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Resource Constrained Time-Cost Trade-Off Analysis in Construction Project Planning and Control

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Abstract : Time-cost trade-off (TCTO) is one of the most significant part of construction project management. Despite the significance, current TCTO analysis, based on the Critical Path Method, does not consider resource constraint, and accordingly sometimes generates an impractical and/or infeasible schedule planning in terms of resource availability. Therefore, resource constraint needs to be considered when doing TCTO analysis. In this research, genetic algorithms (GA) based optimization model is created in order to find the optimal schedule. This model is utilized to compare four distinct scenarios (i.e., 1) initial CPM, 2) TCTO without considering resource constraint, 3) resource allocation after TCTO, and 4) TCTO with considering resource constraint) in terms of duration, cost, and resource utilization. The comparison results identify that 'TCTO with considering resource constraint' generates the optimal schedule with the respect of duration, cost, and resource. This verifies the need for consideration of resource constraint when doing TCTO analysis. It is expected that the proposed model will produce more feasible and optimal schedule.

Keywords : time-cost trade-off, genetic algorithms, critical path, resource availability
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