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COMPUTER TECHNIQES AS A BASE FOR THE DEVELOPMENT OF GEOMETRY OF COMPLEX SHELLS

Descriptive geometry is taught at the Faculty of Architecture and Civil Engineering at the first year of studies, during the first semester. The scope of issues, which students should learn, covers the problems of axonometric projection , basic constructions in Monge's method of projection, marked projection and polyhedron transformations. Additionally, at the Faculty of Architecture, the knowledge of surfaces including Catalan's surfaces is required and a part concerning roofing of objects with the problems of designing roofs of flat slopes. A graduate of geometry course is skilled at solving basic geometrical problems, which he/she as future engineer would encounter in his/her professional career. However, a question should be asked if this knowledge is sufficient in contemporary world, where forms of building objects do not resemble simple polyhedrons, which can be exemplified by e.g. Santiago Calatravę's works (Fig. 1).

Fig.1 Mileaukee Art. Museum projekt Santiago Calatravy, the state of Wisconsin, USA.

The number of classes that we currently have obliges us to give up many geometric issues and thus resulting in a fact that descriptive geometry is becoming niche subject, perceived as not interesting one and quite often in students' opinion not necessary. This is wrong opinion and completely misunderstood. As it is known, it is the geometric shape which becomes architectural and constructional medium of the world, that is, due to computer techniques, constantly developing. Therefore, within this number of teaching hours we are able only to give students basic information on space geometry, 'stealing' many interesting new geometrical issues from them.

Current science and technology offer many tools thanks to which it is possible to present how to use descriptive geometry at modeling constructional object. It also indicates the necessity to run a course within the curriculum, which would discuss the issues of designing problems of complex geometrical forms. It is especially needed at the end of studies, when students have already gained knowledge on steel and reinforced steel constructions as well as mechanical issues and strength, and therefore they know materials and can predict operation of a given construction. It should enable him/her to be well prepared for designing modern forms, which are presently being created.

The course would covered issues concerning creation of Bezier, B-spline (Fig. 2), or Nurbs curves, showing how on their basis it is possible to create complex shells. It would also determine work in computer programs for 3D modeling (Fig. 3), which are essential from the point of view technical development, since in a very short time the knowledge on geometrical issues and the tools for their creation will become a norm.

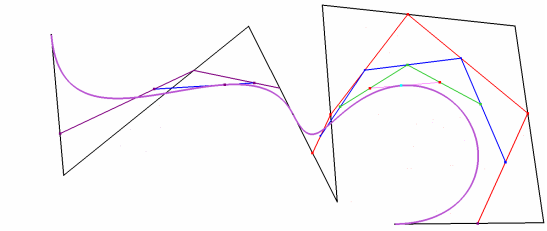

Fig.2 Curve B-Splines geometric construction program Cabri II Plus

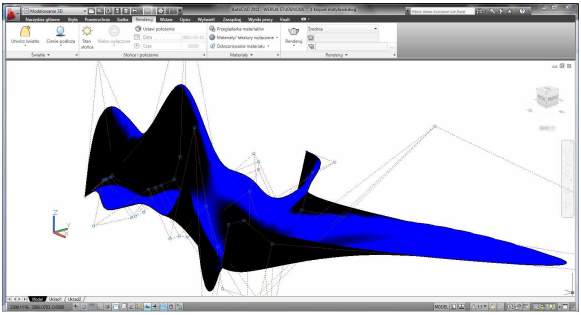

Fig.3 NURBS model of spatial shell program Autocad 2011.