

THE CLASSIFICATION OF COMPUTER RECONSTRUCTIONS OF HISTORICAL AND CULTURAL INHERITANCE

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Abstract. Nowadays the amount of computer reconstructions increases, that why the identification of their common classification as the study of peculiarities of different types of virtual reconstructions and the methods of their creation become more and more popular. The purpose of the article is to elaborate general classification of reconstructions of historical and cultural inheritance on the basis of the analysis of computer reconstructions represented on the Internet. The main approaches to studying given problem became essential and content-related analysis and problem and thematic approach.

During the investigation two types of visual reconstructions (visual reconstruction of the object and visual reconstruction of the 3D-environment) and three types of virtual historical and cultural reconstructions (closed virtual reconstruction, exploratory or locating virtual reconstruction, projected virtual reconstruction) were identified. Identification of different types of computer reconstructions is meant to simplify orientation in varied virtual space and terminological communication of specialists, researchers and implementers of these spaces.

Keywords: history, virtual reconstruction, visual reconstruction, historical reconstruction, historical and cultural inheritance, information technologies.

1. INTRODUCTION

Majority of the virtuality researchers agree that the main peculiarity of the virtuality is its interactivity giving opportunity to the user to be active participant of the events, to influence loops and processes. Nowadays technologies allow to recreate virtual world perceptibly, to “immerse” it. We can feel ourselves as a part of virtual space, which works with all our feelings. It is possible to model almost all conditions, situations and lifetime of different worlds.

Kondratev in the article “*Technology – virtual, result is real*” points out that depending upon the character of interaction of person with virtual environment it is possible to speak about three types of such an environment: passive, exploratory and active. As the name implies in passive environment man is like a spectator: he receives information but can’t rule it. Exploratory environment allows not only to observe but also to move inside it. Active environment gives opportunity to interact it, changing it as you want (1997).

The market is full of great amount of computer reconstructions which are made on the basis of historical sources and which differ in technical performance and visual peculiarities, so the necessity of classification of visual and virtual reconstructions, studying peculiarities of their different types and their creation methods become more and more popular.

2. METHODS

Such common methods as analysis, synthesis and classification were used in the work and they allowed classifying visual and virtual reconstructions of the historical and cultural inheritance. The main approaches to studying given problem became essential and content-related analysis and problem and thematic approach.

Visual reconstructions are understood to be static 3D-images of objects, fixed in the space in one moment of their existence and which don’t push the boundaries of instantaneous image (*Museo Galileo Virtual Museum* n. d). Virtual reconstructions are understood to be the space with its own time, rules, and events. These reconstructions are “dissolved” into the longstanding time period and exist in immaterial space (Kajumovna, Andreevna & Vladimirovna, 2016).

3. RESULTS

Representing static 3D-projection of some object regardless of its size it is necessary to speak about “visualization”. We have an opportunity to examine this object all around and from different perspectives, to measure its geometrical characteristics, to see form material but we can’t use it, put it in motion or do something with it (inside it). For instance, we can see 3D-model of the building but can’t walk around its rooms.

It is possible to identify two subgroup among visual reconstructions represented on the Internet: “visual reconstruction of the object” and “visual reconstruction of 3D-environment”.

The best example of the first subgroup (visual reconstruction of the object) is the data base of Galileo Museum in Florence which is full of different mechanical devices, ancient tools and scientific tools (*Museo Galileo Virtual Museum* n. d). On the online-catalogue of the virtual museum user can get access to inventors’ biography, information about chosen object, glossary, photographs and visual models with explanations.

One more example of this subgroup is interactive portal “*The virtual museum of Iraq*”. Created for highlighting of main events of historical and cultural development of ancient Iraq, project is represented in three languages, in seven virtual halls where there are works dated Sumerian, Babylonian, Assyrian periods. Images, photographs, information about archaeological artifacts, maps and graphs are represented for review. Visual reconstructions of exhibits can be looked through live (n. d).

The *archaeological reconstructions of ensemble of the Solovetsky Monastery* (n. d.) and *Kilcolman Castle in North Cork* created in East Carolina University can be used as an example of the second subgroup (n. d).

If 3D-projection establishes itself in time space, does something actively it is necessary to speak about “virtualization”. When it comes to settlements (from hamlets to cities), in these virtual spaces it is possible to form a clear view of some buildings, importance of squares and streets. These “actions”, “processes”, “interactivity” (the influence of spectator) – objects’ interaction, the process of work of the objects – the main peculiarities, which differ virtualization (the object is dissolved in time) from visualization (object as entity). Such terminological

detailing can clarify interactivity and understanding of participants of the process of virtual and visual reconstructions creation (worlds).

There are three subgroups in the group of virtual reconstructions of historical and cultural inheritance: passive or closed virtual reconstructions; exploratory or locating virtual reconstructions, projected virtual reconstructions.

The passive or closed virtual reconstruction is a time bounded scene which finds room within the frameworks of video clip. Spectator has not got opportunity to affect on virtual world and can only follow virtual citizens' actions, virtual nature, events, and processes. The nature of such video clips can be divided into two areas.

The first area is local reconstruction, where recreated world is shown without story giving common view of this space. The examples are "*Altstadt Projekt (Königsberg)*" "*Über Altstadt Projekt* (n. d) which is set of video clips devoted to historical, pre-war building of Kaliningrad city and "*Lussonium*" project (n. d) created for city museum in Paks (Hungary). There are two video films in museum project: reconstruction of war camp dated Roman Empire and virtual 3D-reconstruction of small, well-made fragment of Roman statue. Reconstruction not only gives opportunity to visitors of the exhibition to see the statue but also shows its locus in the camp.

The second area is narrative or retrospective reconstruction, where we see sequence of construction, changing of the object, space. There are projects which can be used as examples: "*The build history of Florence Cathedral*" (Darmstadt University of Technology, Germany), (n. d) representing technology of gradual building of the cathedral and technical peculiarities of its building; "*Karnak*" (California University) (n. d) involving the work on reconstitution of 3D-models of more than 60 constructions (obelisks, temples, fencing walls, and others), allowing to observe the "growth" of the temples over time – transformed model shows "life" of the temple from the first ideas about its form till its contemporary state.

The second subgroup of virtual reconstructions is exploratory or locating reconstruction. Location is certain locating of something, it means also arrangement and position. This term is used in computer games and usually means certain part of virtual world of the game (level of game, maze and space). Computer model of historical and cultural

inheritance, where real space is imitated, can be named location. In location the move is possible with the aid of mouse pointing device, keyboard, joystick or other peripheral equipment. It (location) is able to interact with user, creating effect of physical presence. We can divide this subgroup into two areas too: the first (perimetral) in the parlance of gamers is usual browser games; in the second (cognitive) area user can build or change something.

The example of perimetral area is "*Historical and cultural inheritance of Yeniseisk town*" project (n. d). On the website it is possible not only to watch video clips with houses of worship reconstructions (The Epiphany Cathedral, the Resurrection Church, the gate church of Zachary and Elizabeth, etc.) but also to download the location for its future usage. One more project is "*Virtual reconstruction of Moscow Passion Monastery*" (mid. XVII – beg. XX centuries), (n. d) where the review of virtual reconstruction is accessible in the mode of augmented reality. In the framework of "*Lascaux cave*" French project it is possible with aid of mouse pointing device to walk across the ancient cave viewing primitive man's wall painting (n. d).

It is possible to put The *Virtual Paul's Cross Project* (n. d) down to cognitive area. Supplement of this visual reconstruction is audio accompaniment with different level of sound effects completeness: buzz of the crowd including from five hundreds till two and a half thousands people listening to the voice of John Donne, the preacher. The location in the square, the amount of people can be chosen during listening to the discretion of the user.

The third subgroup is "projected virtual reconstruction" which can build on the volume around us as if the space exists then and there and we are connected with the unfolding process. We have opportunity to observe it, moving around it and orienting ourselves in it. This subgroup of virtual reconstructions can be divided into two elements: static and operative (complex sensory) reconstructions.

In the static reconstructions user exists inside fixed, inactive space. For instance, in the *Domus Aurea (Rome)* there are archaeological remains of ancient Roman villa, founded beneath the palazzo (n. d). The peculiarity of the exposition is that reconstruction of 3D-interior of the house with original painting of walls and columns and mosaic of the ceiling is projected on the preserved surface (the real space is conserved as it was found).

Projection of the reconstruction helps to see and understand which the interior was.

Among operative or complex sensory reconstructions there are holograms. For example, “*Le Roc aux Sorciers*” (n. d) excursion center presents 25-metre 3D-facsimile of border of ancient cave. Full size electronic copy with painting and engraving recreates original texture and color of the stone; shows the variants of the light impact on sculpture and scenography’s elements in different hours of the day.

4. DISCUSSIONS

The 3D-modeling technology usage has begun since 1990-s. The most noticeable research projects were connected with virtual reconstructions of the Great Temple in Petra (Jordan), Sazaedo Buddhist Temple, Vatican Palace of the Renaissance era, and others. Studies with the usage of 3D-technologies were conducted in Germany, Poland, Italy, Great Britain, Switzerland, and France (Steuer, 1992) (Ryan, 1994) (Visnovcova, 2001). Practical studies by Russian researchers in the sphere of virtual historical reconstructions appeared only in the middle of 2000-s, when researchers started to reconstruct fortress of Ilurat, Tambov, and others (Borisov, Goroncharovsky, Shvemberger & Shcherbakov, 2007) (Zherebyatiev, 2007).

Outstanding modern foreign centers working in the sphere of creation of reconstructions of historical and cultural inheritance are *Darmstadt University of Technology* (Germany), Center for Old World Archaeology and Art, Brown University (USA), “*The Urban Simulation Team at UCLA*” company, and others. In Russia there are also some centers using virtual technologies in historical researches and learning environment (Department of History of Moscow State University, The Bonch-Bruevich Saint Petersburg State University of Telecommunications, Saint Petersburg State University, Tambov State University, Kazan Federal University, Ural Branch of the Institute of History and Archeology of the Russian Academy of Sciences) (*Virtual reconstruction of the Moscow Monastery; Virtual reconstruction of the Old Ladoga; Settlement monuments of the indigenous population of the Middle Ob; Razuvalova, Nizamutdinov, 2015*)).

But despite the fact that there are great amount of such research and that the actuality of the problems of virtual reconstruction of historical and cultural inheritance increases the universal system of the

classification of computer reconstructions hasn’t been elaborated up to date.

5. SUMMARY

Reconstructions of historical and cultural inheritance represented on the Internet can be divided into two big groups: visual and virtual. Visual reconstructions include reconstructions of singular and 3D-objects. Virtual reconstructions are more varied. Among them, there are closed virtual reconstructions including local 3D-reconstructions and narrative (retrospective) 3D-reconstruction; exploratory or locating virtual reconstructions including perimetral and cognitive 3D-reconstructions; projected virtual reconstructions including static and operative (complex sensory) 3D reconstructions.

6. CONCLUSIONS

Given classification of computer reconstructions shows that this product is really varied based on both technical properties and the level of its perception. Visual and virtual reconstructions of historical and cultural inheritance are essential part of modern archeology, architecture, history and museum studies. Modern technologies allow recreating in the details as cultural monuments so products of folk crafts, textile and even people. Owing to computer reconstruction archeology, architecture and history become more understandable and subsequently more popular.

This work suggests classification of computer reconstructions including two main groups of visual reconstructions (visual reconstruction of the object and visual reconstruction of the 3D-environment) and three groups of virtual historical and cultural reconstructions (closed virtual reconstruction, exploratory or locating virtual reconstruction, projected virtual reconstruction), which of them includes two different areas. Identification of different types of computer reconstructions is meant to simplify orientation in varied virtual space and terminological communication of specialists, researchers and implementers of these spaces.

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