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COMPUTATIONAL GEOMETRY – AN OVERVIEW

Keywords: *advanced geometry; generative design; algorithmic design; didactics.*

Introduction of the informatics technology into the architectural-urban discourse had opened for designers new, so far unknown horizons and possibilities in space arrangement. Advancement in this technology grows exponentially year after year, giving designers newer and more sophisticated tools. Variety of digital solutions aiding design process which are available for architects is slowly becoming so huge and specific, that the layman faces a great difficulty in finding the most proper, effective and accessible tool for successful implementation. As a result of the change occurring in the domain – translation from manual, traditional to the digital and virtual and soon inevitably to the holographic and immersive drawing board – it is necessary to introduce digital design in the schools of architecture and to familiarize young minds with this uneasy and rather complex art of digital creation.

Facing the (digital) spirit of time the Department of Digital Technologies in Architecture and Urbanism is incarnating the theory into practice, giving its students the possibilities to get to know the new design methods in possibly wide spectrum – starting with techniques that could already have been called "classic", through more advanced till exceedingly modern and progressive methods of algorithmic, parametric and generative design. Systematics of the didactic activity could be classified in following manner, within three basic groups: "G0. Regenerated geometry", "G1. Generated geometry", "G2. Generative geometry". Fourth component is the experimental activity conducted by the team members as part of their research projects – which in that case would be excluded from this paper, which would focus on describing first three in more detail.

Group G0 covers implementation of basic computer techniques: rules and drawing geometry in Autodesk AutoCAD (digital drawing board), as well as basic 3D modeler – Trimble SketchUp. Those activities are held during the first year of studies. The aim is to familiarize students with basic tools and to establish necessary rules and principles for working in digital environment.

Group G1 covers lessons in advanced 3D modelling, which are held under the codename "(re)constructions". Started as early as in 2000 the leitmotiv covers digital reconstruction of historical buildings –tenement houses at Piotrkowska Street or monuments of wooden architecture

located in Łódź and nearby. In recent years reconstructions are performed in Autodesk 3dsMax, which helped to model numerous interiors of famous palaces in Łódź, the building of the Credit Company at Pomorska Street, as well as the facades of the great Poznanski Palace at Ogrodowa Street. This years (2016) theme is the old Reihold Richter's Villa – currently Lodz University of Technology Rector's Office. Reconstructed object is divided into working parts with similar complexity level (fair play rule) and assigned to the student groups. At the end of the semester, all models are joined into one representing the effect of the reconstruction.

Group G2 covers extended didactic activities in the generative (parametric, algorithmic) design domain, which means design based on the user-composed algorithmic logic, which makes the foundation for object creation. For the Institute of Architecture and Urban Planning, the first tangent point with this modern technology was the P.3 Workshops led by Sebastian Białkowski and tutors from Bauhaus in Dessau. Workshops led to the fabrication and construction of the biggest parametric pavilion in Poland. The seed was planted and the continuation was the P.3.2 Workshops, which resulted in several designs for the student common spaces scattered across the Institute's building.

In 2015, within the Department of Digital Technologies in Architecture and Urbanism, the workshop team FABRIC<action> was created. Its purpose is to organize open workshops, which would familiarize participants with the ideas of parametric design, as well as digital fabrication and rapid prototyping (CAD/CAM). First edition of those workshop, codenamed "DigitalKnitting", was held at the turn of September and October 2015. Mini-workshops organized together with RabbitForm – 3D printing group – under auspices of Marshall Office in Łódź during the Design Thinking Festival (21 – 22.05.2016) were the announcement of the second edition under F<a> flags. Remodelling of public spaces is the leitmotiv of the forthcoming edition, which fits well in the revitalization process currently affecting the city, in the same time indicating the way to approach this complex matter with the help of non-standard geometrical environments. Balancing on the edge of architecture, art and urban sociology is the starting point for the participants.

Incorporation of different media and means of expression frame the experimental side of the G2 didactic group. It consist of e.g. responsive 3D light mapping (NYwhale project), implementation of mechatronic elements in responsive design, as well as development of the digital fabrication space.

Undertaken didactic actions, which are caracterised by its wide spectrum of utilized information technologies, are necessary and essential in the learning process of the new architect, who can take advantage of modern technologies and adapt to changing environment. Common access to the advanced technology demands its understanding or at least basic knowledge and acceptance. Integration of design and manufacturing processes (CAD/CAM), as well as spectacular development of rapid prototyping techniques forces universities to introduce and put more emphasis on practical aspects of architectural occupancy. That means such a construction of the studies programmatic

backbone that would allow young adepts to get to know, understand and empirically experience the whole creation process – from the concept through design to the ultimate realization.

Fig. 1 Digital model combined with a conventional photographic image