A Support Tool Coupling Web-GIS and Virtual Reality to Explore Improvement Draft Plans in Densely Built-up Areas

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The study

In Japan, there still remains about 20,000ha of densely built-up areas and the promotion of safety in these areas is a pressing issue for urban planning. However, improvement in these areas has been very slow. Exploring draft plans through collaborations between local governments and local residents is essential in order to promote improvements aimed at the improvement of safety, living environment and townscape. Therefore, citizen participatory workshops are used nationwide to reach a consensus among stakeholders. However, it is difficult to reach a consensus. This is a key factor to promote improvements in these areas.

This study aimed to try to develop a support tool for discussion of workshop to examine draft plans and to verify usability of using support tool to reach a consensus.

At first, authors focus on the following two issues as inhibiting consensus building: 1) The lack of a method that can quantitatively and objectively evaluate the earthquake disaster vulnerability of the subject area in order for participating residents to easily understand the effects of improvement plans; 2) The lack of a method for participants to share their understanding of spatial townscape images in combination with disaster mitigation performance evaluation (DMPE) during the discussion of the draft plans (Karashima, accept). In order to solve such issues, the necessity of a support tool with a function that visualizes spatial townscape images after improvements by combining DMPE from various draft plans examined by participants is shown.

To develop a tool similar to that mention above, there are two issues in terms of system development. First, the tool must be able to calculate the DMPE for draft plans while in discussion about workshops. Secondly, it is necessary to combine a function for visualizing spatial townscape images of draft plans with a function for calculating DMPE. To solve these issues, first, we have enabled providing DMPE while in group discussions from the result to try shortening the computation time (Karashima, 2012) of the district level DMPE method developed by the authors (Gohnai, 2006; Gohnai, 2007). Moreover, we combined a Web-GIS support tool incorporating DMPE with VR. As the result, a function visualizing 3D spatial townscape images after improvements combined DMPE from various draft plans examined by participants was developed (Karashima, 2012).

In this paper, the authors explain the outline of a plannning support tool for exploring improvement draft plans of unified DMPE in real time with a function providing spatial townscape images by coupling Web-GIS and Virtual Reality based on the results of the system development mention above (Figure 1). Finally, the usability of the developed tool was verified.

Examining the usability of this tool was done by the following method. First, according to workshop flow using support tool we assumed, we provided the information including the spatial townscape images by VR and DMPE results using the support tool to experts involved in the improvement of densely built-up areas. Next, an evaluation was obtained from the viewpoint of an expert regarding the provided information using the support tool mentioned above. As a result, the obtained evaluations are as follows. By providing DMPE results and spatial townscape images after improvements for draft plans examined by participants using the support tool on-site of the workshops, participants can easily understand and share the effects of promoting safety from earthquake disasters and changes in the townscape. In addition, facilitators can extract participants opinions. From these effects, the support tool contributes to the promotion of a consensus building.

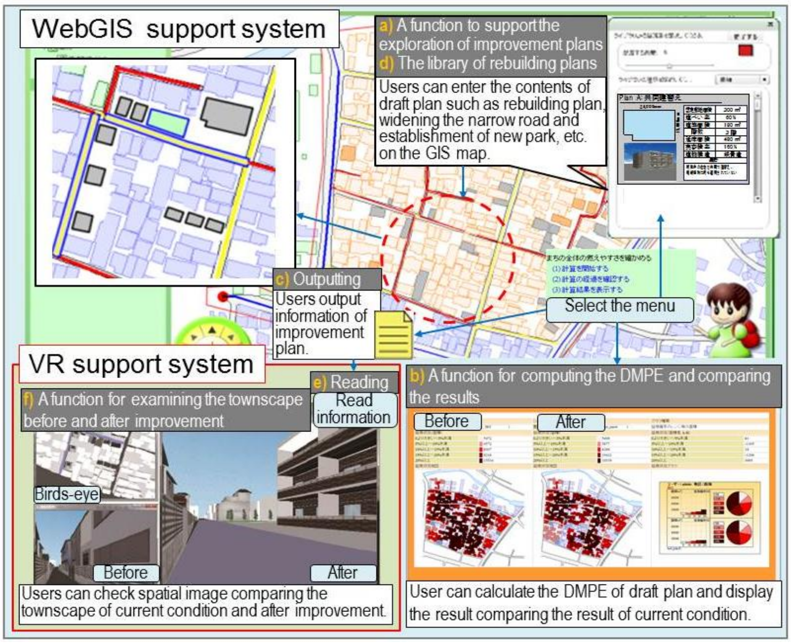

Figure 1 : Interface of the developed support tool

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