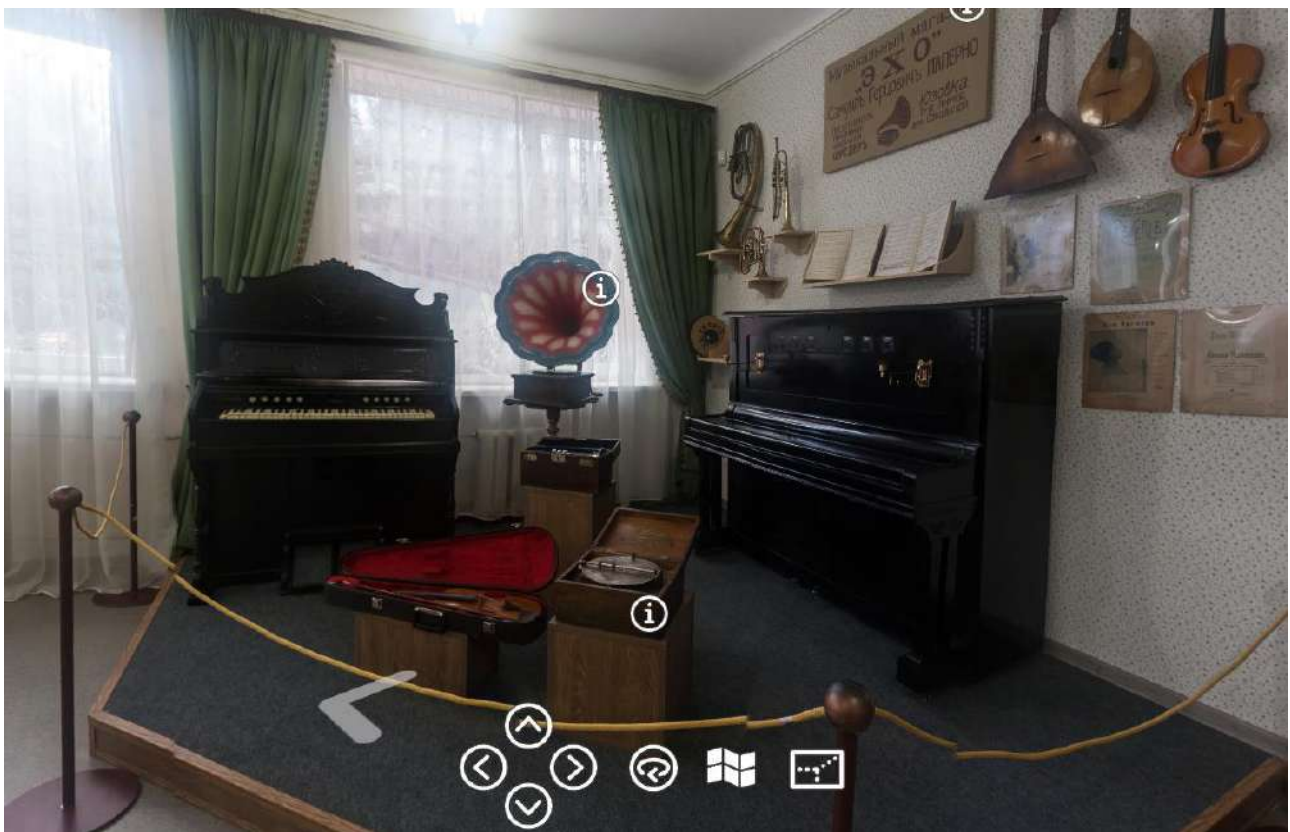


Figure 2 - Panorama "Donetsk Republican Museum of Local Lore"

There have been attempts to create virtual space constructors before. In 1996 the company «Paragraph» created the product Virtual Home Space Builder (VHSB). It

was designed to create virtual three-dimensional worlds that can be put on the Web for everyone to see.

It's been many years since this app was released, and technology has made huge strides forward. Virtual reality is a reality into which we are emotionally immersed through sensations, sounds, and videos. It should be noted that fully immersive virtual museums do not yet exist.

However, with the advent of virtual reality technologies and their increasing spread, cheaper development tools in a virtual environment, the creation of a «fully virtual» museum becomes possible.

Over the past few years, museum modelling solutions have developed solely as a photo exhibit, which excludes the gigantic possibilities of game engines and 3d modelling technologies in general.

We can say that to develop tools for creating virtual spaces, and more specifically museums, you should choose programs that are as convenient as possible, easy to learn and provide maximum opportunities.

Three-dimensional graphics is a vast scientific field in which you can endlessly improve your knowledge and skills. Each software has its own specific set of characteristics that determines the area in which this 3D editor will be convenient to use.

- 3ds Max is the best program for architectural visualization, with full compatibility with other Autodesk products like ArchiCAD, and has extensive libraries of architectural materials, as well as flexible visualizer settings.
- Autodesk Maya is the undisputed leader in creating special effects in cinema and animation. It is in contrast to 3ds Max, which is mainly designed for engineers and techies. The tools of this package are very close to creative people.
- Cinema 4D and VuexStream are the best options to start your acquaintance with three-dimensional graphics.

- Blender is an ideal solution for those who are used to saving their budget. It is as good as its paid counterparts in terms of functionality.
- ZBrush is the best solution for virtual sculpting at present.

The game engine is the central software component of computer and video games. It simplifies development and gives the game the ability to run on multiple platforms, such as game consoles and desktop systems, such as Linux, Mac and MS Windows.

Although this software is called «gaming», these programs have not been used for a long time to create only gaming products. The game engine includes: visualizer, physics engine, sound, script system, animation, artificial intelligence, network code, memory management and multithreading.

In addition to reusable software components, game engines provide a set of visual development tools. These tools typically form an integrated development environment for simplified, rapid game development by analogy with inline production. These game engines are sometimes referred to game middleware because, from a business perspective, they provide a flexible and reusable software platform with all the functionality needed to develop a game application, to reduce cost, complexity and development time.

Gaming platforms:

- 1) Cry Engine 3 is a new generation engine developed by Crytek.
- 2) Unreal Engine 4/UDK UE4 is still considered the most popular top-level game engine. Epic Games has released a free version called UDK, which allows you to use the engine to create non-commercial games and free applications.
- 3) Unity 3D is a multi-platform game engine that is not designed for a specific style of Windows, Mac OS X and Linux games.
- 4) Source Engine SDK for creating modifications on the Source engine, distributed for free by Valve via the Steam network to all players who have bought any Source game from Valve.



Figure 3 - VR «Fine art»

The relevance of a virtual museum is in the preservation of cultural heritage and accessibility to visitors. There are many methods and different technologies for creating a virtual museum. A museum can be like a digital library, containing textual information and images, videos, as well as allowing filtering searches by exhibit. 360-degree panorama technology is popular today in live museums to show their rooms and provide virtual tours with an audio guide and soundtrack. Virtual reality technology allows to create an architecturally unique museum in a 3D environment. This will enable the visitor to explore exhibits and exhibitions in detail, view animated story scenes, travel and interact with objects as in video games. Thus, the virtual museum is a large electronic database containing textual information, video and audio material, images and 3D exhibits, etc.

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Аннотация. В статье рассматриваются актуальность создания виртуальных музеев, а также цели и задачи, необходимые для их создания как для определенной аудитории, так и для общей доступности. Определены методы реализации виртуального музея с помощью компьютерных технологий. Описаны визуальные восприятия подачи информации посетителю, туры и экспозиции, уникальный трехмерный музей, созданные на технологии виртуальная реальность.

Ключевые слова: Виртуальный музей, методы и технологии, база данных, 3D-панорама, виртуальная реальность, моделирование.

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