

# 3D Reconstruction and Digital Visualization of the South of the Royal Palace in Great Preslav

Tsvetanka Boneva, Severina Yorgova

Regional Museum of History – Shumen, Bulgaria

**Abstract.** The report presents the film 10<sup>th</sup> century. The South of the Royal Palace in Great Preslav. It consists of two parts – 10<sup>th</sup> century. The Royal Palace in Great Preslav. The Square with the Pinnacle and The Ruler's Lodgings. 3D and virtual reconstructions of an architectural ensemble – part of the Preslav Royal Court unearthed during archaeological researches are used in the film. 3D documentaries have already gained popularity around the world and are well received by both scholars and the public at large.

One of the distinguished tourist destinations in Bulgaria is Great Preslav – capital of the mediaeval Bulgarian state and a significant cultural center of the European Southeast in 9<sup>th</sup>–10<sup>th</sup> centuries, too.

The first part of the film is created with the financial support of America for Bulgaria Foundation and the second – with the funding of Bulgarian National Science Fund at the Ministry of Education, Youth and Science. A team of almost 20 members worked on the film, including computer specialists, professional actors, and translators in the four main European languages – English, German, French and Russian, Trima Sound Recording Studio.

In the first part of the 3D film are shown a segment of the Royal Palace, the square with the water pinnacle and the adjacent buildings – an important structural element of the town-planning of the Preslav Court center in the 10th century.

In the second part the accent is the southern part of the Royal Palace in Great Preslav, where the personal residence of the Preslav ruler's dynasty is situated. The work on the virtual reconstruction was done by Virtual Archaeology club at the Mathematical School, Shumen. Due to the efforts of its members it is now clear how the square in front of the southern gate looked like.

**Keywords:** 3D Visualization, Archaeological Site, the South of the Royal Palace in Veliki Preslav

## 1 Introduction

The new information technologies entered the field of preserving immovable cultural heritage. The first European conference on virtual archaeology was held in Italy in 1998 and the reports were published in the special series [1]. These technologies introduce new possibilities for their presentation and popularization. With the purpose of attracting the interest of the general visitor, it is necessary to restore the supposed

shape and size of the construction or the architectural ensemble. Thus every visitor can get better notion and perceive easier their cultural and historical value. These technologies offer us a new type of restoration – *virtual reconstruction* [2]. Three-dimensional models are the way to visualize our monuments without any intervention in their authentic appearance. Besides, virtual models can be displayed not only on the PC monitor, but on video walls, which could approach the image to the real perceptions of the observer. 3D modeling of monuments has an important role for the preservation of the cultural and historical heritage. With the assistance of this technology can be restored what was only in the plans and explanations of the archaeologists. It could not replace the “real picture” but it is a magnificent alternative. By means of computer restoration archaeological monuments are displayed in a three-dimensional version. The virtual reconstruction is a precise recreation of the appearance of a given sight based on preserved remains and usage of the available archaeological information, as well as of the surrounding or the historical epoch, in which the monument existed. Applying this method of representation of the cultural and historical monuments is a question of economical availability. This is also a means of popularizing our historical sites through internet communications. A new, unknown so far medium is created, which draws architectural-historical and archaeological sights nearer to the public. The virtual restoration helps the imagination of the visitor with the perception of the monument. Strong impact is achieved with the combination of images of the model with photographs of the current state of the archaeological remains from the same point of view. (Fig. 1, Fig. 2)



**Fig. 1.** The Preslav water pinnacle being unearthed



**Fig. 2.** The Church on the Square with the Pinnacle. Situation after the Excavations

By means of 3D models and digital visualization each monument can be a site of virtual visit. The process of computer visualization can be divided into a number of stages.

The first stage is collecting information about the sight, which includes sketches, photographs, analysis of the current state of the monuments and the environment in which they existed, construction technology and the materials used for them. This stage is particularly important for the 3D visualization in view of the fact that it defines the quality of the reconstruction that is carried out.

The second stage is defining the general notion and concept of the reconstruction, its scale, the way of visualization and the sphere of distribution. At this stage the technical and program basis of the virtual reconstruction is formed. It requires determining the objective and type of visualization in advance. The options here are several:

- single images of the three-dimensional sight,
- animation,
- virtual interactive walk inside the building.

The third stage could include the process of executing the virtual restoration and its finalization as a documentary.

By making documentaries better possibilities for perceiving the monuments are revealed. Through motion in the interior and around the virtually restored monument, the visitor could get a complete idea of its proportions, size and impact. Appropriate shorter or longer films can be shown on displays, installed in the area of the archaeological site or on larger screens in the museum to it. They can be broadcasted as an advertisement of the sight on TV or in the internet or distributed as digital storage media for popularization of the sight, offered to the visitors respectively. Making animations requires time and resources and it is usually the result of the efforts of

large teams of specialists. It is necessary to work out preliminary scripts, to have detailed description of the effects and the motions which will be realized.

## 2 Project Description

One of the distinguished tourist destinations in Bulgaria is Great Preslav which was the administrative capital of the mediaeval Bulgarian state and a significant cultural and spiritual center of the European Southeast in 9<sup>th</sup>–10<sup>th</sup> centuries, too. In 2011 a project was won and a grant was disbursed by America for Bulgaria Foundation. Thus the work on visualization of the historical monuments in Veliki Preslav was started. The opportunities of 3D projecting were used to assist archaeology. The product that was used is 3DsMax 2011. this program is with large graphic possibilities and with its help it is possible to model, texturize (to place materials on the surface of the objects), to stimulate physical processes (rain, water, motions evoked by the wind, water, gravity), to animate cameras, sights, materials and simulations. This product was bought for the virtual archaeology club. The archaeological monuments unearthed so far and the modern technologies helped making a computer restoration of architecture, town-planning and town development and presenting in details the way the southern part of the Royal Palace in Veliki Preslav looked like [3]. The film is named *The Royal Palace in Great Preslav. The Square with the Pinnacle*. In 2012, with the support of Bulgarian National Science Fund at the Ministry of Education, Youth and Science work on the second part of the film began – *The Ruler's Lodgings*. In this 3D animation are shown part of the Palace, the square with the water pinnacle and the buildings attached to this square – a significant composition element of the town-planning of Preslav royal palace in the 10<sup>th</sup> century. The architecture, the town-planning and the town-development are a high expression of the urban thought and practice of Mediaeval Europe. This area has been a subject of special construction attention – the builders have accomplished impressive plan composition, strongly influenced by the Byzantine construction tradition. (Fig. 3)



**Fig. 3.** The Square with the Pinnacle

The highly stretched fortress wall, together with the gate forms the borders and has an effect both over the situation and the planning of the construction works. In this space a several monumental buildings tower. Amongst them are representative edifices, an exquisite cross-domed church, the magnificent and one of a kind water pinnacle, the residence of the Preslav royal dynasty with the office and the personal palace of the ruler's family. The information from the archaeological researches and the evidence of Byzantine authors on similar monuments in Constantinople are used for the 3D models of the buildings. They helped to appraise what was inside the Court complex, what were the size and position. (Fig. 4)



**Fig. 4.** The South of the Royal Palace

The curtain walls and turrets are presented on a scale so that the real dimensions can be assumed and the tourists could easily perceive them looking at the computer restoration. The visualization shows massive fortification works such as the walls reaching a height of 15 m. A special program is used for the calculation of the height based on the width of the foundations. This is a new, but very effective method. (Fig. 5)



**Fig. 5.** The Southern Wall of the Royal Palace

The work on the virtual reconstruction was done by *Virtual Archaeology* club at the Mathematical School, Shumen, headed by Svilen Rusev who made the 3-dimensional images of the unearthed architectural sights. Due to the efforts of its members it is now clear how the south of the Royal Palace in Veliki Preslav looked like. The archaeological researches clarify the plan of the buildings at a ground level or negligible fragments of the over-ground construction. Such remains are of great use to the archaeologists and scholars, but are hardly comprehensible for the general visitor and this is balanced by the documentary that was produced. Part of the film will be available on the web-site of the museum. Thus the result of the project covering long years' archaeological researches will be easily accessible through the internet and will popularize Veliki Preslav National Historical and Archaeological Reserve.

### **3 Conclusion**

Bulgarian cultural-historical tourism is a factor which gives new opportunities for the development of the museum system [4]. It depends on the museum specialists to prove the place of our unique monuments on the world culture scene because we are privileged to live in a land that had always contributed to the achievements of human civilization. A large part of these monuments were destroyed through the ages. By means of new technologies the Bulgarian archaeological heritage is getting available not only in Bulgaria but all over the world. With their assistance the concept of the

past is clearer and more attractive and the historical sights are understandable for the visitors. With the visualization of the monuments, the museums – an indisputable factor in the system of the cultural tourism – will turn our historical heritage in a tourist attraction.

Due to the well developed modern information technologies, today we have great opportunities to make the large number of cultural-historical monuments in Bulgaria more accessible and more interesting for the general visitor.

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