Ⅳ-291 Integrating GIS, CG and the WWW for Facilitating Public Involvement in Urban Landscape Evaluation

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1. Introduction

In spite of the widespread use of the Internet, its potential for facilitating public involvement in urban planning projects has not yet been exploited. In this paper, the integration of GIS, computer graphics (CG), and the WWW to facilitate public involvement in urban landscape evaluation is proposed. This approach explores the possibility of using the Internet to access and display 3D spaces with the Virtual Reality Modeling Language (VRML). This offers a practical and inexpensive method to demonstrate alternative urban landscape designs to, and collect opinions from, the growing public who has access to the WWW. In addition, the flexibility in interacting with the scene makes it possible for the viewer to walkthrough or fly over the modified urban environment and to compare several alternatives.

2. Requirements of Creating and Publishing Virtual Urban Spaces

The potential of the Internet for facilitating the public involvement in urban planning is becoming higher with the recent development of Internet GIS map servers, the availability of more integration of GIS and CG within both GIS and CAD software, and the availability of the VRML. However, the following problems remain to be solved.

(1) The need for a practical method for data acquisition and manipulation: A major task in developing urban landscape simulation is the input of the data necessary for this simulation. One method is to produce approximate landscape simulation by combining available data from several sources using off-the-shelf software (Table 1).

(2) The need to reduce the volume of data to be downloaded: One critical problem when publishing urban landscape simulation files on the Internet is the volume of data that need to be downloaded from the server to the user's machine before he can start navigating in the virtual space using his browser. Another problem is the speed of rendering the VRML file during the navigation. This speed depends on the performance of the video display of the PC, and decreases with the number of faces in the VRML representation. Therefore, every effort should be made to reduce this number by using VRML primitives and using texture mapping instead of geometrical objects.

Table 1. Type of Data Needed for the Urban Landscape Simulation

Type of data	Source	Required Data
Elevation	GIS grid maps	50 m mesh or less is desirable
Maps of buildings, roads, rails, rivers, etc.	GIS vector maps	Scale of 1:2500 or more is desirable
Buildings' height data	Attribute of building GIS data	Number of floors can be used
Texture maps of buildings	Material images libraries	A few number of concrete, steel and glass texture images
Trees, signs, street furniture, characters, etc.	3D objects libraries	Representative objects reflecting the real urban environment
Lights	Created by CG software	Different kinds of lights
Sounds (water, traffic noise, etc.)	Digital sound libraries	Representative sounds

Keywords: GIS, CG, WWW, Public Involvement, Landscape Evaluation

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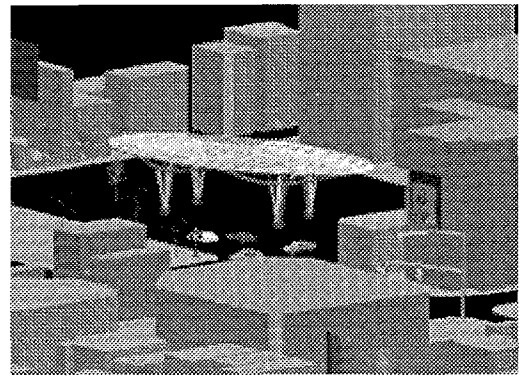

Fig. 1 3D Presentation of the Park and Surrounding Area

(3) Navigation problems: Commercially available VRML browsers such as CosmoPlayer have basic functions for interacting with the scene that makes it possible for the user to walkthrough or fly over the virtual urban space. However, it is desirable to add functions to facilitate this navigation following predefined paths or by adding predefined camera positions. More advanced applications should allow the comparison of several alternatives of the scene.

The steps for building virtual spaces for urban landscape simulation are: (a) Acquire GIS data of neighboring roads, buildings, etc.; (b) Translate GIS data to a 3D format such as VRML or DXF; (c) Acquire/edit the CAD data of the new project; (d) Merge GIS generated data and CAD data; (e) Add CG details such as texture maps, signs, trees, etc.; (f) Translate 3D data to VRML format; and (g) Add navigation functions if necessary. In addition, in order to get the public opinion and to form the consensus through the Internet, a questionnaire can be developed and implemented using HTML forms controlled by the CGI (Common Gateway Interface).

3. Case Study

The case study examined in this paper is a project for the renewal of Sakae Park in the CBD of Nagoya City. In addition to the function of the park, This project adds the functions of an underground bus terminal with 21 bus stops, and shopping mall. The land area of project is 19,869 m^2. Sakae Park was selected as the case study of this research because of the several aspects involved in its plan as a public project which were thought typical for encouraging public involvement. Fig.1 shows the 3D presentation of the park and the surrounding area as can be seen on the web. Several graphical mesh objects representing cars, trees, traffic lights, human beings, etc., were added from freeware archives. Because of the efficient integration of GIS and CG, the model could be developed in comparatively short time. In spite of the efforts made to reduce the size of the VRML final product, this size exceeded 3 MB because of the complexity of the structure of the park roof.

4. Final Remarks and Future Work

In this paper, the potential and requirements of integrating GIS, CG, and the WWW to facilitate public involvement in urban landscape evaluation were discussed and demonstrated with a case study. Further research is needed to compare methods for producing higher quality simulations with the minimum amount of data and to study the reaction of the public to this new media.

References

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