

“PLUG-IN” METHOD AS USED IN THE INITIAL STUDY STAGE OF DESIGN

YASUYUKI YUDA, WOOKHYUN YEO, SOOYEON OH,
ATSUKO KAGA, TSUYOSHI SASADA
*Department of Environmental Engineering Graduate School of
Engineering, Osaka University
2-1 Yamadaoka, Suita, Osaka, 565-0871 Japan
{yuda, yeo, oh, atsuko_kaga, sasada}@env.eng.osaka-u.ac.jp*

REIKA SATO
*Department of Digital Game, Faculty of Information Science and Arts,
Osaka Electro-Communication University
lihua@mwd.biglobe.ne.jp*

Abstract. This paper will propose a new design method “Plug-in”. 3DCG is a powerful medium for presentation and design in environmental design. However, in the initial stage of a design, we are not able to use it easily since there is no reference data required for 3D modeling such as drawings in that stage. This method will solve the problem and help a designer to get inspiration by use of 3DCG from the very early stage.

1. Introduction

Environmental design is a synthetic design around the people, gathering architectural designs, urban designs, landscape designs, and civil designs. Therefore, various people participate in the process and we should design wide areas taking huge environment into consideration.

In environmental design with these features, 3DCG has aided us very much because it can treat equally various scale objects (from huge mountain to parts of furniture) and is useful to share images with other participants easily. (Sasada, 1999)

However, in the very early stage of design when we determine conceptions of design, using 3DCG is not easy since there is no reference data needed to create new 3D models such as drawings.

In this paper, we describe a new design method “Plug-in” which solves this problem and helps a designer to get an inspiration by use of 3DCG from the initial stage of design.

2. Plug-in

2.1. INITIAL STAGE OF A DESIGN

In this section, we propose the approach to creating 3D models in the initial stage of design, considering the features of this stage.

The initial stage of a design is a process where we consider firstly "What kind of thing should be built?" before whole design processes. The medium used here is usually language or a very ambiguous image, such as a conception and a sketch and so on. So there is not enough information to create 3D models with a concrete shape. The obstacle for creation them from an initial stage exists here. In order to create them, these ambiguous images should be broken down into concrete images.

On the other hand, in this process, it is repeated that a designer gets ideas from inspiration and develops them more clearly. Therefore a medium is needed to express and correct ideas easily and rapidly according to new ideas produced one after.

The results of the consideration are summarized as following two points.

- Breaking ambiguous images down into 3D models
- Shortening the time of 3D modeling

The concrete means of these will be described below.

2.2. BREAKING DOWN IMAGES INTO 3D MODELS

Breaking down ambiguous images, such as a conception and a sketch, into 3D models is accomplished with using existing facilities.

First, we start to get information needed for these facilities' 3D modeling like as their photos and drawings, as we look for the existing facilities fitting our images by considering their facade, purpose of use, size and so on. Secondly, we make these 3D models by use of this information. Then, we plug-in the 3D models into surrounding environment made by 3D models. Finally, in 3-dimensional space, we are able to get new ideas, reading the relationship between the inserted 3D models and surrounding areas.

In related research, the approach to breaking down design concepts into visual images has been reported. (Jozen and Kaga...et al, 2000)

2.3. SHORTENING OF MODELING TIME

With an aim to shorten modeling time, we use simple 3D models with texture mapping, avoiding creating detailed models.

In order to make 3DCG understandable for everyone, it has been a mainstream approach that we create detailed 3D models. However, it takes a lot of time to create them. Therefore, in case of modeling some parts of models which are less important in considering design policies, we make those kind of models as simply as possible and apply textures made by existing facilities’ photographs to them.

Thus, we will realize saving time without dropping the level of expression.

An example is illustrated by Figure1. The model in the left is made by 345,586 polygons, on the other hand, right one is made by only 66 polygons. As you see, both of them are realistic enough. This example makes it clear that a texture mapping method is very effective to shorten modeling time.

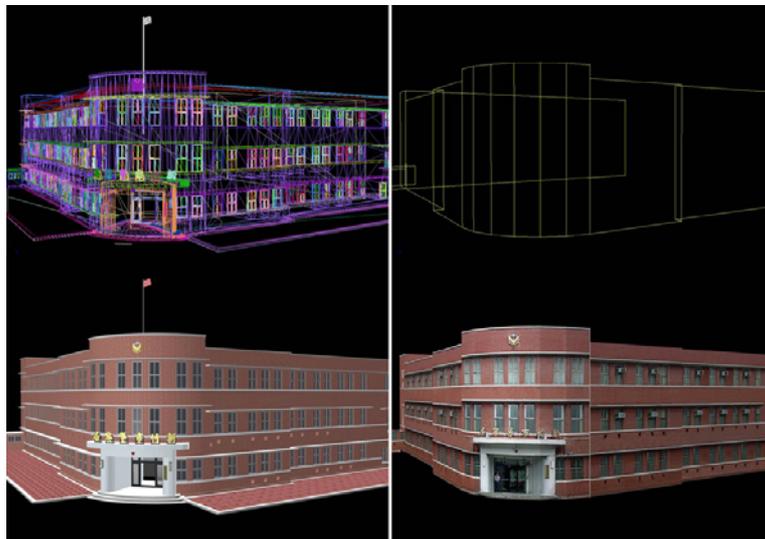


Figure 1. A comparison of a detailed model (left) and a simple mode (right).

2.4. PLUG-IN

Let me summarize the main points that have been made in this chapter. “Plug-in” method as we describe in this paper help designers to get inspiration for new design idea by use of 3DCG from the very early stage of design where using 3DCG has not been easy. And the use of existing facilities and the application of a texture mapping in 3D modeling make this method possible.

In the next section, we shall apply this method to the real design project in order to evaluate if it can be effectively used in the real project.

3. Application to the Real Project

3.1. BACKGROUND OF HIROSHIMA BALLPARK PROJECT

The project used for the evaluation is called Hiroshima ballpark project. The purpose of this project was to create a design for the new Stadium of the Japanese professional baseball team, while considering in the surroundings of its location.

There is the station of a railroad -- the Shinkansen line -- in the northwest of the site, and the railroad runs north side of it (see Figure 2) .

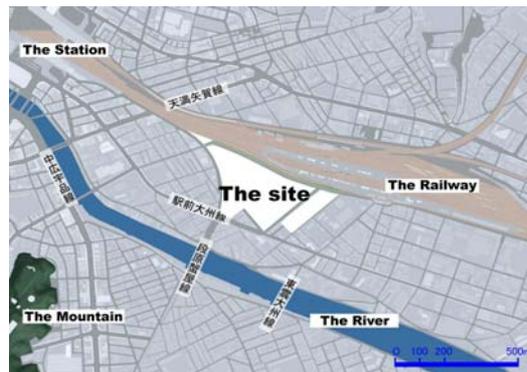


Figure 2. The site of Hiroshima ball park project.

3.2. PROCESS TO PLUG-IN

First, we made 3D models of the surrounding area, such as the terrain and the buildings around the site, by means of 2D maps and aerial photos and so on.

Secondly, we inserted existing stadium's models into the surrounding environment made by 3D models. The plugged-in 3D models are the stadium that the baseball team is using now, the domed stadium, and some major league stadiums in the United States -- the SD stadium and the SF stadium -- which we chose because they were likely to match into our conception. We were able to make them in short time because of reference data we collected and a texture mapping method. Figure3 and Figure4 show the situations each stadium model is plugged-in.

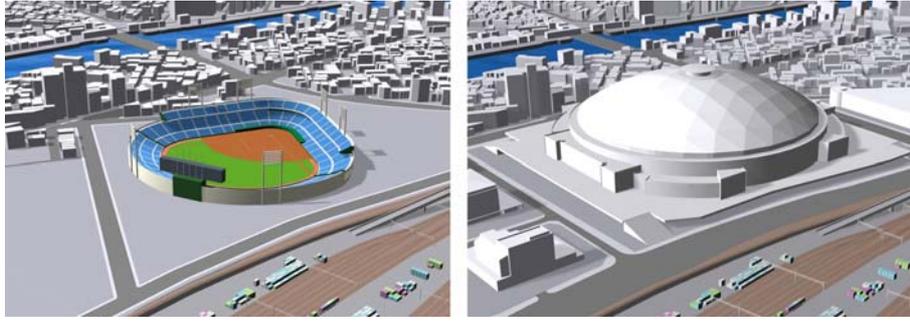


Figure 3. The pleasant stadium(left) and The dome stadium(right).



Figure 4. The SD stadium (left) and The SF stadium (right).

Finally, after a careful comparative of each situation in 3-dimensional space, we decided to adopt the SF stadium in consideration of opinions of participants.

3.3. PLUG-IN AND ITS EFFECT

One of the greatest features of the stadiums of MLB (Major League Baseball) in the U.S. is the very good harmonizing with their surroundings.

The SF stadium adopted in this case, is located right beside the sea. And we can see the ocean view from the left stands through the right side of the stadium because the height of the right side walls is low enough and there are not any big stands, only small ones (see Figure5). During baseball games, in this sea the enthusiastic fans are waiting on their boat for the chance of getting home run balls hit by The power hitter.



Figure 5. Pictures of The SF stadium.

Needless to say, in the site of this project, there is not a sea and neither is the strong batter. However, checking the relationship between the plugged-in 3D model and the surrounding area in 3-dimensional space, a good idea was generated that it would be exciting if we were able to see the fields of the stadium through those low walls from the train running through the north side of it. Because of the Plug-in method, the new idea was given.

To make this idea more clear, we repeated the process of trial and error in correcting the model with the aid of 3DCG animation, which showed how the field from the train could be observed (see Figure6, Figure7 and Figure8).

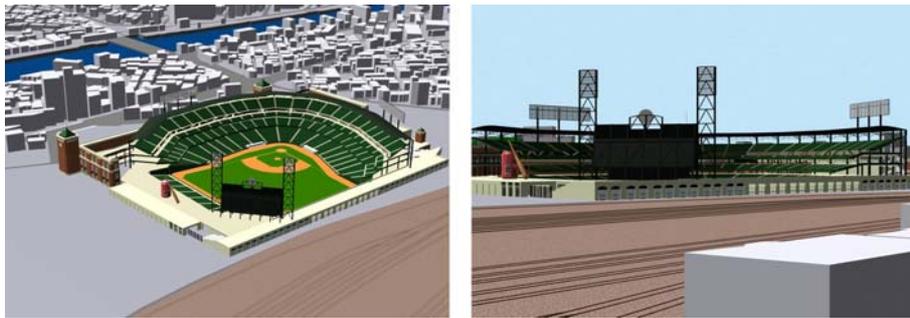


Figure 6. The first Plan.



Figure 7. The second plan.



Figure 8. The third plan.

Finally, we could decide the conception about the position and the form of the stadium in short time (see Figure9 and Figure10). In addition to this, we were able to make other conceptions clear -- the main entrance and the night scene design (Fukuda and Nagahama...et al, 2002) and so on.



Figure 9. The final plan1.



Figure 10. The final plan2.

Moreover, it was able to build up a foundation for the participants to proceed with the project smoothly in the following stage because 3DCG helped us to share the concrete images of the conceptions correctly.

4. Conclusion

4.1. CONCLUSION

The result of this project proved that Plug-in method can help us to get new ideas and make them more clear by use of 3DCG from the very early stage when we are not able to use it easily. From the standpoint of environmental design that attaches great importance to harmonization with the environment, this method is highly effective.

Moreover, the feature of 3DCG that is easy to understand for everyone has the great effect on sharing images of design concepts and helps us to include participants' opinions into design conceptions easily.

4.2. PRESENT AND FUTURE OF PLUG-IN

At the present, with the aid of the commercial software named Virtools Dev that is developed mainly for game developers, the real-time simulation system has been established, which enables us to read the relationship between plugged-in objects and their surrounding areas from various view points as you want to see in real-time. And it has been possible that we are able to design more interactively (Lou and Kaga...et al, 2002; Yeo and Kaga...et al, 2003). Figure11 shows the real-time simulation system.

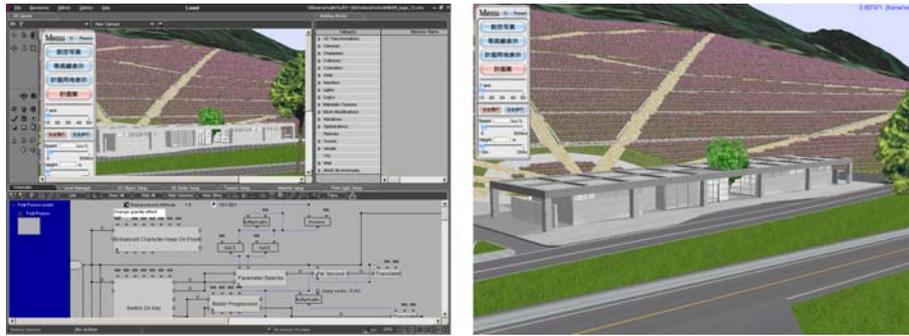


Figure 11. Real-time simulation system by Virtools Dev.

In the rationalization of the process, our future work will be directed at developing a plugged-in 3D model database system and a texture database system.

On the other hand, to develop the design begun in 3-dimensional space, there are indications that the new roles of 3DCG as a tool of design with real-time and interactivity will be established (Yeo...et al, 2004; Wang...et al, 2004), and we have to seek these continuously. To promote this study, it is important that we will have a positive attitude toward use of 3DCG in the very early stage of design like this paper.

Acknowledgements

We wish to thank many people, who participated in this project.

References

- Fukuda, T., Nagahama, R., Kaga, A.& Sasada, T.:2002, Collaboration Support System for City Plans or Community Designs based on VR/CG Technology, *CAADRIA2002*, Malaysia, PP257-264
- Jozen, T., Kaga, A., Wang, L., Oh, S., Sasada, T.:2000, The Concept Network Model Database, *CAADRIA2000*, Singapore, PP379-388
- Lou, C.W., Kaga, A. & Sasada, T.:2002, Environment design with Huge Landscape in Real-time Simulation System: real-time simulation system to real project, *CAADRIA2002*, Malaysia, PP265-272
- Sasada, T.:1999, Computer Graphics and Design, *CAADRIA99*, Shanghai, PP21-29.
- Yeo, W., Lou, C.W., Kaga, A., Byun, C., Ikegami, T.& Sasada, T.:2003, An Interactive Digital Archive for Japanese Historical Architecture, *CAADRIA2003*, Thailand, PP513-522