EXPERIENCES OF THE DIGITIZATION OF MUSEUM COLLECTIONS THROUGH TECHNOLOGY LASER SCANNING AND PHOTOGRAMMETRY FOR THE PROJECT «PORTAL OF CULTURE OF THE RUSSIAN FEDERATION»

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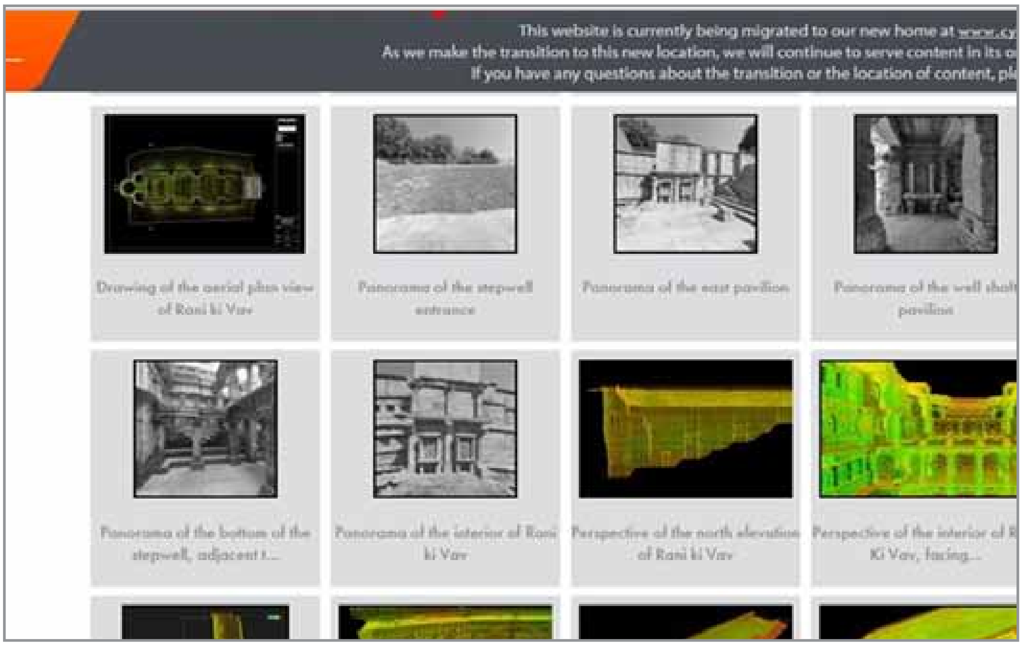

Fig.1. Example of description a culture heritage object RANI-KI-VAV (India) by project Cy-Ark-500.

The large-scale project of by Russian Department of Culture and IT company MEDIA-TREST (managed by the Department Historical Informational Science of Lomonosov Moscow State University) devoted to digitization of museum collections through technology laser scanning (Artec Eva) and photogrammetry (Agisoft Photoscan) is discussed.

Expedition Project of the Ministry of Culture involves working in 33 museums in Russia, located from Arkhangelsk to Astrakhan. The report will be discussed about the features of the organization of working process of laser scanning and photogrammetry museum exhibits, equipment, stages of work, and the very concept of a virtual museum.

Introduction

The brief report on large-scale project of by Russian Department of Culture and IT company MEDIA-TREST (managed by the Department Historical Informational Science of Lomonosov Moscow State University) is devoted to digitization of museum collections through technology laser scanning (Artec Eva) and photogrammetry (Agisoft Photoscan).

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The developers also relied on the experience of world famous projects of digitalisation museum artefacts. Among the best examples of 3D digital archives of museum collections are: CyArk-500 project [1], Virtual Hampson Museum [2], Digital Sculpture Project of UCLA University (USA), digital archive of the Museum of Natural History (United States, Idaho).

Project CyArk-500 involves the creation of virtual models of cultural heritage sites within 5 years and publishing of all 3D documentation. The company uses in its work laser scanners of its own production on the basis of its own technologies.

Another 3D digital archive is the Virtual Hampson Museum, developed by the Center of advanced space technologies of the University of Arkansas. The museum presents 3D models of artifacts, mostly obtained during the excavation of an archaeological settlement Naudin by Dr. James Hampson. Currently it is the world's largest full-featured 3D Museum of archaeological artifacts, which houses 442 different exhibits. Any visitor can consider in details the artifact from every angle and every detail and conduct any necessary research measurement. You can also download a model on your personal computer in .pdf or .obj formats and analyse 3D model in Adobe Reader (take measurements, create cross section, mark some comments to one of the part of 3D model) considering the deficiencies such as low poly 3D model and low texture resolution.

In March 2013 the company MEDIA-TREST cooperated with The Ministry of Culture has announced a competition of research works on the subject of software and technical tools implementation of 3D digitization of museum exhibits. Department of Historical Information Science Faculty of History (Moscow State University of M.V. Lomonosov) represented among authors by D.I. Zherebyateva offered a program of 3D digitalization museum artifacts and software based on technology of laser scanning (Artec EVA) and photogrammetry (Agisoft Photoscan) and software for render, demonstration 3D model in Web, PC and mobile device (Autodesk 3Ds Max, Adobe Acrobat, Object2VR, web service sketchfab, p3d.in and so on).

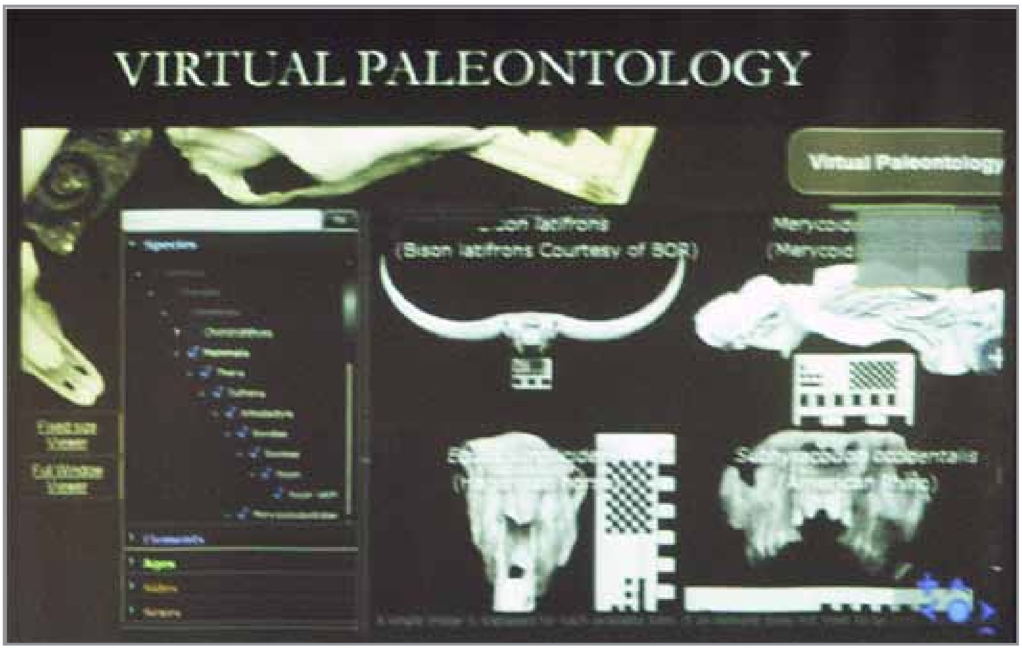

Fig.2. Digital archive of the Museum of Natural History (United States, Idaho).

As a result of the competition the program has been recognized as the best among the documents submitted and in the course of the working process in May 2013 a team under the direction of photographer R.V. Galaneva and staff and faculty of Moscow State University was formed, also including the students of the Department of Historical Informatics (Ph.D., assistant. D.I. Zherebyatiev, leading programmer Institute Belozersky S.V. Kokoleva, MA of the Department of Historical Informatics M.U. Demidov), Institute of Geodesy and aerial photography (MIIGAiK) teacher D.O. Driga and MA V.I. Morozova and D.V. Pashkovsky whose responsibilities included direct digitization of the collections of museum collections. It is worth noting that part of the project was a collective publication of the final result on the portal of a separate company, which the authors have provided the necessary files for publication.

Expedition Project of the Ministry of Culture involves working in 33 museums in Russia, located from Arkhangelsk to Astrakhan. The report will discuss t the features of the organization of working process of laser scanning and photogrammetric in museum exhibits, equipment, stages of work, and the very concept of a virtual museum. The aim of this project was to create virtual models of 2000 exhibits of museums.

For the digitization of museum collections has been selected three groups of equipment. First of all – photogrammetry and VR equipment:

- Camera Canon EOS 5d + Tripod
- Complete lighting equipment
- Photobox 90h90h90sm
- Turntable
- notebook
- IN Agisoft Photoscan 1.0.4.
- Second group includes laser skaner equipment:
- Scanner Artec Eva
- Notebook
- Software Artec Studio 9.0.

Third – software for Post-Processing 3D model, rendering and so on:

- Adobe Photoshop CS6
- Autodesk Mudbox
- Adobe Acrobat X
- Autodesk 3Ds Max
- Object 2VR

During the work the authors have encountered a number of difficulties:

- not all of the museum artifacts can be subjected to laser scanning;
- laser scanning technology (Artek EVA) does not reproduce the texture of certain materials (gold, glass, porcelain, pearl) good;
- photogrammetry technology could not cope with a complex shape geometry of the individual museum artifacts unlike laser scanner (Artek EVA);
- laser scanners does not capture subtle geometry objects (for example the monk fan);
- during the process of digitalasin museum artefacts appear uncaptured areas (dead zone) which are very difficult to be captured by camera or laser skaner;
- The laser scanner software Artec Studio 9.0. does not allow to build UV mapping of 3D model correctly that have complicated greatly the post-processing phase.

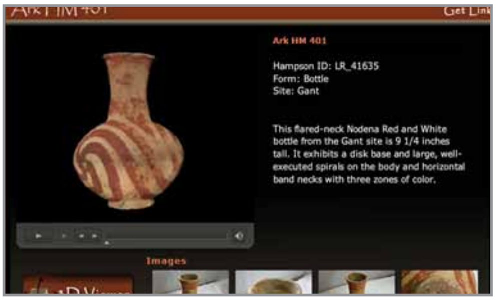

Fig.3.

Fig.5-6.

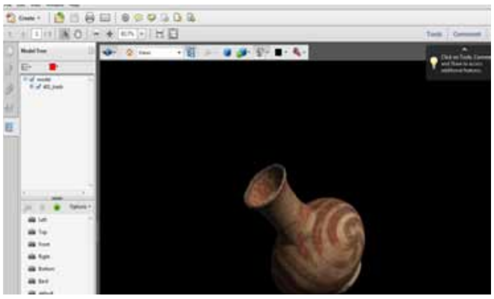

Fig.4.

Fig.7.

Fig.3. Example of description a museum artifact. Fig.4. Digital 3D model in PDF.

Fig.5-6. Example 3D digitized exhibits of the Museum of Religion (Saint-Petersburg).

Fig.7. Example 3D digitized exhibits of the museum of the East (Moscow).

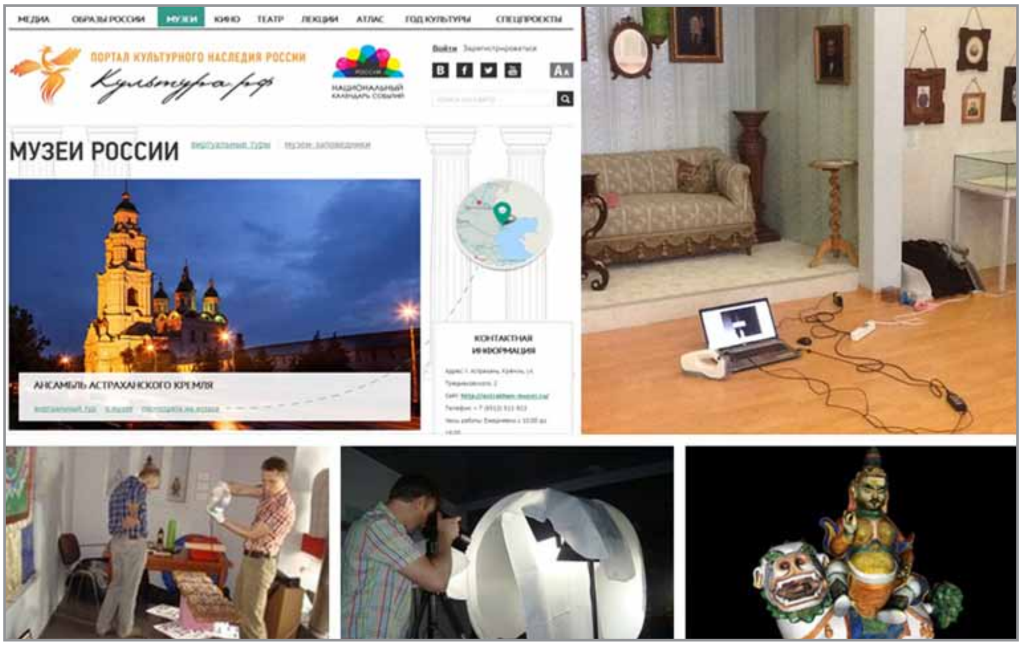

Fig.8. Stages of the project Portal of Culture for the 3D digitization of museum collections.

It is worth noting that during the project implementation the concept of the portal with 3D exhibits have been changing repeatedly depending on the technical complexity of another copmany which is directly responsible for the publication of material on the site. Fistly our team provided 3D model in OBJ format with texture to the company that planned to create web player for site and mobile device supporting 3D model. Web service of publishing 3D model by technology skethfab, p3d.in and anothers were big 3D data are not supported for archiving, also PDF format were rejected as formats for PC/MAC users. As a result, the proposed formats of the publication of 3D models have been rejected by the company MEDIA-TREST and as the core technology has been selected technology of virtual panorama – VR (Object2VR) which is planned to use only for 3D models demonstration without tools for analysis.

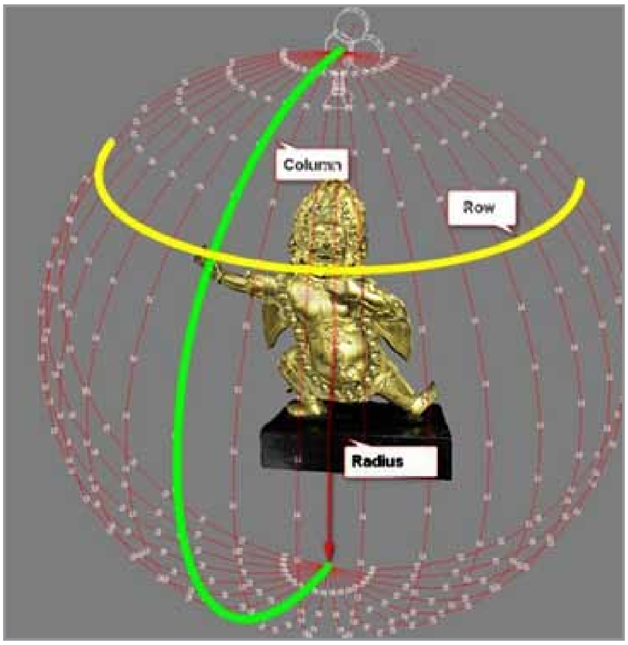

Fig.9. Examples Object2VR script for Autodesk 3Ds Max writed by programmer Klaas Nienhuis.

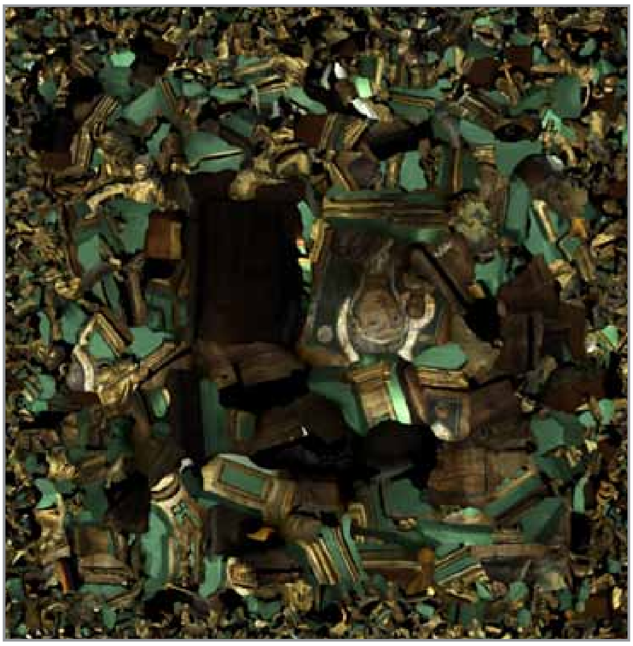

Fig.10. Example UV mapping texture created in chaotically algorithm.

References

[1] CyArk 500 [Electronic resource. URL: http://www.cyark.org/about/the500 (accessed 11. Feb. 2015).

[2] The Virtual Hampson museum. [Electronic resource]. URL: http://hampson.cast.uark.edu (accessed 11. Feb. 2015).