Multi-constraint information management and visualisation for collaborative planning and control in construction

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In complex and concurrent construction projects, reliable planning becomes a centre for effective collaboration across upstream supply chains and downstream operations at the work face. Thousands of literatures in construction planning have been published over the past 50 years; introducing, testing, and implementing mountain of techniques and tools. However, they are very fragmented and have not yet provided a universal system that remedies a typical problem of separation of execution from planning. To solve this puzzle, this paper introduced a new methodology called ‘multi-constraint planning’, which possesses five superior characteristics including (1) collaborative and multi-level planning; (2) multi-constraint consideration; (3) effective uncertainty handling; (4) appropriate visual representation; and (5) practicable optimisation. An integrated decision support system that incorporates web-based and mobile information management system, 4D-visualisation system, and evolutionary optimisation system is successfully developed as an enabler for implementation of the proposed methodology. The two modules of information management and visualisation are detailed and demonstrated in the paper. It is envisaged that successful implementation of this system will enable generation of reliable plans and constraint-free execution assignments, in turn, reduce production risks and improve on-site productivity.

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