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Looking for the Best Place for Computer Models in Architectural Education

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In the past, many Schools of Architecture were mastering skill of preparing hand made models and hand drawings as a main technique in design education (e.g. Warsaw School of Architecture). Introduction of CAAD to teaching process brings a new modelling techniques and a new possibilities. The role of computer models in architectural education is very promising and still not fully recognized. Development of modelling techniques and communication media is much quicker than development of design studio concepts. Many concepts and experiments in this field had place in architectural schools all over the world. A new concept of design studio based on computer modelling techniques as a communication media is the subject of interest of the Warsaw School of Architecture. The virtuality versus reality in teaching concepts is one of the most important issues in our traditional, professionally oriented school.

Introduction

In the past, many schools of architecture were focused on mastering skills of building hand made models as well as free-hand sketches as a main presentation technique in design education. Warsaw School of Architecture is certainly one of them. Introduction of CAAD to the profession and, naturally, to the teaching process brings forth new modelling techniques and new possibilities. The role of computer (virtual) models in architectural education is extremely promising yet not fully recognized. Architectural design studio concepts do not really follow the development of modelling techniques and communication media. PRIVATE

Many ideas and experiments in this area originated in the architectural schools all over the world. A new concept of the design studio based on the computer modelling techniques utilized as a communication media and a design tool is the subject of interest of the Warsaw School of Architecture. The virtuality vs. reality in the teaching concepts is one of the most important issues in our traditional, professionally oriented school.

Every single attempt to illustrate form in the design process in architecture presents at least part of the model, although frequently limited to only one or two aspects of the problem. Nevertheless, this single representation is always (or it should be) related to the entire object and therefore the whole process of design can be referred to as spatial modelling, or simply "3-D modelling". Traditionally, the need for

the communication of architecture was satisfied by the two main techniques, mentioned already in the introduction: two-dimensional drawings and scale models.

Models in the architectural design process: their character, place and role in the design process

1. Types and function of the models:

- scale model: is the true three-dimensional representation of the designed form. It can be used in the design process, to study various aspects of the project (study models), or it can be used to communicate the project to the client (presentation models).

- assembly model: can be restored from the two-dimensional drawings, yet it does not exist physically. Usually it is necessary to possess some professional knowledge to be able to "rebuild" this model from the perfectly flat information. Some drawing techniques try to reflect the depth of the forms (perspective, axonometric views), but the perception of those relies on the conventions (languages) alien for some people.

- conceptual model: is the source of all of the others. It is how the form takes shape in our mind. In the design process it is changing fluently, influenced by the images created for this purpose ("design tools") or of the more coincidental type. This type of model is the most subjective, has to be communicated through more permanent medias.

Computer techniques of CAAD introduce the new type: virtual model. It shares features with all of the other kinds (e.g. it is three-dimensional within the virtual space, yet so far can be perceived dynamically only through its two-dimensional representations), but its ability to contain the most complete design information, of all of the kinds of representation, makes it possible to call it the virtual realisation (or simply the virtual architecture).

Architectural models discussed here have all the same roots and purpose: they are the design tool and means of communication. Obviously, there would not exist so many if there were no differences between them. Here are some of the most important features, distinguishing between our design tools:

- methods of recording information: from two-dimensional to three-dimensional. In the 2-D records the relationship between the drawings describing the complete object is regulated by conventions and sometimes more specific needs. In the 3-D models spatial effects are literal.

- types of information: various features can be used to distinguish specific types and groups of information. The most basic one is structured around the role of information in the model: it can be described as spatial or functional.

- precision: some types of models allow for more ambiguity (scale study models and free-hand sketches) while the others require uncompromised precision (virtual models, working drawings).

- scale: it is here where the virtual architecture makes the most significant difference: it is being realised in the full scale, even though it may be presented much smaller on the computer screen or through the casted model. All other techniques require the element of scale.

- versatility and potential for interaction: generally it is related to the specific position of the model in the timeframe of the design process. Some of them are structured around the need for frequent and easy changes, some are meant to be permanent, or the scope of changes is clearly limited and relatively troublesome.

The characteristics of the specific type of a model make it more or less useful in the various phases of the design process:

- conceptual design: it is necessary for the model to be the most flexible, which also means avoiding the unnecessary precision. Very often the ambiguity is used to stimulate the design process. The use of the models is limited to the communication within the design team, although recently it seems that more and more often architects choose to use their early sketches (in any form - 2-D or 3-D) to illustrate the depth of their ideas more clearly than only through the working drawings.

- design development: the models require flexibility at the level of the details of various scale, while the main elements of the project do not change or don't change drastically.

- design presentation: the characteristics of the model is most tightly related to its function. It will collect all available data and present it in the most informative way (different for various purposes, while the working drawings are as much the presentation model as the set of architectural renderings) for the audience.

With the introduction of the CAD techniques in architecture it became obvious that the virtual modelling process will be built around the two factors: traditional design methods and the potential strengths of the algorithmic techniques. After years of experience and experiments it is obvious, that computer modelling became irreplaceable in many areas,

while it still fails in the others. It can be generalized, without the detailed analysis, that the use of the virtual modelling techniques is the highest in the design development phase, and it is still growing there. As for the presentation models, it is necessary to distinguish between different types of them, where the working drawings are the most traditional and well established area within the capabilities of the CAAD applications, while rendering, animation and virtual reality are the most recent phenomena with the highest expectations and the greatest speed of growth. On the other hand, it is the conceptual design phase where virtual modelling presents the slowest growth and really minimum usage. It can be observed that from the core of the design development and working drawings (models), architectural virtual modelling try to reach out currently to the extreme ends of the entire design process. Still, it is most widely used in the areas of higher objectivity, but the more subjective and ambiguous phases benefit far less from the new technology.

Since the students, who study now, are going to start practising architecture in the next few years, it is our duty (and pleasure) to be ahead the tendencies and improvements of the computer modelling technology. We should be able to give the students necessary background for their future needs. In the area of computing the advancement is much faster than in many other fields. It is difficult to predict how exactly it is going to develop, although some directions are clearly visible:

- information management: the models become more "intelligent", they allow for the faster retrieval of data and more integration between different aspects of information.

- presentation: probably the most spectacular area, where the changes are currently the fastest and promise a lot of improvement in the future. It is also here, where the virtual modelling usually becomes really fascinating for the students, where "it all starts".

- conceptual design: the area with most questions and therefore allowing for the most innovative thinking. This area may become the key issue in the nearest future, when the virtual modelling becomes really the most frequently used design tool and the computer will be as common as the pencil now.

Models and their place in the architectural education

As it was stated before, the entire design process can be described as building architectural, three-dimensional models. Therefore it can be easily concluded that modelling is the focus of the design studio. How the process is being performed is the result of the philosophy of the schools or professors. Generally, the process is structured around generating information in the design phase and retrieving it for the purpose of presentation. For example, the School of Architecture in Warsaw has very strong tradition in, what can be called, "design through drawing". It basically means that thoughts are being tested through their graphic realisation (models), and the results (doesn't matter, whether positive or negative) are used for the next steps of designing. In this scheme the model is being used as an active design tool. The same approach is being currently applied to virtual modelling. It is widely observed, that students sense easily the limitations of CAAD in the area of conceptual design, yet substitute them with still excellent sketching skills. In the natural way the students combine the greatest strengths of both techniques, using free-hand drawing as the highly subjective, individualized tool where it is the most effective, and virtual model where it proves to be irreplaceable. It should be also mentioned, that Warsaw School of Architecture presents quite specific approach to free-hand drawing, which has proven to be very effective in terms of training the students in observation, understanding and presenting the three-dimensional forms. The drawing method is based on the most complete, structural analysis of the forms and similar way of drawing. Drawing studies of this kind make good introduction to the virtual (computer) modelling and it's architectural applications.

The tradition of modelling in Warsaw School of Architecture is naturally followed by the need to record the information of the model. These "records" used to be (obviously) realized in the form of the drawings, perspective sketches etc., considering the strength of the school. Currently the same need is frequently realized through the virtual models. It is necessary to emphasize two major virtues of the "growing" models in architectural education. Firstly, it allows for the discussion based on the concrete (although frequently very loose) elements. They are the necessary references throughout the entire design process, since architecture is visual as much as conceptual art. The development of the model is an excellent educational tool in the architectural design studio. An open discussion teaches the students how to read their models in terms of their spatial or conceptual meaning. On the other hand, if the professor follows the growth and changes in the model, he can understand the ideas of the student more clearly and, in the end, will be able to give the student a fair evaluation of the project through the final grade. All of the above conclusions show the need for

the formal language of the model which will be as much personal and subjective as it has to be communicative. In this area virtual models present excellent communication abilities, but they still fail to be the satisfactory personal languages. Drawing, on the other hand, can carry almost as much information (obviously in the conceptual design phase, there is no comparison in the later needs), while it still maintains the quality of the personal tool. Many other aspects of the design process and its implications on the modelling tools could be discussed, and there are probably as many common problems as highly personal opinions. It is important, though, to appreciate the value of the design process and the development of the model in the architectural education and not only its final result.

Conclusions

Architectural modelling is not restricted to the aspects of form only. The form is the final output of any project, but to become true architecture it requires understanding and integration of other areas, and we all know how many of them. If we really recognize the meaning of the term "modelling", we shall see that the model can be the tool of many specific courses (technical, economical, social etc.). It is the easiest to imagine the integration of structures or plumbing with the students' projects. But the virtual architectural model can be used (not now, but probably in a few years) to be part of simulated social models of the future cities, or it can be studied in its potential influence on the economics of the given area. These ideas need the computer models even more intelligent than now, but they are rather realistic and could change the entire picture of the architectural education. It is also a direction the entire architectural profession could be taking, to study as many aspects of the future building as possible in the earliest design phases, to exclude the chance for mistakes. This becomes a good place for the following question: in this screenplay, where is the room for architect's intuition and creativity?

Everything that has been said so far places architectural models in the centre of architectural education. It has always been so, and, with the introduction of the computer (virtual) models it will remain the same. The future is also very likely to bring the unparalleled integration of multiple functions within the single model. It is all due to the potential for the information contents of the model that could not have been met by any traditional media. This conclusion takes us back to the concept of the architectural virtual realisation, which contains EVERYTHING in one, single model. (We could even imagine, that the computer could simulate the aging of the model and show it, let's say, when it is 64 years old...) It is difficult to predict all consequences of this move. Today the students can enjoy one of the aspects of this model which is the basic integration of the conceptual, development and presentation phases through the virtual model. All incoming (conceptual) data is being collected slowly in one, integrated file which is the base for every single piece of output, purely informational or visual, generated more or less automatically by the computer. The concept still requires a lot of fine tuning and detailed work to be fully operatable, but we can already observe the beginning of it.

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