Some Aspects of 3D-objects Presentation in a Common Digital Space of Scientific Knowledge

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Abstract. The paper deals with the issues of multimedia objects presentation in a common digital space of scientific knowledge. Examples of using new technological solutions for transferring images of physical objects into virtual space are given. The technology for representing digital 3D models in the environment of a common digital space of scientific knowledge is proposed. The principle of scientific virtual exhibitions formation in the environment of a common digital space of scientific knowledge is considered.

Keywords[1]: scientific information, structure of knowledge space, 3D model, museum object, virtual exhibition content.

1 Introduction

Today, there are several large aggregators of information resources that provide access not only to individual digital copies of printed publications, but also allow you to form and view thematic collections or virtual exhibitions. The sites of such services provide digitalized monographs, art albums, sheet music, cartographic materials, manuscripts, periodicals, etc. [1]. Scientific digital resources are actively developing, providing a wide range of users with such services as:

- Search in various scientific disciplines and sources in special databases;
- Search in various scientific disciplines and sources in full-text electronic editions of major scientific publishers of the world;
- Access to found information resources;
- Use of applications that turn electronic libraries into a research ground (virtual observatory, virtual chemical or biological laboratory, etc.);

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• Preservation of scientific information;
• Integration of digital images of information objects of various nature;
• Providing opportunities for scientific cooperation on a regional and international scale.

2 Multimedia objects representation methods in a common digital space of scientific knowledge

When creating a Common Digital Space of Scientific Knowledge (CDSSK), it is necessary to solve the problems of forming the content of the CDSSK, and its visualization for scientific, educational and cognitive purposes [2]. The CDSSK content visualization allows the use of information about dynamic processes and volumetric objects (reconstruction of historical monuments, modeling of physical and technological processes, visualization of solutions of mechanics or chemical factors), as well as such "popular science" services as excursions to museums, scientific laboratories, observatories etc.

For the presentation of multimedia objects, the toolkit for the formation of the CDSSK should provide the following basic capabilities:

- detailing of the entire image (or part of it) while maintaining the image quality;
- obtaining reference (or explanatory information) about the object;
- reproduction of audio, corresponding to a static or dynamic visual series;
- video sequence playback using the "freeze-frame" function;
- creating custom collections;
- the use of game components with information components.

Methods of presenting library and archival storage in the form, as well as providing access to them, are currently well developed digitally. However, the presentation of multimedia objects in the CDSSK involves not only the creation of means for describing these objects and providing access to them, but also the tools development and integration multimedia objects in the digital environment. In addition, for museum objects, it is necessary to form high-quality, in terms of visual perception, digital images of their 3D models. The information environment, created by multimedia objects, along with objects of library and archival storage, will make it possible to create multimedia digital collections and form virtual exhibitions.

Fig. 1: Set of pre-captured individual exposure frames.

To represent the digital 3D models in the CDSSK environment, it is advisable to use the so-called interactive animation technology. This technology is focused on the basis of a fixed set of object types (frames) with the help of interactive display programs that allow scaling both the entire image and its fragment. To create such an interactive animation, a set of pre-captured scenes, which are separate frames of the exposure (Fig. 1) [3].

3 The structure of the virtual exhibition

The virtual exhibitions, as an information resource that provides users with heterogeneous information (digital copies of printed materials, archival documents, multimedia materials, etc.), integrated according to certain criteria, allows you to effectively solve the problems of presenting information resources, including digital museum collections, integrated by means of the CDSSK [4, 5].

Despite the fact that each virtual exhibition is unique in its content, the following main sections can be distinguished in the formation of such exhibitions in the CDSSK environment:

- the main thematic section;
- an interactive section;
- biographical section;
- section of video materials;
- section of photographic documents;
- library;
- section “Collection of 3D objects”;
- reviews section;
- contacts.

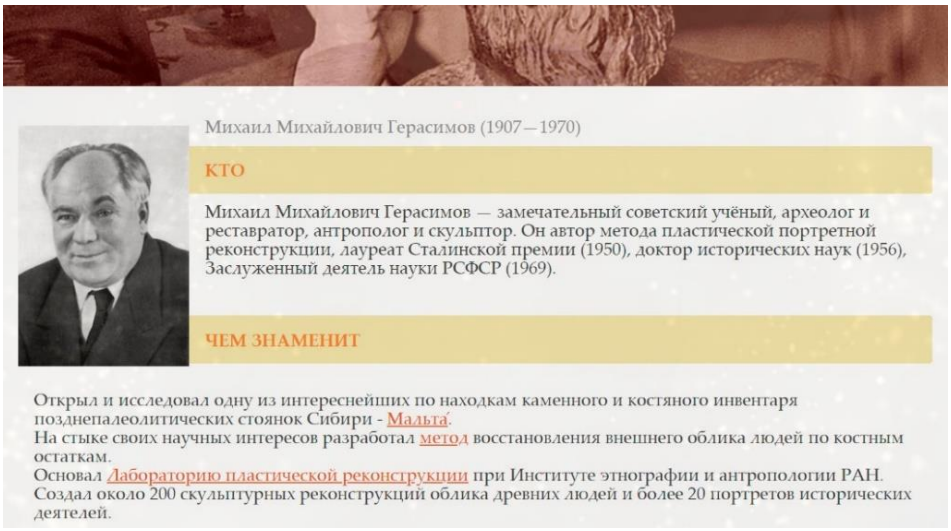

Fig. 2. The main thematic section (by means of an example of the virtual exhibition "Forensical sculpture reconstruction").

The main thematic section. This section contains a selection of materials covering the main theme of the exhibition. As a rule, these are articles (including author's, written specifically to reveal the subject matter of the exhibition), a selection of rare photographs and images, excerpts from publicistic and periodicals (Fig. 2).

Interactive section. The controls of the section interface should enable the user to interact with the elements of the virtual display. The purpose of this section is to increase the interest of the user (visitor to the virtual exhibition), the transition from passive perception of information to active understanding of the collection. The main elements of the interactive section are science quizzes, intellectual games, 3D animations (Fig. 3).

Biographical section. This section contains biographical information and portraits of scientists (Fig. 4).

Video materials section. Videos in this section are documentaries, archived videos, and / or popular science films. Viewing video materials is possible in various modes. All the necessary controls for watching video are also implemented. In addition to the provided video materials, the section of film documents contains links to publicly available video materials, if any (Fig. 5).

Photographic documents section. The section, as a rule, contains unique photographic documents provided by the participants of the project for the formation of a virtual exhibition (Fig. 6).

Fig. 3: Interactive section (by means of an example of the virtual exhibition “The Garden of Life”).

Fig. 4: Biographical section (by means of an example of the virtual exhibition “Forensical sculpture reconstruction”).

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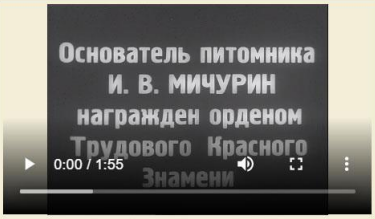
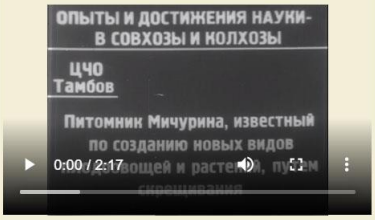
№	Название РГАК	Краткое описание	Год выпуска	Длительность
1	Совкиножурнал № 69\248.		1929	1 мин. 54 сек.
2	Социалистическая деревня №24.		1931	2 мин. 24 сек.
				

Fig. 5: Video section (by means of an example of the virtual exhibition “The Garden of Life”).

Fig. 6: Photographic documents section (by means of an example of the virtual exhibition “Forensical sculpture reconstruction”).

Digital library. The section contains publications on a given topic from the collections of various electronic libraries. Additionally, links to publications that are freely available on the Internet are provided. For publications that, for some reason, have not been digitized yet, bibliography are provided, allowing users of the collection to find and read these books in scientific libraries (Fig. 7).

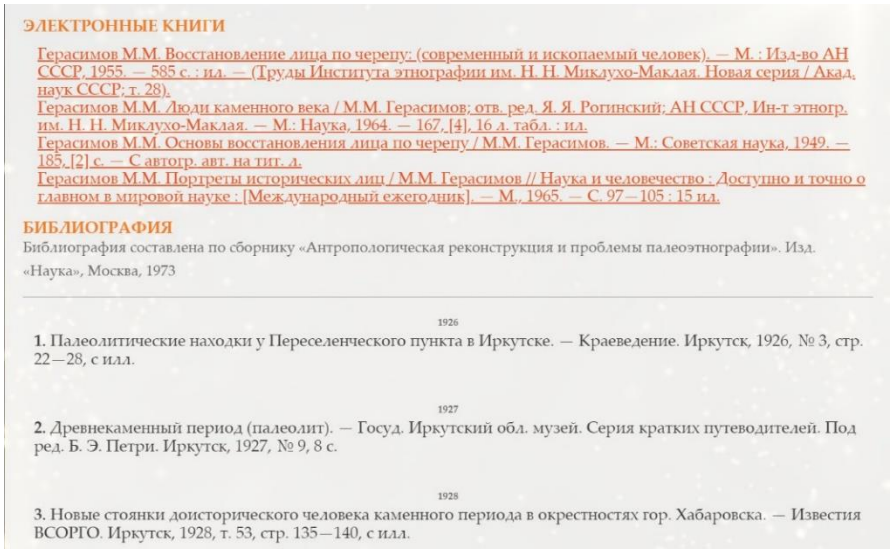


Fig. 7: Digital library (by means of an example of the virtual exhibition “Forensical sculpture reconstruction”).

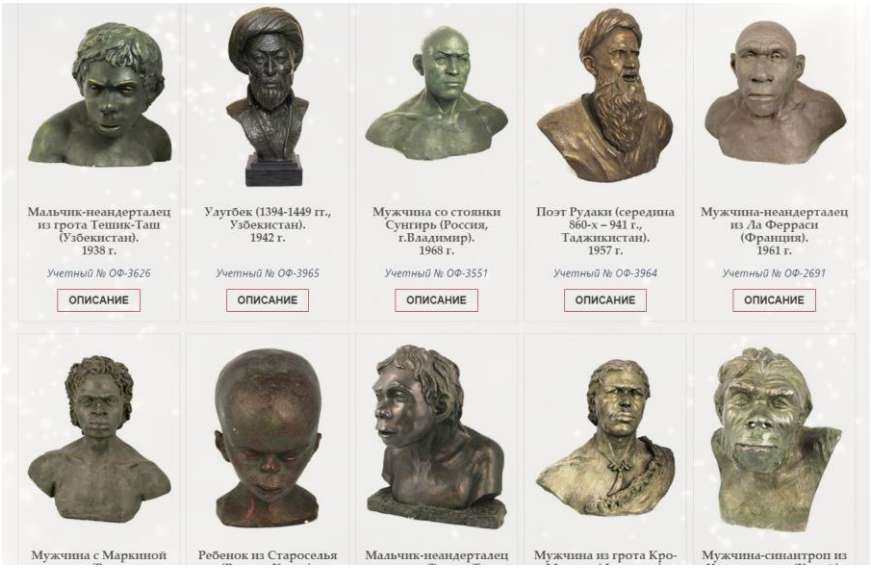


Fig. 8: “3D Collection” section (by means of an example of the virtual exhibition "Forensical sculpture reconstruction").

"3D Collection" section. The section is a gallery consisting of 3D models of digitized archival or museum items. The objects are digitized in such a way that the user of the interdisciplinary collection can examine the object in detail from all angles, "turning" the object (Fig. 8). "Rotation" is possible thanks to the developed means of representing 3D objects.

Reviews section. This section is created for feedback from visitors to the virtual exhibition. Here you can (after the obligatory registration) exchange opinions, make various reports on the subject of the exhibition.

Contacts section. This section contains the contacts of the administrator of the virtual exhibition for communication with him.

4 Conclusion

The described scheme of virtual thematic exhibitions is implemented on the platform of the digital library "Scientific Heritage of Russia" [6]. These exhibitions are dedicated to the 160th anniversary of the I.V. Michurin and the genetics development in the USSR (http://vim.benran.ru/) and the scientific heritage of M.M. Gerasimov (http://acadlib.ru/).

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