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CREATION AND ANIMATION SCHOOL OF STRING CONSTRUCTION BRIDGES

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Owing to rapid development of global economy, and thus significant number of road investments in both Poland and the world such engineering constructions as bridges are common sights. Nearly every day we walk or drive over a bridge. Their role is undisputable, they serve a dual purpose of facilitating journeys and enabling fast trade exchange . Thanks to technology development, contemporary engineers delight us with unusual slender string constructions, created with modern materials in order to overcome difficult and several-kilometer-long obstacles. Bridges constitute a vital part of building space, and should therefore be the subject of investigation to determine the appropriate design, in terms of construction, as well as aesthetics. These arguments led to the fact that this type of construction was chosen to be the main task when teaching future civil engineering engineers.

That economic development, mentioned before, facilitates the dynamic development of information technologies. The innovative computer software generates, in turn, the rapid development in every field of life. Naturally, the aspect of geometric spatial modeling is included in the scope of our interest. Every day we observe the increase in implementation of cinematographic virtual images or those formed during the creation of computer games. While conducting Visualization of Buildings classes with the eighth semester students of the Faculty of Civil Engineering we chose 3ds Max. In this program, as we know, a number of animations and videos have been created, among others, Polish 'Cathedral'. However, it is most often used to visualize architectural objects. Also the problem of simulation and animation which can be achieved with this tool is interesting.

3ds Max is a very extensive program, and therefore it has many techniques to create the individual elements of the structure. Each element can be generated in several ways depending on the final destination of that model. The opinion on 3ds Max is often heard that the program is very complicated and difficult to operate and so some beginners in the field of visualization choose simpler programs like SketchUp. Nevertheless the truth is completely different, because to perform basic model in both programs almost the same amount of time and skills is needed. The difference

and gap which differentiate models made in both programs can be seen when we want to get better visualization results. Significant impact on the quality of the model and subsequent reception of visualization is created by accuracy, the amount of detail and texture quality. These elements make the models created in simpler programs reach their limits and not be able to meet the expectations and the effects of a designer. Despite the possibility to import such a model to other more advanced one, it is completely unsuitable for processing and any modification, which is often associated with the creation of the model from scratch.

As mentioned earlier, Max is so extensive a program that it is impossible to present and then show all of its features during the 30 hours of laboratory classes. Therefore, the selection of individual issues was made. Priority was granted to the tools which are most commonly used in architectural modeling, i.e. the most useful and versatile ones. The basis, of course, was students' acquisition of 3D modeling skills using such techniques as extrusion, polygons modeling, Boolean operations etc.. In the case of bridges, which are located over various obstacles, much attention was also devoted to terrain modeling. In the next stage we dealt with the design preparation for visualization and animation of objects and views. The knowledge was supplemented by the issue of creating and texturing as well as lighting of the scene. For the day mode a daylight system was used, while simulating night lighting photometric light was used, configured according to different profiles. It was also significant to show how to create and customize your cameras for future rendering and animation. It is worth mentioning that Mental Ray engine was used for the renderings, and therefore the materials which go well with it were utilized.

The students had extensive lecture on the principles of operation of string arrangements in bridges, on the structures i.e. rigging systems, pylons, supports and common building materials before laboratory classes. Also numerous examples of these types of objects carried out in Poland and in the world, along with architectural and construction drawings and visualizations created at the design stage were presented. During the presentation the aims and formal requirements of getting credits from these classes were gradually discussed. After the lecture, the academics responded to various questions about the technical and engineering issues, software-hardware ones, as well as organizational matters. The students liked the idea of selecting a designing example of the project, which was worked on during the laboratory classes. They even suggested organizing a competition for the best visualization at the end of the semester.

Architectural modeling of each building structure also requires presenting it in a virtual space, which is a real representation of the environment where it is to be realized. At the stage of computer modelling it can be already predicted how this building will fit in with the surrounding natural or urban landscape. This allows for multiple possibility of changing the decision on the applied design structure or shape of geometric form of individual elements of the object.

It is worth mentioning that for designers and constructors, a digital model implemented in a computer program used for 3D modeling is a valuable source of information. The designed structure

can undergo a detailed analysis of its operation, using a specific scope or using different types of materials and thus, it facilitates making the most optimal decisions.

Nowadays, we are witnessing a kind of rivalry in the execution of architectural objects. The newly established projects are bigger, better both structurally and technologically than their predecessors. The use of computer methods stimulates imagination and consequently is a drive for creativity. [7]

But getting back to the very object - the bridge – basically it has one task which is to lead the road over an obstacle. It would seem that it has only the requirements concerning its structure. This makes it possible to achieve a purity of form unrestricted by nothing but construction. Why have we chosen bridges of string construction to achieve the didactic objective? Bridges can be included in this group of modern buildings which spectacularly embody the support structure. This architecture seems to be an example of a model of extracting the plastic shapes, revealing qualities of materials and the play of forces in the exposed structure. The modern suspension and cable stayed bridges seem to confirm Schopenhauer's thought that "purely architectural" means the same as "structural". [5]

Fig. 1,2 Visualization of string construction bridges made by eighth semester student of the Faculty of Civil Engineering within Visualization of Buildings classes.

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