URBAN WIKI AND VR APPLICATIONS

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ABSTRACT: The research paper involves the implementation of Urban Wiki, an online urban design system employing Wiki concept, allowing the use of an interactive immersive virtual reality system for visualizations with dynamic agents such as human and vehicular traffic. The VR system is a platform developed by a software company. The term Urban Wiki is created by the researchers. Urban Wiki aims to creating a networking system of urban designs, enabling the collaborative work between users around the world through a VR platform. The presented system framework is created and tested by the researchers from two different locations in the world. The purpose of the research is to study how the users can share effectively designing a large scale urban project, and how VR platform helps in building up the VR urban models to facilitate visualizations and designing. An urban project of a village scale, which was conducted by one of the researchers is used to demonstrate the potentials of Urban Wiki, presenting its functions and highlighting the possible uses in the urban area. Moreover, using the created models in the VR platform that enables visualizations with dynamic agents opens various urban paths of designing, decision-making, sharing, and communication with the stakeholders, decision makers, and planners. Techniques employed in the design of Urban Wiki can be potentially used to build scalable, easily navigable and extensible models of large-scale entities. Combining the application of the two systems, Urban Wiki and VR platform, will be designed as an intuitive simulation tool, helpful in identifying novel approaches for control and visualization in such applications as urban design, urban plan and Land Use –Physical- Plan.

KEYWORDS: Urban Wiki, VR Applications, VR Platform, Collaborative Design.

1. INTRODUCTION

Collaborative design concept enables users to modify the content of a file from different places around the world. The available modifications at the beginning were exclusive to the text format, and then other formats such as image were adapted. Yet, the collaboration in the designing process itself especially on the 3D level is not effectively introduced. Editing or modifying a 3D design file through a computer system that displays the content of this 3D design file has not been investigated.

Although there is no enough literature in the area of 3D collaborative designing, some researches investigated similar areas. For example, Yamashita et al. (2006) developed a collaborative design environment which considers Information and Communication Technology and architectural space, through supporting synchronous design collaboration in a face-to-face meeting at a local site and also in a continuously connected project-room at distributing sites (Yamashita et al., 2006). Lan and Chiu (2006) demonstrated a Web 3D-GIS approach to develop the urban information system. Lan and Chiu proposed that a digital city should be able to not only visualize a large-scale 3D city model but also integrate useful urban information for potential users' retrieval in a web environment (Lan and Chiu, 2006). Matsumoto, Kiriki, Naka, and Yamaguchi (2006) proposed the collaborative design education program on the web, and developed the special Design Pinup Board system for running it. The introduced program focuses on very limited environment; distributed collaboration beginners, asynchronous, first meeting, and plural teams (Matsumoto, et. al., 2006). Lee (2001) maintained the possibility to create a 3D modeling tool based on the recognition of labels in freehand sketches, and introduced a symbol-based 3D modeling tool (the SpaceMaker) that allows designers to make freehand floor-plan drawings to explore the initial concept of spatial layout and allows users to apply labels to identify different types of space (Lee, 2001).

Offering the opportunity to modify a 3D design through a networking system at different locations around the world has been effectively introduced only on the commercial level, such as Secondlife and CityEngine. Second Life is a 3D virtual world. Its residents are allowed to build, own and retain the rights to their digital creations. They, therefore, can buy, sell and trade with other residents. The Marketplace currently supports millions of US dollars in monthly transactions. Another example related to the same approach is Massively Multiplayer Online Role-Playing Game (MMORPG) Ultima Online that was created in 1997. CityEngine is 3D modelling software for urban environments. It enables its users to build their own neighbourhoods, urban areas and cities with certain types of buildings and houses.

Linking the concept of collaborative design on the 3D level to the famous Wiki concept is one of the concerns of this research. Urban Wiki is an online urban design system employing the Wiki concept. The research concern, moreover, is to investigate the use of an interactive immersive virtual reality system during employing the Urban Wiki.

2. RESEARCH OBJECTIVES

Urban Wiki implements the requirements and objectives that can be summarized in the following:

- Sharing an urban plan through/in a file of max scripting;
- Using a 3D modeling system. Its transformations and changes of form assembling are through only three simple buttons (create, edit and delete);
- Applying functions of searching (zoom in and out) and modifying (create, edit and delete) through networking; and
- Linking the urban file to a VR platform.

3. WIKI AND URBAN DESIGN

A Wiki is a website that allows visitors to add, remove, edit and change its content, typically without the need for subscription. A wiki is an effective tool for mass collaborative authoring through this easiness of interaction among its visitors. Urban Wiki of the same Wiki potentials is investigated by the researchers in another research paper. Moreover, Wiki concept on the design level, Design Wiki, was previously introduced by the researchers*******. Design Wiki has a networking 2D/3D visual design map, DesignMap, through which Design Wiki visitors can edit the existed designs and then save the modified designs in series based on their topological properties.

The main objective of this research is to share effectively the designing process of a large scale urban project, and to allow visualizing the urban file through a certain VR platform. Therefore, Urban Wiki investigated by this research is focused on activities of a group of interest during conducting an urban planning project.

3.1 Urban Wiki

The public Web portals that appeared in the mid-1990s, such as Yahoo, Msn, AltaVista, and Excite, have portlets that provide self-contained boxes for different features like e-mail, news, weather and search. By the late 1990s, software vendors began to produce pre-packaged enterprise portals, which would be toolkits for enterprises to quickly develop and deploy their own customized enterprise portal. There are many enterprise portal vendors such as, Apache Software Foundation (its product name is Jetspeed 2.1), IBM (its product name is WebSphere Portal Server 6.0.1), and Microsoft Office (its product name is Sharepoint Server 2007).

Urban Wiki is programmed as a main Portlet. Urban Wiki portlet, which is programmed in Java, is a reusable interface for online applications, and it is running with JetSpeed2 framework provided by Jakarta Project. The portlet can be run through all kinds of Portal applications. It was tested using a free Enterprise Internet Portal Framework, JetSpeed2 (by Apache Portal Project site, http://httpd.apache.org/).

3.1.1 Methodology

The user has to prepare two files; an initial space layout file and a file of space property list. The file of Space Property List has the adjacency list of a design, for example in Figure 1, the adjacency list for 43 is: 8, 22, 40, 39, 30, and by changing the three outlined cells to a new space, e.g. 45, the list will be: 8, 45, 8, 22, 40, 39, 30. The

Space Layout file should have at least one design with an array of 400 (20x20) integer numbers such as (0 0 0 0 1 1 1 …. 0 0 0).

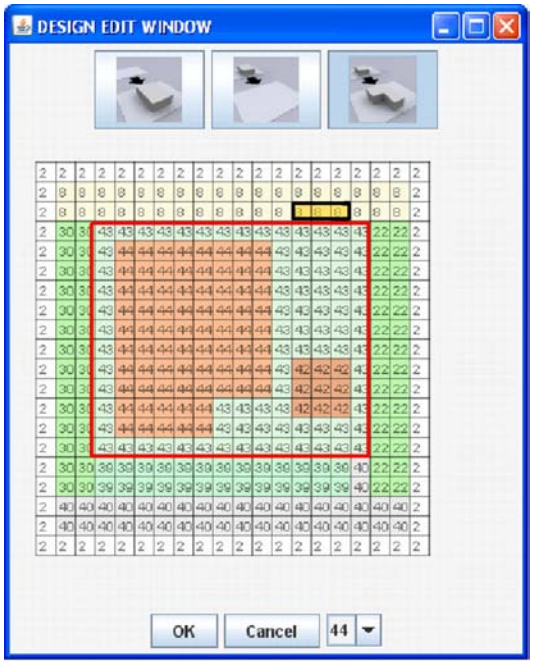

FIG. 1: A displayed 2D design with the three buttons of modifying by adding the three outlined cells

Each integer number represents a space property such as 0=Street, 1=Sidewalk, and 2=House, which are defined the file of space property list, Figure 2. By changing the properties of cells in the portlet's grid, new spaces are created. A space is defined as a set of cells with the same property such as house, front yard, driving way, and garage.

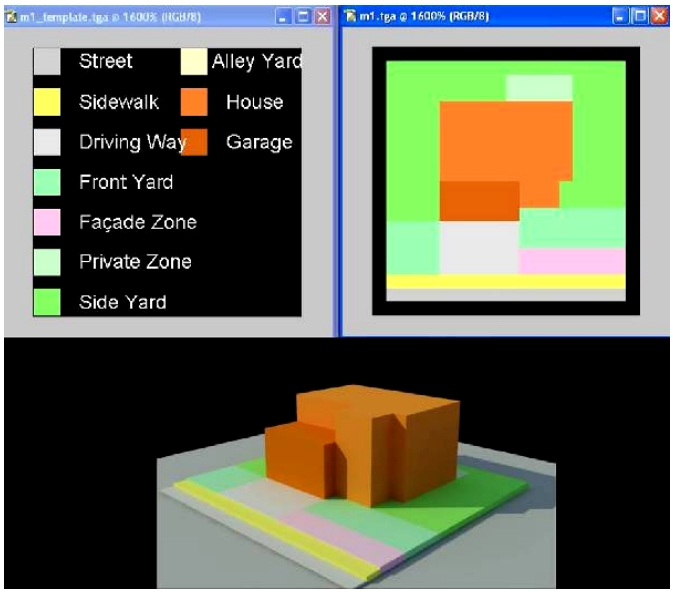

FIG. 2: A design displayed in 2D and 3D with a space list

After creating the design or the urban plan, it can be added to the main urban file of max scripting. Visitors, a group of interest, who have the access to the main urban project file can add, edit or delete designs of this urban project. Figure 3 presents a 2D urban plan project that was used to test the application.

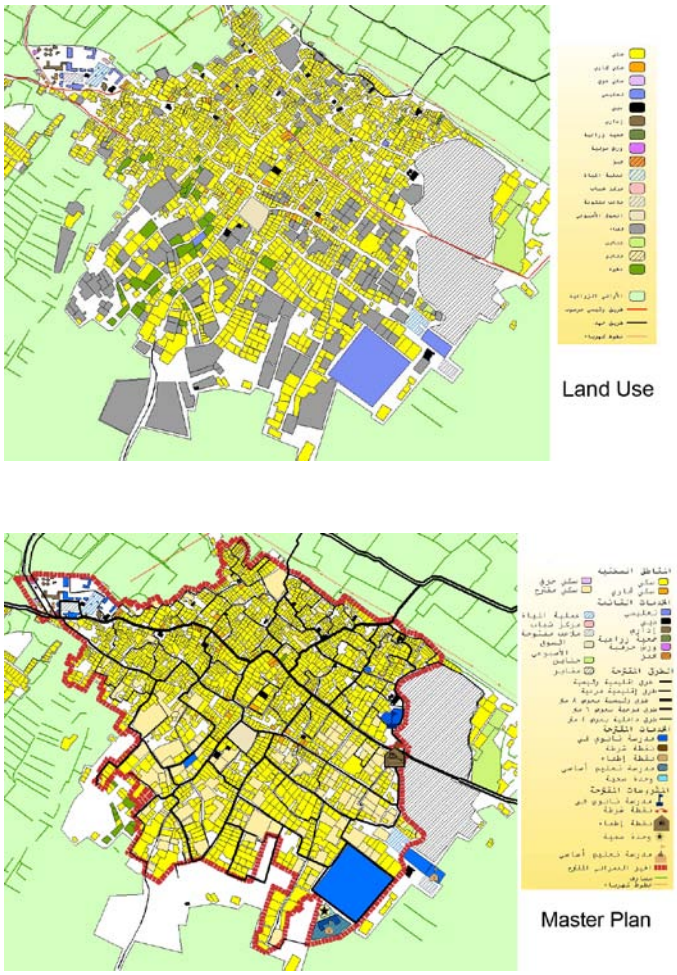

FIG. 3: 2D maps, land use and master plan, of the urban plan project, Arabah Sharqeyah Village, Sohag Governorate, Egypt.

3.1.2 Functions

The functions offered by Urban Wiki were tested by the researchers through making modifications at two different locations to the urban file. The interactive modifications through the VR allow to visualize the impact of these modifications and to link them to other factors. The influential factors assessment and their impact in an interactive VR environment help not only urban designers but also the associated partners and stakeholders.

3.1.3 Abstract outputs

Urban Wiki applies only square grids which would generate straight shapes and forms. Although diagonal lines and polygonal shapes can be adapted and implemented by Urban Wiki, the research paper employs an abstract style for the created designs possibly added to the urban models. Whereas the focus on the large scale projects of urban designing and urban planning is directed to the surrounding environment rather than buildings and their details.

3.2 The Urban Project

On large scale urban projects, many authorities and individuals are involved, for example municipalities, district councils, stakeholders, decision makers, and planners. A major part of the designing process itself is the effective communications between the different parties. Facilitating the processes of sharing, communication, decision making, and visualization is the main advantage of employing the Wiki concept in urban design projects.

The urban project presented by this research is of Arabah Sharqeyah, a Village at Sohag Governorate in the middle of Egypt. During this urban project, there were several meetings with the inhabitants of the village and the members of village council in order to share in the decision making processes whenever it is approved by the planning authorities and the Ministry of Housing and Planning.

The urban model was created by the 3ds max file and displayed in Urban Wiki system, Figure 4. The final output that has modifications made by the Urban Wiki is imported to the VR program platform in max scripting file format. The link between Urban Wiki and a VR platform eases many activities and tasks of the urban designing. Of the previous experience resulted from conducting this urban project, the VR models with the possibility of interaction offer a more effective way than of provided by the static models.

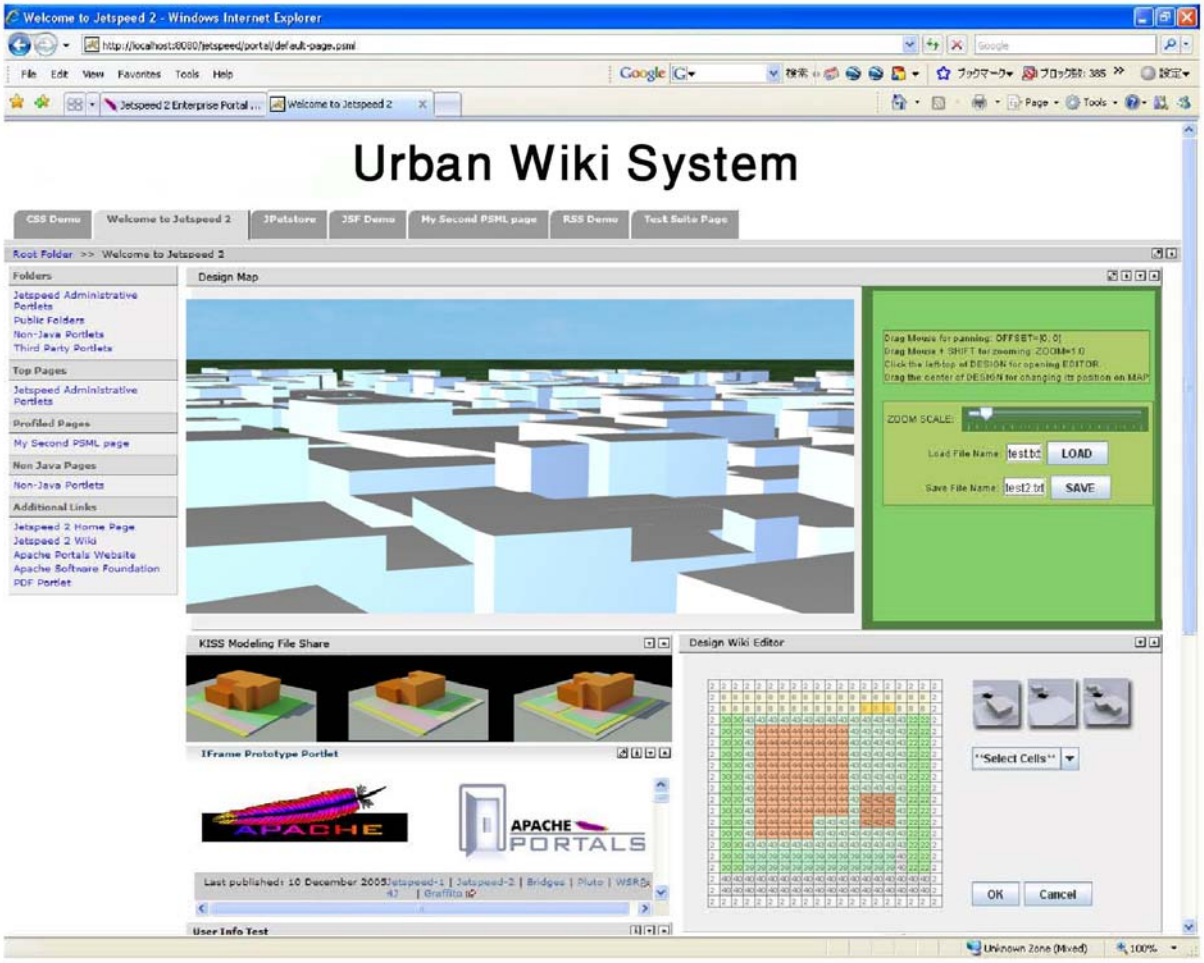

FIG. 4: The user interface of the Urban Wiki System.

Based on the Space file used in the Urban Wiki, each design can present certain data. This flexibility is important to adapt different styles of urban fabric of different urban projects. Different models would be built up to visualize and evaluate the alternative solutions and various influential factors of the urban environment. These changes and modifications can be visualized through the Urban Wiki system at different locations at the same time through networking.

4. VR PLATFORM

The final step is to import the main urban project file to a VR platform. The platform used is UC Win/Road, a software program developed by the Forum8 Company. Its version 3.04 has the function of importing different file formats such as shp, max script, 3ds max and dwg. Urban Wiki employs the option of max script format. Also, the latest version, VR studio, has the function to visualize the same VR model through networking at computers of different locations. Figure 5 shows a screenshot of the VR model of an urban project, displayed in UC Win/Road.

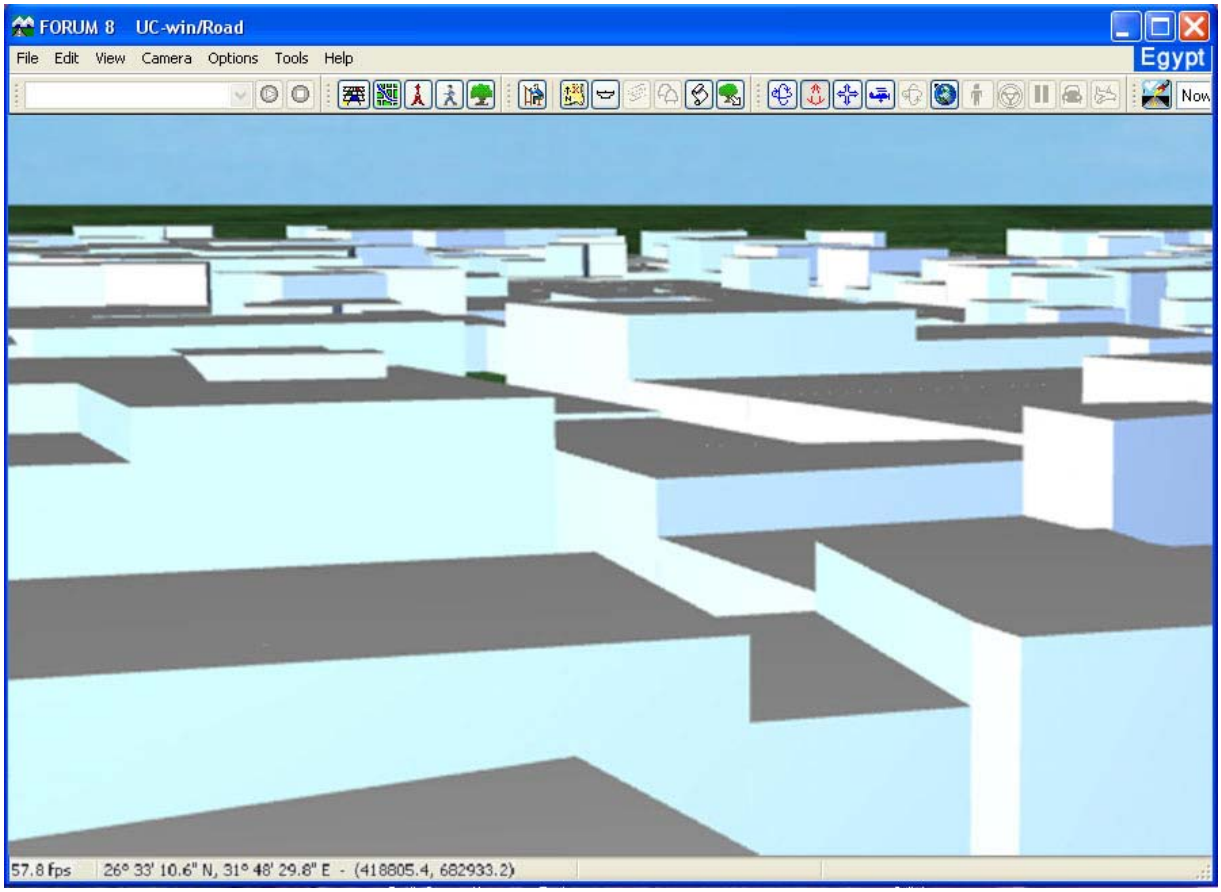

FIG. 5: A screenshot of the VR program showing the village model.

The VR platform, UC Win/Road 3.04, enables visualizations of traffic simulation with dynamic agents such as cars and pedestrians. This interactive immersive virtual reality system opens various urban of designing, decision-making, sharing, and communication with the stakeholders, decision makers, and planners. These applications of Virtual Reality platform are the concern of this research. Various urban project problems can be solved while different scenarios can be visualized for evaluation and comparisons.

On another research contribution, techniques employed in the design of Urban Wiki can be potentially used to build scalable, easily navigable and extensible models of large-scale entities. On a village scale or district level, navigation

through the whole project in terms of adding or modifying certain urban areas is highly important. Providing this function at different locations and visualizing the outputs within these locations at the same time, through Urban Wiki system, are a major part in the design process of urban projects.

5. SUMMARY AND DISCUSSION

The research concludes to a unique urban system, Urban Wiki, where its objectives, functions and methodology were illustrated. The contributions and applications of Urban Wiki, through networking and its possible link to a VR platform can be employed effectively in urban planning as tools of designing, decision-making, sharing, and communication. VR models are improving the practice of urban environmental planning and design. The visual display capabilities enable the explanation of the development plans, alternatives or various scenarios to both the urban project team and the public.

Although the research paper did not concentrate on the urban planning project itself, some modifications were made in the urban design at different locations –countries- through networking in terms of testing and simulating the same conditions during conducting the project.

There are areas and factors which can be considered crucial urban planning issues that present focuses of future research papers to be investigated on the urban level.

6. ACKNOWLEDGEMENTS

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