COLLABORATION SUPPORT SYSTEM FOR PUBLIC DESIGN

the system for understanding the 3-D space with interactive operation

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Abstract. It is very important to collaborate not only with professional people such as designers and engineers but also with non-professional people such as clients and citizens in the field of a public design. But a maker which provides signs, lighting equipment, and street furniture etc does not always design satisfactory. This paper presents the system requirements for public design and the prototype system which reviewers can understand their position and orientation, and application of the system to the project.

1. Introduction

A city consists of many public facilities such as roads, parks, squares, bridges and rivers etc. And it also consists of many elements such as buildings, monuments, signs, lighting equipment and street furniture etc. These facilities and elements are correlated with one another in a city. So the concept of public design is to design these facilities and elements continuously and harmoniously. The public design has been researched in the field of city planning, architecture, civil engineering, landscaping and industrial design until now. But many public design loose its balance from a view of total design as designers and engineers design their part separately.

The paper is organized as follows. The second section deals with public design process and system requirements. The third section deals with the system development. The forth section deals with application of the system
to the residential area planning. The fifth section raises conclusion for this paper.

2. Public Design Process and System Requirements

2.1. PUBLIC DESIGN PROCESS

Figure 1 shows the typical example of the public design process. After a general constructor or its subcontractor is decided, a maker usually begins to design their products such as signs, lighting equipment and street furniture etc. In this stage, a maker can only fit up the design which is already decided with their products. It is rare to change the design by making full use of maker’s professional.

It is very difficult for a maker, even if it has technical and design skills of their products, to collaborate with other participants so that it provides only their products.

2.2. SOLVING THE PROBLEM

To solve the problem, it is important to change the social system itself. And we found that there are two major problems which we could solve with
computer technologies. The first is the problem of design process. The second is the problem of design tools.

2.2.1. the problem of the public design process

There is no place for participants who are professional people and non-professional people to understand the design concept and the schematic design and to review design alternatives as necessity requires to support collaborative works. And a maker usually gets a chance to process their design in the final stage of the public design. In this step there is no chance to communicate with participants and to make many alternatives. A maker always have to make their proposal in this condition.

2.2.2. the problem of design tools

Participants can not understand a realistic image of public design by only using catalogues, photographs of products, and plans. Recently a designer uses still images or animation of computer graphics in addition to models or perspective drawings in their presentation. But these tools don’t make alterations dynamically.

2.3. SYSTEM REQUIREMENTS

According to our approach, there are six functions needed for public design in collaboration. Figure 2 shows the image of the ideal collaboration system. Participants can share the design information and review as necessity requires.

1. The system should not delay, distort and lack the design information during design process.
2. The system should be able to share with necessary information from anywhere at anytime.
3. As the design information includes more than one media like documents, photos, sketches, videos, and animation, the system should treat them with equal operation.
4. The system should be able to share both micro and macro details of the design with participants.
5. The system should be able to understand the space with interactive operation.
6. The system should be able to review many alternatives in real time.
3. System Development

The concept of NODE (Network Open Design Environment) was generated to make wide area collaboration in 1994. In 1995, ProjectFolder, a function of the NODE system, was created on the World Wide Web. ProjectFolder is a file that includes documents, plans and tools to proceed with the project, and makes hyper links between 3-D objects and text, images, and other digital data. With the NODE system, participants in a project can easily browse design alternatives from anywhere at anytime. The system has been applied for practical use. Papers have been submitted to CAADRIA. Our system is also created on the World Wide Web because the existing NODE system can realize from the No.1 to the No.3 of the system requirements in the chapter 2.3. In addition to the NODE system, it is necessary to develop the design system not only to share design information but to review many alternatives. This paper aims to realize the No.5 and the No.6 of the system requirements in the chapter 2.3.

If 3-D virtual space is used as design tool, reviewers should always have the information about their position and orientation. Otherwise, they can not reach where they want to review and may get lost in the virtual space. Similarly, a function is needed to move, rotate, and transform a design object both interactively and exactly. Otherwise, it is difficult for reviewers to move
or rotate exactly in the virtual space which represents perspective view. They want to move or rotate on 2-D plan rather than on 3-D virtual space.

In this paper, all models in the 3-D virtual space are described in the Virtual Reality Modeling Language (VRML) which is the standard in 3-D graphics and internetworking. Reviewers can browse 3-D virtual space with a VRML browser. And the VRML External Authoring Interface (EAI) connects design interfaces written as a JAVA applet with a VRML browser (Figure 3).

The system is designed such that it is platform independent. It works well on Unix Workstation and on P.C. which runs Windows95, WindowsNT and Mac. But VRML browser with the EAI specification is available only on the Silicon Graphics’ Workstation, Windows95 and WindowsNT.

The followings are design interfaces written as a JAVA applet we develop:

1) Plan View Window
Reviewers’ position, orientation and field of view in the virtual space represent on the Plan View in real time. In addition to this, if reviewers set position and orientation by dragging mouse on the Plan View, the view information is represented in the virtual space in real time. And they can set eye level with scroll bar exactly.

2) Color Palette
When reviewers want to change the object’s color, they select the object and change the color with the color palette.

We must use some converters to create 3-D models described in the VRML until now. But recently many software can save as the VRML format. For example, we use CAD software named “FormZ” which can save as the VRML format. In this system the models made by “FormZ” can be used effectively. Since existing EAI specification can not access Inline node file, we have implemented an interface using JAVA. Figure 4 shows the structure of VRML models. And the lighting simulation software named “Inspire” can save the results of the simulation as the VRML format (Figure 4). In the early stage participants can discuss the concept of light planning with the realistic 3-D models.
4. Application of the System to the Project

Recently, we take part in the residential area planning (A-project) with the consultant in the A city. We make alternatives to take necessary conditions such as coverage ratio and floor area ratio into consideration. To collaborate our team in Osaka with the consultant in Tokyo more seamlessly, we make the ProjectFolder of A-project and throw open to the participants on the Internet. Each alternatives, a table of some necessary conditions, design images such as facade and pocket park, and 3-D virtual space are classified on the ProjectFolder (Figure 5).

The person in charge of this project doesn’t have a thorough knowledge of computer technology. Her computer skill is to operate CAD, send E-mail, and browse the World Wide Web but she can handle this system. She says, “With this system, we can understand the planning process at a glance. Though it is very difficult to communicate the design images by telephone or facsimile, we can share them easily on the World Wide Web.” In this project, we make good use of the 3-D virtual space to review the volumes of buildings and the coloring of the surface of a wall.(Figure 6).
5. Conclusion

In this paper, we can realize parts of the No.5 and the No.6 of the system requirements in the chapter 2.3. Because of the improvement of VRML browsers on PC, participants can review alternatives easily and effectively. And linking the 3-D virtual space to Plan View Window, reviewers can always understand their position and can review from more clear viewpoints. In the A-project we can not achieve to review the whole of the public design including makers’ professional. But we are convinced that we develop this system as a part of the public design system.
References