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Presenting Landscape Design of Sunter Reservoir Urban Forest in Virtual Reality Landscape Model

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Abstract—The landscape design presentation in Virtual reality (VR) Model is a new type of landscape design presentation recently. The objective of the research is investigating the users opinions about the usage of VR Model in Landscape Design presentation of Sunter Reservoir Urban Forest (SRUF). The software used for developing VR Model of SURF is Quest 3D. The online method is used for distributing and evaluating VR Model of SRUF. The result shows that for respondents who are students of landscape architecture department of Bogor Agricultural University are able to operate the VR Program and understand about the landscape design idea of SRUF. The constrain of using VR model as media of landscape design presentation is the large file size of the VR model file that influences the online distribution by internet and the performance of VR Model in personal computer set. Those limiting factors are important to be considered in presenting landscape design to public.

Index Terms—Virtual Reality, Landscape, Design, Sunter

I. INTRODUCTION

Sunter Reservoir Urban Forest (SRUF) is one of reservoir and urban forest in Jakarta. The main function of reservoir in Jakarta is in hydrological aspect as runoff collector, preventing flood and preserving ground water supply. The other functions of Sunter reservoir are supporting biodiversity, micro climate and public recreation. In recent condition, those functions are not optimized yet because of sedimentation, public waste and settlements surrounded.

The public awareness to conserve SRUF is still low because the existing condition of SRUF is untidy. It is important to design the landscape of SRUF and present it to public in order to raise public awareness that SRUF can come benefits for social and ecology. The landscape design should be supported by a good visualization which able to perform future condition of SRUF. The realistic 3D landscape visualization may offer advantage to increase public awareness about environment (Sheppard et al, 2008).

The Digital 3D landscape visualization can be performed in several types, such as 3D still images, 3D animation and 3D real-time Virtual Reality (VR) landscape model. The VR landscape model is relatively new media in landscape design presentation in Indonesia. In VR model, user who operate the program are able to give commands to the program in order to learn the model presented without driven by operators. With this excess, there is a hypothesis that users may obtain more information about the landscape design presented. That is why, it is important to investigate if the landscape visualization in VR model can be implemented as landscape design media with the study case the site which is involving public in its landscape design process such as in SRUF. The type of group of public, potential users and the availability of sufficient tools will influence the implementation of landscape design presentation in VR model.

The Quest 3D software was chosen as a tool to develop VR Model of SRUF because Quest 3D is a real-time software which able to publish stand-alone executable file (*.exe) program of 3D landscape visualization. The other excess of VR model developed by Quest 3D is walkthrough command that possible for user to explore more information about 3D model presented by doing walkthrough in any direction inside the model. Despite on those excess, it is important to investigate if The VR Model of SRUF developed by using Quest 3D is suitable media to communicate landscape design idea from designer to users and stakeholders.

II. FUNDAMENTAL THEORY

Landscape visualization has two important elements, those are the existing reality and the future intended reality which represents how the future landscape is going to be and how the impact to existing feature (Thompson and Horne, 2006). Landscape visualization attempts to represent actual places and on-the-ground condition in three-dimensional (3D) perspective and capable to show future worlds and conditions which people may or may not able to imagine on their own (Sheppard et al, 2008). 3D visualization can influence classic top down approach and bottom up approach in order to get the sustainable landscape planning and design (Lange, 2005) and also can affect public engagement, credibility, cognition, awareness, emotions, motivation and behavior of community about their environment (Sheppard et al, 2008).

There are 3 main objects in scenery of 3D visualization of landscape model; they are terrain, trees and buildings. The development of 3D terrain is starting point of 3D visualization research, because terrain has permanent impact in visibility. The rest scenery characters such as trees and buildings have more temporary character that depends on local policy (Ozimek and Ozimek, 2008).

Quest 3D is a tool for creating stunning real-time 3D multimedia productions and the perfect software package for creating 3D scenes, i.e. product presentations, architectural visualization, virtual trainings and computer games (Quest 3D manual). Quest 3D is real-time software that have channel system so the users do not have to worry about syntax error (http://www.quest3d.com/index.php?id=208). The working process in Quest 3D is real time, that is mean the end result of working process can be seen in run mode in animation section (Quest 3D manual).

There are several projects in landscape architecture that are use Quest 3D as software builder for creating 3D real-time landscape model. Mach (2008) had created a nice project of Interactive 3D Visualization of a River Renaturation Measure by using Quest 3D. Quest 3D is used to create a game-like environment which combines landscape, terrain and design data. Mach (2008) mentioned that the game-like environments should include a correct representation of design data, a friendly and good looking layout, a clear distinction between existing and planned measures and it had to be easy to handle and navigate.
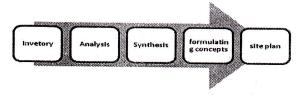
III. METHODOLOGY

A. Time & Place

Sunter Reservoir Urban Forest (SRUF) is located in North Jakarta, DKI Jakarta Province, Indonesia. The site was stated as urban forest of DKI Jakarta by "SK Penetapan Gubernur DKI Jakarta No. 317/1999 tanggal 18 Februari 1999". The area of SRUF stated is about 2 hectares.

B. Method

The research method is survey and descriptive method. The survey method is used in obtaining primary data from the site. The descriptive method is used in obtaining user opinion about the use of 3D real-time landscape visualization in landscape design of SRUF.

C. Design Method

The landscape design process is consist in several steps, those are inventory, analysis, synthesis, formulating concepts and site plan. The landscape design model is made both in 2D site plan and 3D model. In inventory and analysis, the method of obtaining and analyzing data are survey and descriptive method.
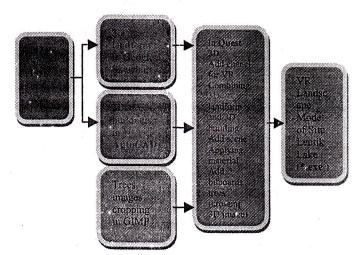

Diagrams of Landscape Design Steps

D. Visualization Method

The method to create virtual reality (VR) of landscape model is integrated multimedia, which integrate 2D, 3D and real-time software (Figure 6). The VR presentation is built from landscape design of SRUF in 2D and 3D model. The 3D model of landscape design of SRUF is made by using Google Sketchup and export it separately of 3D landform and 3D hardscape into Quest 3D.

The 3D landform and 3D hardscape exported are combined together in Quest 3D. The 2D trees and 2D plants models are attached into the model in Quest 3D by using nature path finding facility. The trees and plants objects are billboard objects that is built from 2D crossing cropped images. GIMP is needed as a tool to crop trees images which is not available in Quest 3D template.
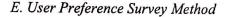

Diagrams of visualization method to create VR landscape model

The VR model is made in Quest 3D and published as execute files (*.exe) which able to be opened in each personal computers or laptops without installing specific programs. The VR model of landscape design alternatives and existing model are combined together in one executable file, so the respondents can operate each VR model at once. The changing scene and camera commands between walkthrough and flythrough are important commands which it should be added to the VR model. The changing of cameras are provided by clicking button C on PC's keyboard.

E. User Preference Survey Method

The user preference is users' opinion after having experience operating VR Landscape Model of SRUF. The online survey method was established by creating online questionnaire by using qualtrics.com software. The questions are about what are experiences operating VR Landscape Model of SRUF, such as if respondents able to open and operate the program, if respondents understand about the landscape design presented and what are respondents' opinion about using Virtual Reality Landscape Model in Landscape Design Presentations. In the online questionnaire, there are also instructions to operate the VR program.

The respondents selected are students of Landscape Architecture of Bogor Agricultural University who are 4th semester or above. The respondents selected are students who already attended the basic subjects in landscape architecture major and have understanding about landscape design presentation. The Executable VR Model File was uploaded to Students of Landscape Architecture Association (Himaskap) Facebook Group and the respondents were requested to download it and operate it in their own PC/laptop. After operating the program, respondents were asked to fulfill online questionaire which the link is attached on Himaskap Facebook Group.
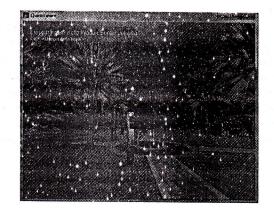
IV. RESULTS

The complexity of landscape structures covering future design of SRUF is the main constraint in Quest 3D. The complexity itself forms the challenging constraints in landscape modeling and represent it entirety is not appropriate nor possible for every single model regardless of its purpose (Thompson and Horne, 2006). Represent each structures and landscape elements in 2D billboards and 3D made a large size of the published file. One of possible efforts to reduce the number of published file was reducing the number of 2D billboards of shrubs and detailed of 3D structures. The final published file of VR Model of SRUF is 32.723 KB from the first published file 66.044 KB.

The large size of published VR model file overcomes a problem in distributing it online to respondents related to speed and capacity of upload/download file by internet and the capability of respondents PC to run the program. From 160 respondents invited, only 40 respondents downloaded the VR model of SRUF file from online file sharing website and fulfill the online questionnaire. From 40 respondents who downloaded the program, 5 respondents cannot opened the file in their PC. The reasons why they cannot operate the program are it was not responding, blank and working very slowly. Four respondents who answer cannot open the VR program do not have dedicated Video Graphics Array (VGA) card in their computer set and only one respondent has dedicated VGA card in her computer but it its capacity is only 64 MB. The performance of VGA card in computer is very important to operate VR program of SRUF which has file capacity 32 MB. A personal computer set with high capacity of VGA dedicated card is very important to operate the VR Program.

The VR Model of SRUF made by Quest 3D is a game-like environment application with walkthrough. There is a hypothesis that respondents experiences in playing 3D Game application may help the ability of respondents to operate the VR Model of SRUF. From 35 respondents who able to operate the program, 79% have experiences in playing 3D computer game and 21% do not have experience in it. On the other hand, from 5 respondents who cannot operate the program, only one respondent (20%) has experience in playing 3D game and 4 respondents (80%) do not have experience in it. From its proportion it is concluded that experience to operate 3D game in computer influence the capability of respondents to operate VR program of SRUF.
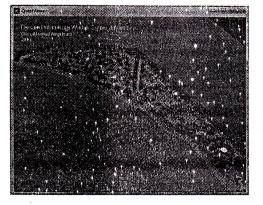
The excellence to have VR model as landscape design presentation is that users are able to do walkthrough inside the model with human eye level in any directions. But human eye level in walkthrough is not enough to show the entirety of landscape design model to respondents. That is why, the VR Model of SRUF was completed by flythrough in bird eye level that users are able to watch the entirety of the model in bird exe level. From 35 respondents who able to operate the program in their computer, 26% of Respondents are prefer to do only walkthrough in the VR model of SRUF and 74% of respondents are prefer to do both walkthrough and flythrough in it. It shows that in landscape design presentation in VR model, the walkthrough and flythrough commands are very important to be provided for user.

The VR landscape model of SRUF in human eye level

The VR landscape model of SRUF in bird eye level

The most important result is about user's understanding of landscape design presented in VR model. From 35 respondents who able to operate the VR model of SRUF, only one respondent (3%) do not understand about landscape design of SRUF but 34 respondents (97%) are understand about it. It shows that VR model is possible and capable to be used in landscape design presentation.

V. CONCLUSION

Landscape design presentation in VR model is a nowadays presentation that allow users to get more information about the site without driven by operators. For academics people who are landscape architecture's students of Bogor Agricultural University, presenting landscape design in VR model which is made by using Quest 3D software is possible to do but it is limited in by the big file size of VR Program. It influences the online distribution by internet and the performance of VR Model in personal computer set. Those limiting factors are important to be considered in presenting landscape design to public.

Despite on the limiting factor above, landscape design presentation in VR Model is possible provide more information about the landscape design. In VR Model, users are able to give commands to program in order to know about the design information. This is the distinguish between landscape design presentation in VR model and other type of digital presentation where users are only viewers without capability to give command to the model.

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