Abstract. Computer graphics is a powerful medium for presentation and design. In early days of its usage, it has been used mainly for presentation. Then it was started to use computer graphics in design development stage. Even more, nowadays you can get an inspiration from it. With tracing the change, we can see a centripetal movement of usage from the fringe to the core of the design field. This paper will describe how this change occurred with what kind of effort.

1. Introduction

Sasada Lab of Osaka University is carrying research on computer-aided design. The main subjects of us are computer graphics as a communication medium and collaboration in design. We tried to use computer graphics in various stages of the design for various aims like as a design tool, as a communication tool, as a review tool, and so on.

We did more than 100 design projects with using computer graphics during these 15 years. Taking examples from these projects, the author would like to show how the usage of computer graphics changed from presentation to conception.


Computer graphics is a powerful and easy to understand medium, but it takes a lot of time for 3-D modeling and rendering. This made it difficult to use computer graphics just in the middle of design process where alternatives change frequently and quick response is needed for decision making.

Presentation is an activity to show architects’ idea and concept to people who may concern the design project and it is hold usually at the end of the design process. In this case we can neglect the lack of quick response of computer graphics. Thus computer graphics application started from presentation.
In 1986, Shanghai has no high rise building, but the pressure for needs of more floors had already become high. The government of China and local government of Shanghai wanted to gather opinions from wide varieties of people to decide that they should go on or not. For this purpose we created computer graphics animation with several high rise buildings by collaboration with ECADI (East China Architectural Design and research Institute).

*Figure 1. Downtown Shanghai, 1986 (Computer Graphics)*

*Figure 2. Downtown Shanghai, 1998 (Photograph)*
We started the project of Shanghai from scratch, with writing all programs for 3-D modeling, rendering, and animation making. Even some parts of hardware were designed and built by us.

Then the animation was used in government meetings, professional conferences, and TV programs to gather opinions for high rise buildings and the decision came later. It was the beginning. Nowadays, you can see several hundreds of high rise buildings in downtown Shanghai.


The heart of design development stage is decision making. For good decision making, we need a smooth evaluation of design alternatives. In this heuristic process, one of the most important things is the continuity of thinking. To keep the continuity of thinking, a medium that is used in this process, should have a quick response.

When we did a project for Shanghai, the power of a computer was so low, but the power was increasing dramatically year by year. After the project for Shanghai, we started to build up a computer graphics system that can be used in the design development stage. It is a great help for architects if we can use computer graphics in the design development stage, because we can use its power directly to our design.

Akashi Ohkura Coastal Community Zone is a long term design project for the City of Akashi close to Kobe. In this project we started to use computer graphics from early stage of design. At every stage of design, except the very early stage of conception, we tried to use computer graphics for communication, evaluation, and presentation. At the beginning of this project, around year 1990, it looked like that still a computer graphic system was not so flexible to trace an idea of architect immediately.

Figure 3. Akashi Ohkura CCZ 1990 (Sketch)
It took more than 10 years for this project. It was started with developing rapid computer graphic system. However, during these 10 years, the power of machine was increased, and it became easy to get smart computer graphic systems in the market. Nowadays we are using several these smart systems from the market, but on the other hand, still we are continuing to develop computer graphic systems.
Computer graphics systems in the market are smart enough to use in design development stage now. However, we can not find a good tool for smooth graphical communication through the net. Similarly, it is difficult to find out a tiny tool for light and fast presentation. So, we can not stop to develop tools, and all these tools are combined under the name of ODE (Open Design Environment).

*Figure 6. Akashi Ohkura CCZ 1997 (Computer Graphics)*

*Figure 7. Akashi Ohkura CCZ 1998 (Computer Graphics + Photograph)*

Conception, compared with design development or presentation, looks like far from machine ability. However, to get a conception we can be helped by a computer not directly but indirectly. Rich experience of modeling, rendering, and animation making, seems to make it possible.

Project W, still going on, is a project to design a man-made island. To preserve landscape of rocky islands from a popular view point, the local government wanted to make a mound in front of the man made island to hide the background. A problem is how to make such a mound looks like natural rocky scene.

One of the most direct ways to make a mound is to use artificial lock panels for the steep cliffs. You can get excellent lock panels in the market, and it is difficult to point out that it is a fake or not. However, we did not need such a detail because the distance from the view point is more than 700 meters.
Furthermore, it looks like direct apply of an engineering rather than design. We needed some different approach.

![Figure 11. Project W 1998 (Computer Graphics)](image1)

When we were making a computer rendering with using a 3-D grid surface model generated by fractal method, an inspiration hit me. “We use models to represent a natural scene. Then, why not to use these models to make a natural scene?” This is the beginning of a concept of “Demodeling.” We use models
to represent a real world simply. So, we can use these models to reconstruct a real world simply.

To make this idea realize we built up a team of an architect, a coast engineer, and an artificial rock professional. The team add new ideas to the original one from professional views of feasibility, then final proposal for design was fixed.

Figure 13. Project W 1998 (Computer Graphics)

Figure 14. Project W 1998 (Computer Graphics)

Figure 15. Project W 1998 (Computer Graphics)
It is difficult to say that we can be supported by computer graphics in conception, because it is not a direct support. However we can say like this; the experience of using computer graphics made it possible; or if you have no experience of 3-D modeling, you have never find this idea.

5. Conclusion

This paper attempted to trace a change of the relationship between computer graphics and design in our lab. The direction of the change shows that computer graphics is going closer and closer to the central core of the design activity. It took thirty years for the author. However with an accelerated machine and smarter software, architects will be able to share this exciting experience easily in near future.

References