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4D dynamic construction management and visualization software: 2. Site trial

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Abstract

The performance of any system can only be gauged by practical applications. This paper delineates some insight and experience on the on-site use of a prototype four-dimensional (4D) site management software system for a warehouse superstructure in Hong Kong. It links a three-dimensional model and a construction schedule to furnish visualization of the state of a site at any user-specified date. Site personnel generally view this system as potentially very promising and helpful. The 4D visualization is found to have capability to assist cognitive, reflective and analytical activities of site management. Through this site trial, some limitations of the software are also spotted which consequently lead to enhancement to the system. The prototype model may require a large amount of data input for large projects which lead to large computer files and slow processing speed. Hence, careful implementation of details is required in the planning level for practical 4D simulation modeling. This, however, will not be a long-term problem, given the recent advancement of computer technology.

Keywords: 4D site management; Construction planning; Scheduling; Site trial

1. Introduction

Conventionally, planners rely on their experience, intuition, imagination and judgment in using the general arrangement drawings and schedules to make resource allocation and site layout decisions. It is hypothesized that an appropriate management support tool, by furnishing a visual representation of the construction site including representation of construction progress of the buildings and status of the prospective site space utilization on any user-specified date, and by allowing interactive manipulation of the site objects and the bar chart schedule, will be of practical help to site management.

This paper describes an on-site trial use of a Four-Dimensional (4D) Site Management Model 4DSMM, which links a three-dimensional (3D) modeling system with a construction time schedule based on Microsoft Project, and outlines the key evaluation findings. The 4D Graphics for Construction and Site Utilization system (GPCSU), intended as an effective aid for better planning and communication amongst site individuals, enables projected visualization of the

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state of a site. The detailed description of the evolution and development of this prototype visualization system can be referred to [1–4]. The system is currently limited to the modeling of structural elements only. The site state includes finished permanent structural work at that date, the status of the current ongoing construction activities at any specified physical level, the positions of major items of equipment and how the site is being used for such as roadways, storage, assembly areas, etc. The system, as a by-product, can also provide additional management information such as resources requirements on manpower, materials and working space, which are conventionally addressed by algorithmic tools [5,6].

In order to ensure that 4DSMM is not just developed under a purely research environment, the system development team has spent many short periods on site over the years and many of the system features have been tailored to reflect a diversity of practitioners' inputs. The scope of the on-site study being reported here is limited to the planning at the level of detail relevant to the co-ordination of the structural work of subcontractors and the visualization of completed and ongoing structural work. Through the site trial, both the potentials and difficulties evolved during the study are identified and the implications are then discussed.

The site personnel are very positive about the need for visualization and planning tools like 4DSMM. It is considered that, if the software could better fit the way in which site management actually operates, and processing speeds become much faster in the foreseeable future, then 4D visualization planning and control tools will become very useful and cost effective. Subsequent to this site trial, some enhancements are made to the prototype system in order to

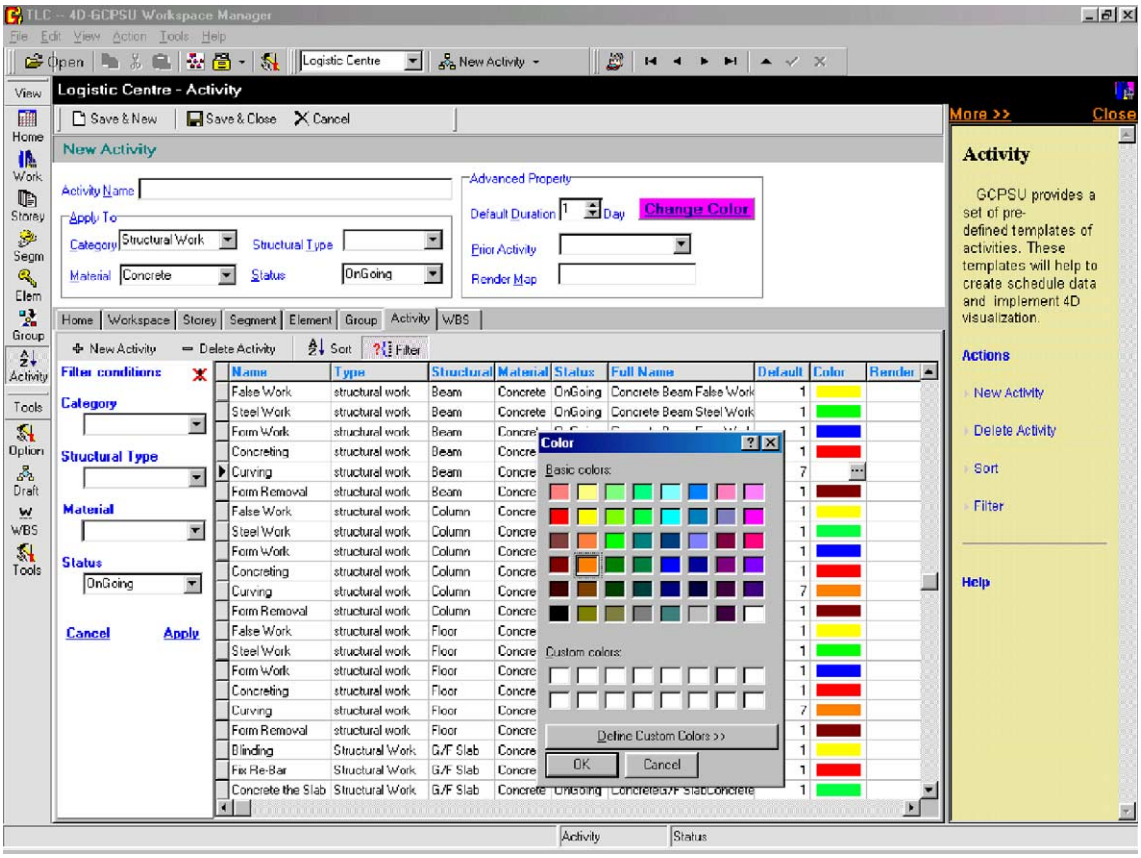

Fig. 1. Sample screen displaying input of activity data in Workspace Manager.