Ain Shams University
Faculty of Engineering
Department of Engineering Physics and Mathematics

APPLICATION OF OPTIMIZATION TECHNIQUES ON ECONOMIC DISPATCH

A Thesis Submitted
For The Degree of Masters of Science in Engineering Mathematics

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ABSTRACT

The design and performance of electric power systems has attracted the attention of many researchers. With the increase in the price of operation and the limitation of generation resources, effort is put in improving efficiency of generation and operation of power plants. Economic load dispatch is crucial since it is required to schedule committed generating units so as to meet load demand at minimum operating cost satisfying all unit and system equality and inequality constraints and limitations imposed on the generating units during operation.

To solve the economic load dispatch problem, traditional and intelligent techniques were applied. The traditional techniques are simple and fast, however, they have the disadvantage of converging to local optimum solutions rather than global optimum solutions. Researchers have shown interest in utilizing metaheuristic methods to solve complex optimization problems in real life applications. Metaheuristic methods solve the most complex optimization problems rapidly and global optimum solutions are most probably guaranteed.

Firefly algorithm is suitable for solving the economic load dispatch problem. Compared to other techniques, firefly algorithm has a high convergence speed and can deal with multimodal and non-linear optimization problems efficiently. Yet, it could get trapped in local optima, its parameters aren't dynamic and it doesn't memorize previously superior solutions.

In this study, three recent modifications of the firefly algorithm: modified firefly algorithm, memetic firefly algorithm, and variable step size firefly algorithm were applied to solve the economic load dispatch problem. Their performance were evaluated and compared with each other and to the original firefly algorithm. Numerical simulations were implemented and show the efficiency of the modified firefly algorithm over the other approaches.

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