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Integrating BIM Models with 3D Scenery from UAV-Assisted Survey on Embankment

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Extended Abstract

In recent years, with the development of smart city concept, the traditional two dimensional (2D) information for the civil or geotechnical construction industry has a severe limitation of use before and during construction. Three dimensional (3D) information has become a topic of general interest and the future trend for new and old civil structures. Both for macroscopic geographic information system field and the relatively microscopic building information field, the 2D has gradually been replaced by 3D. The 3D visualization and information can be used to improve the engineering efficiency and construction accuracy. Therefore, the building information modeling (BIM) had been established and used for representing the 3D information during planning, design, and construction for the past decade [1-4].

At present, Taiwan's construction industry has been using BIM before construction. For public construction, the government asks manufacturers to provide BIM models and use them effectively as an object-oriented model to manage the entire life cycle of the construction facilities. About planning, design, construction, operation, and maintenance, BIM has become a trend in the civil construction industry. However, most of the BIM models focus on the problem of interface integration in the regular building itself. Few of the BIM models fully consider the local conditions occurred during construction especially for building the infrastructures such as bridge, highway, embankment, and surrounding landscape. Therefore, this study used the characteristics of high mobility and convenient shooting of high-resolution images of the unmanned aerial vehicle (UAV). Also, UAV was used to assist in surveying 3D real landscapes and to obtain actual information on the surrounding land and landscape features before and during construction. UAV was used to assist in the building of BIM models before, during, and after the construction of highway embankment and bridges.

The main task of this study was the integration of different software and image formats. Three types of integration scenarios were assumed; long-distance and close-range interface integration; 3D browsing animation; and 4D process simulation. With an actual embankment construction case, UAV was used to assist the survey of existing status. Then Pix4D and Context Capture were used to construct the models of the surrounding landscape feature. Finally, Revit was used to complete a structure model for future statuses.

With a view to bring 3D real scenes into BIM, using Revit and Micro Station as integration software, integration was tested in three hypothetical situations. The compatible formats between software were solved. However, the problem of the component presentation in the integration process was encountered. Also, in the present study, the feasibility of integrating the 3D reality of UAV-assisted mapping into the BIM model was explored. The procedures developed in the study can be used for application on geotechnical and civil construction using UAV and suitable software.

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