Computers as a Creative Tool in Architecture

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Abstract

The School of Architecture at Lund Institute of Technology was augmented by the establishment of the Computer Studio in 1987. As a result the school now has a device for teaching and research in the architects' use of computers. We are now conducting several research projects as well as courses and an education project.

The third and fourth years of the education at the school of architecture are arranged as education projects instead of traditional lecturing. The students choose from projects that are organised by different departments at the School of Architecture. The issue is that the students will ask for instruction when felt needed, and that learning will therefore be more efficient.

The Computer Studio has conducted such a project during the first half of 1989. We have tried to encourage the students to use our different computers and programs in new and creative ways.

One of the issues of the computer project is to teach the students how computers are used at the architects offices today as well as expected future developments. The students shall be aquainted well enough with present and future possibilities to make good choices when deciding upon buying computers for architectural use.

Another issue is to develop new ways of making and presenting architecture by using computers. As a group the teachers at the school of architecture have a very restrictive attitude towards the use of computers. We hope that our project will open their minds for the possibilities of computers, and to engage them in the development of new ways to use computers creatively in architecture.

An interesting question is if the use of computers will yield different outcomes of he students' work than traditional methods. An object for research is whether the added possibilities of considering different aspects of he design by using a computer will make for higher quality of the results.

Background

Computers are already used by many architects, but that is not the same as that architects are helped by computers in their designing. The programs in use today are aimed at making drawings and other documents needed for erecting the buildings. As the task of making such documents is time consuming, the programs for drawing and writing documents are welcome. These programs can however not be called CAD-tools, where the letter A stands for 'Aided', because most of the designing is already done when it is time for making documents.

The real effort in designing a building is not to make drawings, but to decide what to draw. A lot of decisions has to be made, concerning all aspects of constructing and using the building. These aspects are interrelated to each other, so that a change of one aspect to a more satisfactory state often inflicts others in a undesirable way. The computer as a creative tool in architecture should help the architect to make the decisions, by showing the consequences of changes in the developing design.

The Architectural Idea Processing Environment

One activity at the Computer Studio is to find and develop programs that can serve as creative tools, or Architectural Idea Processors. That is: They should help the architect by making his ideas and the implications of them on the built environment clear to himself. Such programs will, of course, also help the architect in displaying their projects to non-architects. An Architectural Idea Processing environment should consist of programs to help in the various decisions that an architect has to make during the development of a building design. Among these are analysis of construction cost, maintenance costs, energy consumption, lighting, visual appearance etc.

All these analyses has to be possible to perform at any time during the design process. This is where future programs will differ from those of today, who mostly acquires completed designs to work well. It is very important that all evaluations can be made early, when as little work and time as possible is spent on the design. Thus the loss will be small when abandoning a non-satisfactory design, allowing the architect to try unusual ways of solving design-problems without fear of getting trapped in an costly dead-end. When such programs are available, the architect will be also able to do a much more thorough work, resulting in better buildings. He will, due to his greater knowledge of his design, be in a stronger position when defending his ideas against other wills.

The point is that the programs should be able to work on sketchy data, giving approximate answers. When the level of precision gets higher during the design process, the precision of the answers will get better accordingly.

The complete set of programs should ideally work on the same base of data. However, when using different programs not always meant for the purpose, the transfer of data between programs can be difficult. This is a reason why most of our programs at the Computer Studio runs on Macintoshes, where exchange of data between programs is more simple than on other computers.

An important factor is the availability of the equipment. We have decided to use common personal computers as Macintoshes or PC-compatibles at the Computer Studio by several reasons. One is that we should afford to get enough workplaces for educating. Another is that our findings should be immediately applicable on the architect's offices, where often those systems are the only affordable. A third is that the rate of development of new and revised programs for these computers is very high. If a desired program does not exist today, it can often be expected in a couple of years.

The need for futurism in education

When the students have become practising architects they will probably neither have time for developing new use of computers nor have money to spend on programs and computers just for testing. Instead they will have to use systems that is already on the market. Those systems are generally directed towards production of drawings, and will not help in conceptualising the design. If the architects never have had the opportunity to try what a real computer AID would mean to them, they will presumably not ask for it either. This is the reason why the schools must take the responsibility of developing the use of computers. The courses must be directed into the future, and not only teach how to use the most popular CAD programs presently in use on the architects' offices. This may conflict with the students' whish learn using existing CAD-programs as a means of putting themselves in a better position in the concurrence of jobs.

The Computer Studio

As mentioned we are both developing our own programs and trying to find other programs to use as architectural idea processors. In the latter process our students are of great importance, as they have the time to explore possible uses of new programs that the researchers don't have. To accomplish this the students must be encouraged to use computers by the other teachers at the school. The students now doing their work at the Computer Studio do so by their on initiative. The most engaged example is a second-year student that has been doing a town planning task all on the computer. He has by his work proved that it is possible to solve architectural problems creatively on a computer. His use of the computer allowed him to try several different approaches to his design, including different shape and locations of the proposed buildings, as well as different patterns of vegetation. The strength of computer modelling is clearly visible here, when the designer is able to make changes in the model without destroying it. A model made of wood or cardboard will not allow such explorative use. The result was that he had viewed a lot more ways to accomplish his design than he would else, and thus had a greater knowledge of it.

The Computer Project

As the school of architecture in Lund so far has no obligatory courses on computers, the students have a varying degree on familiarity with the different programs. This was also true for the students of the so called Computer Project of this spring. Thus some of them had to spend much time on learning how to use the programs, before they could do anything productive. The students that had previous experience with computers made more use of the various programs, even if they had not practised on the very same programs before.

All the students had to participate in the construction of a model of the surroundings of the site where the designs were to be situated. In a few weeks a part of Lund, consisting of several tenths of houses, was modeled. The work started by scanning a map of the part of the city. In order to scan the complete map we had to divide it into smaller pieces, each of which a student had to work on. In the second step Mac Draw™ was used to redraw the scanned raster-pictures to obtain object-pictures. Thirdly these were expanded in Model Shop™ to get the correct height of buildings. The fourth step was to combine the sub-

models into a larger one. Afterwards a great deal of editing was required to make the model sufficiently consistent with reality.
The model was used by the students to watch their designs set into the existing environment. This made possible a new way of designing buildings in an existing built environment, as the speed of the program in generating perspective views allows the designer to work interactively. Although the interactiveness is not perfect, for example is the time for generating views not imperceptible, the program shows a good indication of the future. Generating views is fast enough that waiting for them is not tedious.

Summing up

An interesting question is if the use of computers will yield different outcomes of he architects' work than traditional methods. An object for future research is whether the added possibilities of considering different aspects of he design by using a computer will make for higher quality of the results. As of the five designs of this year's project I can not find any obvious influences by the computers. On the other hand can the often heard suspicion that computers would yield square and uniform buildings be found untrue. One of the students had the deliberate goal of showing that it is possible to design buildings of expressive form using a computer. His design was of a very irregular form, with cylindrical and conical volumes intersecting each other. This complexity would have made it very difficult to make traditional perspective views and models to evaluate the design's appearance at the site, while the programs made it possible to work interactively with the design in 3D. At the critique he explained that his design would have been impossible to accomplish without the assistance from the computer. He added that he would find it hard to work without computers when becoming an architect, after this experience. The other students, who did not have the same previous experience with computers, did not make such exclamations. Neither had they produced as many different pictures using different programs as he had, although they had probably spent the same amount of time on the computer. This shows the not very surprising fact that practise makes the master even when using computers, and that one have to master also these tools before being able to play with them.