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3D ELECTRONIC MODELING OF ARCHITECTURAL PARK COMPLEX OF COASTAL AREA IN SARAPUL

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Abstract: In the article herein the application of cultural and historic heritage as image in environmental design was considered, as well as a usage of up-to-date tools for 3D computer-aided modeling while designing electronic model of architectural park complex was reviewed.

Keywords: Russian wood architecture, architectural park complex, CAD systems, 3D geometrical modeling.

Ever-growing development pressure is one of the main factors having an adverse effect on mind of modern urban man. Animate nature areas such as public gardens, avenues, sports-grounds, etc. arranged in the city assist in cushioning of adverse impact [2]. Aesthetic design solution of this environmental space may be found in cultural and historical heritage of the cities having wood architecture traditions. Natural materials and warm true colors of wood constructions create an atmosphere favoring calm repose. In addition, it should be noted that preservation of historical and cultural image of wood Russia within space designed contributes to the matter of great concern, i.e. spiritual renewal of Russia.

Long before stone constructions appeared, a lot of architectural forms were designed of wood as the most available construction material (Figure 1). It was wood architecture where many building and composite techniques, which satisfied natural and climatic conditions and artistic and aesthetic sense of people, were worked out [1, 4]. In order to determine dimensions of future constructions Russian carpenters developed a system of measurements which was closely related to average dimensions of human body. Speaking a language of modern design we may say that all architectural forms of Russian wood constructions met ergonomics requirements. Later on methods of proportions worked out in wood architecture were passed into stone one [5].

Modern procedures of wood architecture research and use of the research results in contemporary environmental design is unconceivable without active application of 3D geometrical modeling software. High-grade 3D electronic rendering of environmental objects provides at any stage means for making an assessment and introducing timely changes in space arrangement with due account of unique color and historical distinction of its location. Moreover, it is a matter of no little significance that electronic geometrical models of environmental objects may form primary initial data for issuance of technical documentation in practical implementation of the projects. Let us consider an example of design concept of a part of *Sarapul* quay.

Sarapul is one of the oldest towns at *Kama* river. In the description of *Sarapul*'s emblem there is the phrase as follows: "In silvery field upon a high mountain there is a wooden log town thanks to which this place is worthy of notice" [3]. Situated on the side of *Startseva* mountain *Sarapul* was built as defensive fortification at *Kama* river. These are quays that were a face of the town. Taking it into consideration a special concept was developed for arranging recreation area at quay using wood architectural composition.



Figure 1: Watchtower in *Belskoe* village (end of XVII century)

In this case selection of software for 3D electronic modeling was determined due to composition highly packed with elements of wood architecture. This assumes a great number of small structural elements such as trusses, bars with various section, boards, carved balusters, etc. that required to use software with good tool sets for geometrical construction. Hard CAD systems suit well these purposes, since they have powerful toolset for parametric modeling and photorealistic imaging of proper quality.

The concept of front-end engineering design consists of related set of environmental objects according to selected style of Russian wood architecture (Figure 2).

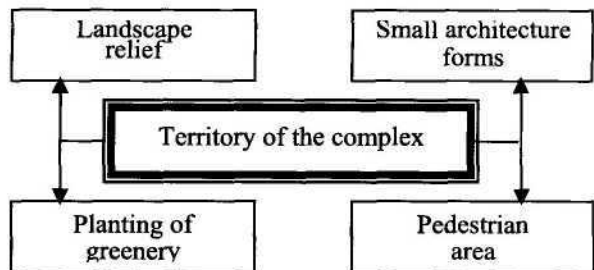


Figure 2: Concept of front-end engineering design

Expressiveness of overall environmental complex shaping is provided by stepped land form, alteration of high and low volumes, roof of various constructions and arrangement of the objects to be designed at different height.

Landscape relief.

The landscape features artificially created relief with three-level difference reinforced by retention walls with radial-wise lines. Between them there is an artificial pond with curved

wood deck, benches, carved bridges and steps at the relief difference.

Pedestrian area.

Away from entrance lobby there are two parallel avenues paved with cubes. Paths are curvilinear; they skirt a group of trees providing continuous change in distant views of watery waste.

Planting of greenery.

Trees are arranged by groups by two to three plants of different age. This structure of planting does not interfere with a view of water pool; moreover, it enchases and accentuates opening-up views and forms open glades as well.

Small architecture forms.

Small architecture forms in design concept as proposed are open space patterns of different species of wood: pier, light shaded shelter, above-water watchtowers and arbors (Figure 3).

Entrance lobby is arranged in the form of open framework with carved fence.

After 3D electronic model of landscape and architectural park complex had been completely developed, some photorealistic images were generated. Application of specialized software such as 3D-MAX for these purposes in the project was handicapped by great number of small modular elements. Therefore, the images were generated within CAD system software environment that considerably sped up the project to be worked upon (Figure 4). Moreover, a photorealistic image of satisfactory quality was made.



Figure 3: Small architecture forms of the project

The project of architectural park complex of coastal area in Sarapul as proposed above is an example of build up design concept which assumes combination of historical and ethnocultural features of the *Kama* region, wood architecture traditions and modern computer aids for 3D virtual modeling.



Figure 4: Photorealistic image of design concept of architectural park complex in Sarapul. View from water pool

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