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Open Design Environment and Collaborative Design

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OpenDesignEnvironment is a concept of a design environment for environmental design. At the same time, OpenDesignEnvironment is a system which was build according to that concept. It uses 3-D models and computer graphics as a communication medium, and aims to make a design process open to the people who are concerned with a design project. OpenDesignEnvironment was used in practical environmental design projects, and worked as presentation tools, design review tools, and design tools. Furthermore, OpenDesignEnvironment is going to be an environment for collaborative design.

Research and Education System in Lab

The Department of Environmental Engineering has six labs in it. As a research and education unit, a lab has one professor, one associate professor, and two assistant professors. In the Department, we have 180 undergraduate students, 60 master course students, and 20 doctor course students. Undergraduate students are receive their education in a class room and a studio untill the end of their third year.

At the beginning of their fourth year, undergraduate students select one of labs and decide to be members of the lab. Allmost all of educations for the 4th year students are conducted by each lab. Allmost all of undergraduate students go on to the graduate course and become research staffs of the lab. With its own major subject, each lab is carrying on their research and education together in intimate small group atmosphere.

Our lab has 15 undergraduate and graduate students, and 5 research students on the average. Research students have their occupations, and they are sent to our lab by their organizations. As materials for research and education, we are carrying on practical design projects constantly, and almost all of these projects come to us from goverments and local goverments. Shortly, our lab is working practically in the education and the research.

OpenDesignEnvironment

After ten years experience in computer graphics applications in architectural design projects, we developed

OpenDesignEnvironment in 1991. OpenDesignEnvironment(ODE) is a concept of a design environment for environmental design, and at the same time, ODE is a system itself for environmental design, too. It uses 3-D models and computer graphics as a communication medium and aims to make a design process open to the people who are concerned with a design project.

ODE is not a strictly integrated system, but a loose combined application set. On EWS, all applications are developed by us, on the other hand, all applications on Macintosh are commercially available ones. To make these programs in one combined set, we wrote programs for inter application communication on EWS, Macintosh, and both of them. ODE is developped on multi vender LAN environment of our lab, and on that LAN, we have 10 EWS's and 20 Macintosh's.

ODE is a freeware, and distributed more than 30 organizations in Japan, Korea, Canada, and France. We have a ODE user's group and communinate to each other via closed user group in commercial network service. The development and refinement of ODE is going by users including us.

Presentation, Design Review, and Design with OpenDesignEnvironment

ODE has been used in many design projects in various ways. However, we can pick up three typical case of ODE application in design process, which are; (1) as a presentation tool, (2) as a design review tool, and (3) as a design tool. Each case is shown in figure 1, with a design process, and a part of process with ODE is shown in black stripes.

In case of a presentation tool, following to design in a traditional way(Figue 1.A), a designer starts to use ODE to make presentation materials(B), and after its completion they show the materials to a client and other related people for their design review(C). After the design review, design altenatives may be concidered according to requirements from the client(D).

Problems of a presentation tool for clients are, that the client can not always check what they want, and that the designer has not so much enough time to reflect the requirements from the client to the design alternatives. This is the reason why clients start to use ODE by themselves for design review.

In this case after design was almost finished(E), a client starts to use ODE and to make 3-D models and computer graphics for their own design review use(F). Because the client starts their review from the point that they have most interested, requirements return rapidly to the designer(F), and the designer has enough time to reconcider about their design(G).

In both cases of presentation and design review, design itself is done in a traditional way, this means that to use ODE 3-D models should be made from traditional 2-D drawings. To avoid this cumbersome unefficient works, ODE is used as a design tool. If a designer uses 3-D models and computer graphics in his design(H), clients and related persons can review the design at any time(I). For traditional communication, documentation process will follow them(J). To use ODE as a design tool we refined the system to be able to show realistic image, interactively, in real time.

Open Design Environment and Collaboration

Presentation, design review, and design are three typical ODE applications in design projects. In these cases, only one ODE system is used in a design process. However, if more than two ODE systems are used in a design process, communication among related people will be much more smooth and effiient. In this case 3-D models and computer graphics are used not olly as a communication medium, but also as a collabpration medium.

Two examples are picked up from practical design project in which we used two ODE systems as a
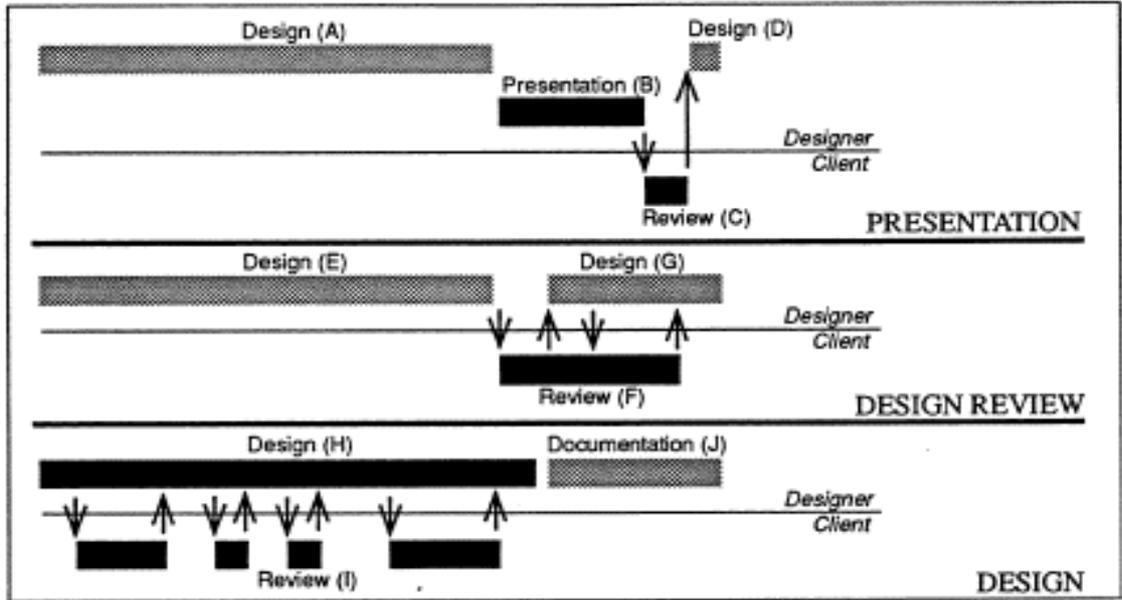
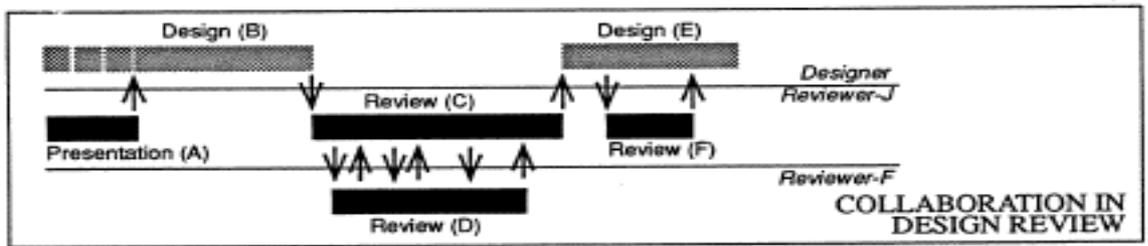Figure 1. OpenDesignEnvironment and presentation, design review, and design.

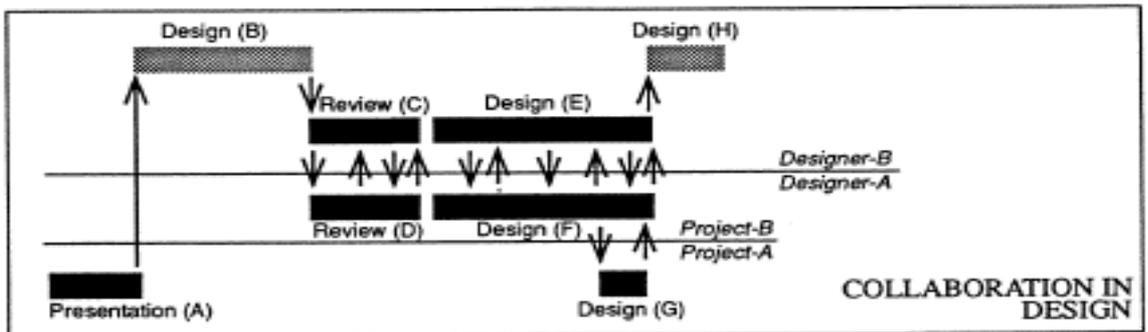Figure 2. OpenDesignEnvironment and callaboration in design review.

Figure 3. OpenDesignEnvironment and callaboration in design.

collaboration tool. One is a collaboration in design review, and another one is a collaboration in design.

In case of a collaboration in design review, after a presentation(A), it has understood that a necessity of a new design project. When design was finished(B), the review was started in collaboration with two reviewers(C,D). Then it was followed redesign and second review(E,F).

In case of a example of a collaboration in design, the situation is a little bit more complicated. Design and a presentation for project-A was already finished(A), and design for project-B was started at adjacent site of the project-A in a traditional way(B). Because all data of site and surrounding area was prepared for evaruation by the designer-A for the project-A, the review for the project-B was started in a collaboration of two designers(C,D). This collaboration in review was handed over to the next collaboration in design(E,F). In the process of design of project-B(F), the designer-A found out some alternatives for the project-A(G), which will fit better to the design of project-B. After all collaboration process was done, the designer-B carried out their own process(H).

Conclusions

As shown above, a design environment ODE changed the system of communication and collaboration in a design process. At the beginning, we thought that 3-D models and computer graphics should be a good communication medium in a design process. It was true. However, later we found out that the set of 3-D models and computer graphics was a good medium for corrabolation in a design process, too. Design is not a work of loneliness. It needs a collaboration of many professionals and non-professionals. We need the combined wisdom of all who have concern with a design project. Through the ODE project, we beliebe that we found out a way to realize it.

References

Sasada, T. 1991. "OpenDesignEnvironment." *Computer Applications in Civil and Building Engineering, Proceedings of the 4th International Conference on Computing in Civil and Building Engineering,* 57-64.