

Composing Method of Decision-Making Function for Construction Management Using Active 4D/5D/6D Objects

Authors : Hyeon-Seung Kim, Sang-Mi Park, Sun-Ju Han, Leen-Seok Kang

Abstract : As BIM (Building Information Modeling) application continually expands, the visual simulation techniques used for facility design and construction process information are becoming increasingly advanced and diverse. For building structures, BIM application is design - oriented to utilize 3D objects for conflict management, whereas for civil engineering structures, the usability of nD object - oriented construction stage simulation is important in construction management. Simulations of 5D and 6D objects, for which cost and resources are linked along with process simulation in 4D objects, are commonly used, but they do not provide a decision - making function for process management problems that occur on site because they mostly focus on the visual representation of current status for process information. In this study, an nD CAD system is constructed that facilitates an optimized schedule simulation that minimizes process conflict, a construction duration reduction simulation according to execution progress status, optimized process plan simulation according to project cost change by year, and optimized resource simulation for field resource mobilization capability. Through this system, the usability of conventional simple simulation objects is expanded to the usability of active simulation objects with which decision - making is possible. Furthermore, to close the gap between field process situations and planned 4D process objects, a technique is developed to facilitate a comparative simulation through the coordinated synchronization of an actual video object acquired by an on - site web camera and VR concept 4D object. This synchronization and simulation technique can also be applied to smartphone video objects captured in the field in order to increase the usability of the 4D object. Because yearly project costs change frequently for civil engineering construction, an annual process plan should be recomposed appropriately according to project cost decreases/increases compared with the plan. In the 5D CAD system provided in this study, an active 5D object utilization concept is introduced to perform a simulation in an optimized process planning state by finding a process optimized for the changed project cost without changing the construction duration through a technique such as genetic algorithm. Furthermore, in resource management, an active 6D object utilization function is introduced that can analyze and simulate an optimized process plan within a possible scope of moving resources by considering those resources that can be moved under a given field condition, instead of using a simple resource change simulation by schedule. The introduction of an active BIM function is expected to increase the field utilization of conventional nD objects.

Keywords : 4D, 5D, 6D, active BIM

Conference Title : ICCCE 2015 : International Conference on Civil and Construction Engineering

Conference Location : Melbourne, Australia

Conference Dates : December 13-14, 2015