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Bilevel multi-objective construction site security planning with twofold random phenomenon.

Summary: The lack of early security arrangements during the construction period can increase the vulnerability of construction project. To support current construction security standards, this paper proposes a bilevel multi-objective model for construction site security problem (CSSP). In contrast to prior studies of CSSP, the bilevel relationship and twofold random phenomenon are considered. Specifically, the upper level programming denotes that project security officer must first decide which facilities to be secured under limited funds whilst maximizing the efficiency of the construction facilities system and minimizing the countermeasure cost and economic loss. The lower level programming denotes that the attacker will destroy a subset of the facilities to inflict maximum loss of efficiency in the construction facilities system. To deal with the uncertainties, expected value method and chance constraint method are introduced to transform the uncertain model into a calculable one. Thereafter, a stochastic simulation based constraint checking procedure is designed. Plant Growth Simulation Algorithm (PGSA) is applied to solve this model. Finally, the approach is carried out in the Longtan hydropower construction project to illustrate the efficiency of the proposed model and algorithm.

Keywords: construction site security; bilevel multi-objective model; birandom variable; Plant Growth Simulation Algorithm

doi:10.3934/jimo.2015.11.595