Contemporary Renaissance Architect - Yet Architect?

Anetta Kepczynska-Walczak
Institute of Architecture and Urban Planning, Technical University of Lodz, Poland
http://www.arch.p.lodz.pl
anetta@p.lodz.pl

Abstract. This paper is a contribution into domain of Generative Design and Digital Aids to Design Creativity. The outcomes of two workshops for the fourth and fifth year students of architecture are presented. The workshops allowed to draw particularly interesting lessons leading, in consequence, to more general reflections on questions such as the limits in design creativity versus unexpected outcomes calculated by a computer, the gap between boundless possibilities offered by digital design tools and real practice in building construction. And finally, how advanced research results can be incorporated in teaching. This is particularly important, as nowadays students, to become successful architects in the future, not only will have to be good in using CAAD software but also in programming and software development.

Keywords: Generative Design; Digital Aids to Design Creativity; CAAD Curriculum.

Introduction

An architect – the main hero of one Kurt Vonnegut’s novels entitled ‘Timequake’ – broke down when a new CAAD software had been launched. The software named ‘Palladio’ produced buildings of any kind at one button click...

Nowadays CAAD technologies dominate not only in drafting, visualization and animation. Moreover, they have started to play a key role in generation and optimization of the design, which until recently, despite CAAD dynamic development, was perceived as ‘analogue domain’ of an architect.

Generative design approaches have emerged from the search for strategies to facilitate the exploration of alternative solutions in design, using computers as variance-producing engines to navigate large solution spaces and to come up with unexpected solutions (Negroponte, 1970). In generative design, algorithms are often used to produce an array of alternative solutions based on predefined goals and constraints, which the designer then evaluates to select the most appropriate or interesting (Herr and Kvan, 2005).

According to Kolarevic (Kolarevic, 2001) the advancement of CAD/CAM technologies has opened up new opportunities, so digital tools can assist the designer in his or her thinking process from the very beginning. On the other hand, the capacity to generate new designs becomes highly dependent
on designer’s perceptual and cognitive abilities (Kolarevic, 2003). And it is stressed even stronger by Hou: “But can architects and designers express and create freely in CAAD environment that is supposed to be in tune with their way of thinking? If we look into how designers operate the computer, we soon realize the stumble way of thinking when using CAAD” (Hou, 2005) What is more, in many schools of architecture, computer technology is not adequately integrated into the curriculum. It is not surprising the subject was broadly discussed in previous conferences proceedings and journals.
Workshops

This paper is a contribution into domain of Generative Design and Digital Aids to Design Creativity. The outcomes of two workshops for the fourth and fifth year students of architecture are presented. The main task was to introduce students to the algorithmic design techniques. It is necessary to stress that students had not had any experience in programming before.

The first workshop took place at the Institute of Architecture and Urban Planning at the Technical University of Lodz in October 2007 (Figure 1). A theoretical background was provided by Prof. Neil Leach of the Brighton University in two lectures, viz. ‘Digital Morphogenesis’ and ‘Camouflage’ while an introduction to generative design area was given by Tobias Schwinn of Skidmore Owings and Merrill (London).

The software chosen for the purpose of the workshop was Autodesk Maya Complete 8.5 since it is an excellent teaching tool due to the interactive nature between GUI (Graphical User Interface) and the MEL (Maya Embedded Language) scripting editor. Typical programming techniques such as simple loops, parametric scripts, shape grammars, and genetic algorithms allow for different methods of surface generation. “Programming allows us to employ different mathematical concepts of geometry and topology in the description of surfaces” (Strehlke and Loveridge, 2005).

The results of this short three-days workshop were remarkable. The involvement of students was impressive, although the visual solutions depended mainly on cognition of algorithmic design and programming skills (Figure 2). The effects were compared with outcomes of a complex semester project done by students for a problematic Hong Kong site.

The second workshop took place in May/June 2008. This intensive four-day workshop introduced students to advanced digital design techniques and scripting also by using Maya and MEL-Programming for the design and fabrication of component based structures. The event started with the lecture by Kristof Crolla assisted by Monika Bilska, both from Zaha Hadid Architects (London). The main task of the workshop was to create a component, as a basis for a complex structure by experimenting with various transformations of this basic element (Figure 3). Students explored and tested different tools and functions of the software, such as: duplicate, grid, field force, deformers, blend shapes and lattice.

Created structures were evaluated in terms of emergent effects, potential architectural qualities and constructability. Moreover, students were asked to produce physical models of designed structures. Since the lack of a 3D printer this part of the workshop was ‘analogue’ – students made cut-out models pre-prepared with the use of special software (Figure 4).

The results of this workshop were immense. While the first workshop was a sort of playing with Maya, during the second students were able to experience the real design process from a concept, through evaluation to construction of designed structures. They learnt the codification of design intention using scripting languages had potential to build consistency, structure, coherency, traceability, and intelligence into computerized 3D form.

Due to workshops students were not only introduced to Maya and scripting but, what is more, also developed an understanding of computer controlled design and fabrication processes – essential skills for architects willing to operate successfully in the Information Age.

Conclusions

It is commonly recognised that advanced digital design and manufacturing technologies have been being progressively employed in building construction and, what is more, architects interest in this area is growing widely (Sousa and Duarte, 2005). Information Technology is emerging and offers unexploited possibilities for the practice, which unfortunately, does not follow R&D at the same pace.

Architecture enters, however, the new era of
digital representation, geometrical theories and processes are being implemented, tested, and pushed to their limits. The final outcomes depend on architects’ scripting skills. Similar situation was experienced in the beginning of ‘traditional’ CAAD when imagination was constrained by available tools and computer literacy – for example instead of complicated roof shape drafted smartly by hand, design resulted with simpler solution created digitally. There is another question closely related to the subject – viz. design authorship – some architects would say looking at the computer screen: “I didn’t do it. The computer did it. So who is the author of this project?”. They can feel more like observers than main actors of the
The above described workshops allowed to draw particularly interesting lessons leading, in consequence, to more general reflections on “questions such as how advanced research results can be incorporated in teaching”. This is of significant importance since in our organisation “E of education is a prominent factor”. The pace of advancement of the technology in the area of computing, brings the need to adapt architectural teaching process to increasing use of more sophisticated tools. Since the future designer not only will have to be good in using CAD software but also in programming and software development (Ibrahim, Krawczyk and Schipporeit, 2003).

During the Renaissance times, to be an architect meant not only to design buildings. Architects of the period pursued range of activities deploying various skills and wide knowledge – they not only designed buildings but also were painting, sculpting, engineering... Similarly, contemporary architects are challenged by constantly evolving CAAD metaphor and, as a consequence, are provoked to explore undiscovered domains.

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References

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