

The Optimization of Reinforced Concrete Cantilever Retaining Walls by Using the Firefly Algorithm (FA)

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Abstract

In order to minimize the cost and weight of reinforcement cantilever concrete retaining walls, the optimization is performed by a new swarm intelligence algorithm that is called firefly algorithm (FA). This algorithm has been inspired from firefly behavior which search for food and find mates using bioluminescent communication. A computer program has been developed to investigate the capability of FA and compare with the other research. Two verifications are performed to show that the FA is able to optimize the wall. The obtained results show that the FA can simply minimize the cost and weight of retaining walls. Furthermore, two kinds of conventional reinforcement cantilever concrete retaining walls are presented with more variables and constraints. The normal T-shape wall and the T-shape wall with variables thickness are optimized and compared for two points of view; the wall cost and weight. This comparison is performed to show the performance of walls and determine the superiority. Moreover, the effect of fixed and initial parameters such as stem height and surcharge load on both objective functions has been investigated by sensitivity analysis. All results illustrate that the FA is capable to optimize the retaining walls.

Key words: Reinforcement concrete cantilever retaining wall, Firefly algorithm, optimization, Sensitivity analysis, Cost and weight objective functions, Swarm intelligence algorithm.

1. Introduction

The main goals to design all structures are cost reduction and safety. In other words, the best design is obtained when the structure has low cost besides the safety against structural and geotechnical requirements. In order to reach to this purpose, the engineers apply the optimization to decrease the cost and weight structures. The reinforcement concrete cantilever retaining walls are an important structure in civil engineering. It is obvious that the engineers have been utilized various methods to optimize the retaining walls from long time ago. Saribas