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Editorial Introduction

Special Issue on "BIM and VR Technology"

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During the process of urban planning and design, it is important that all stakeholders understand, participate, communicate and collaborate with each other to obtain a high quality outcome. However, communication difficulties mainly occur as a result of different planning cultures, and because there is insufficient collaboration and information sharing during the process. The most common problem is that the information is not presented in such a way that people can understand it. Building Information Modeling (BIM) is becoming a better known established collaboration process that stakeholders can better understand, communicate and make decisions with in urban planning and design (Hergunsel, 2011). In addition, the use of Virtual Reality (VR) technology as a tool for collaboration to exchange information and data has increased significantly (Menck, Weidig, & Aurich, 2013). Thus, this special issue focuses on BIM and VR technologies which play more and more important roles in urban planning and design.

As stated by Kim (2004), any 3D visualization method typically involves 3D modeling, so the first paper "Automatic Generation of 3D Building Models with Efficient Solar Photovoltaic Generation" aims to contribute an automatic modeling system which integrates Geographic Information Systems (GIS) with Computer Graphics (CG) to automatically generate 3D building models based on building polygons or building footprints on digital maps (Sugihara & Shen, 2017). The proposed system partitions orthogonal building polygons into a set of rectangles and places rectangular roofs and box-shaped building bodies on these rectangles. To implement efficient PV generation, the authors propose to automatically generate 3D building models topped with double shed roofs overlaid by PV arrays, and simulate the solar photovoltaic generation change of a city block by performing land readjustment and changing the shape of buildings, ordinary roofed houses or double shed roofed houses suitable for efficient PV generation. Their simulation result reveals that double shed roofed houses have greatly improved solar photovoltaic generation.

The second paper "Construction of Urban Design Support System using Cloud Computing Type Virtual Reality and Case Study" contributes an urban design support system (UDSS) of Cloud-based virtual reality (Cloud-based VR) for urban planning and urban design (Lei et al., 2017). The

authors introduce a Cloud-based virtual reality platform (VR-Cloud server) which can be used to open the VR dataset to public collaboration over the Internet. The digital asset representing the design scheme of design concepts includes the Land Use Zone, Building Regulations, Urban Design Style, and other Design Detail of urban planning and design. The authors also gave three latest case studies of how a Cloud-based VR has affected the urban planning and design process in each project, and attempted to argue what exactly has been altered during each planning phase, based on the qualitative findings taken from the three cases.

Consensus building is a conflict-resolution process used mainly to settle complex, multiparty disputes (Burgess & Spangler, 2003). A consensus process among a variety of stakeholders is required during the process of urban planning and design. So, the third paper "Cloud-based Virtual Reality Integrated Automatic Presentation Script for Understanding Urban Design Concepts in the Consensus Process" focuses on how to improve the understanding of design concepts related to the One Foundation Disaster Prevention Park of China through a consensus process using a Cloud-based VR integrated automatic presentation script (APS) (Zhang et al., 2017). The authors built a Cloud-based VR platform to propose design concepts, and created an APS for auxiliary guiding of users toward understanding the concepts of urban design and deliberate design alternatives in a design report meeting via the Internet. Their application results show that the Cloud-based VR (with integrated APS) platform not only can simplify the discussion of design concepts without the limitation of space and time, but can also improve the efficiency of design alternative discussions to reach a consensus without any extra expense.

In recent years, BIM technology has usually been used as a design evaluation tool to consider the relationship between indicators concerning the urban landscape view planning, physical spatial design and the performance of environmental planning (Lee et al., 2010). In order to foster better, but also speedy, decision-making processes, the fourth paper "Assessment of the Process of Designing an Apartment Building through IM and VR" applied various types of software and solutions based on Information Modeling (IM) and VR in the design of a company dormitory (Imaizumi, 2017). In this research, simulations via a BIM model are performed and a Cloud-based 3D VR is used for consensus building. The author examines the detailed process of the application project, the effectiveness of feedback on the design, and the process of reaching consensus. In addition to what has been done or is currently available, the author also suggested a summary of what the research team will offer in the future in terms of BIM modeling, environment simulation and VR simulation, collectively.

Vertical greening means a vertical triumph of greenery in high density urban areas, the use of vertical greening in urban areas to improve sustainability of the environment. However, conventional vertical greening is in open fields, unprotected and threatened by climate disasters. A greenhouse system could instead solve different facets of these problems. Therefore, the final paper "Green-energy water-autonomous greenhouse system: an alternative-technology approach towards sustainable smart-green vertical greening in smart cities" summarizes new greenhouse technologies and approaches to introduce the relationship and development between vertical greening and greenhouse systems, and presents a proposed novel prototype of a green-energy water-autonomous greenhouse system (Hung & Peng, 2017). The authors suggest using a true BIM model for further design

of the proposed greenhouse system. A design with foresight based on BIM modeling is necessary to provide advanced understanding of the proposed greenhouse system and to allow us to build a smart-green point cloud with BIM workflow for any network in a smart city.

This special issue is one of the outputs of the Biennial International Conference on Spatial Planning and Sustainable Development held on 7-9 August in 2015 at the Taipei University of Technology. We would like to express our sincere gratitude to the researchers who joined the conference and submitted their works to our journal. Special thanks go to Prof. Kuang-Hui Peng who organized this International Conference as the Chairman of SPSD2015. We would also like to express our sincere gratitude to the reviewers who gave us their most generous support on reading and commenting on the papers. We hope all our efforts will contribute to the development of urban planning and design, as well as the creation of a more sustainable world.

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