Thesis Title   Integrating Genetic Algorithms with the Design of Telecommunication Tower Structures

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Candidate   Mr. Phiphat   Tongbor

Supervisor   Dr. Pasit   Lorterapong

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Abstract

Implementation of genetic algorithms to the design of telecommunication tower in order to minimize the weight of structures is presented in the thesis. A computer program has been developed to integrate genetic algorithms with Augmented Lagrangian method. Three main design variables of structure including topological variable, slope variable and section variables are considered. The topological variable, influencing the shape of structure, is expressed by the number of vertical blocks composing the structure. The slope variable, effecting the slope of leg member, is treated as a continuous variable varying from 0.01 to 0.06 at the accuracy of 0.001. The section variables are those used to identify the type of members selecting from the commonly used standard angles. The heights of telecommunication tower being considered in this study are 27, 37 and 45 meters respectively and design criteria are conformed to EIA/TIA-222-E(1991) standards and AISC specifications (Manual 1989).

A comparison has been made between the weight of the existing structures and those generated using genetic algorithms. At the same amount of displacement, it is found that, the weight of the three different height structures using genetic algorithms are reduced by 22.318 percent, 13.125 percent and 25.806 percent respectively. From this study, it can be stated that genetic algorithms can be used as a tool to enhance the design of the telecommunication tower structures. In addition to the design criteria mentioned above, heuristic rules (i.e., rules for selecting the structural members) can easily be incorporated into the genetic algorithms. This will help increase the suitability and constructibility of the structures.