A HYBRID ALGORITHM TO SOLVE UNIT COMMITMENT PROBLEM

By

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"A Hybrid Algorithm to Solve Unit Commitment Problem"

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By

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Final Approval

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DEDICATION

Dedicated to my loving parents and family

Irfan Sabir

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ABSTRACT

Presently most of the world's electricity demand is met by thermal power generating stations which purely growth on conventional fossil fuels. Every thermal generating unit is characterized by its distinct incremental heat rate curve which directs the production cost. An optimal allocation of generation among the different power generating units can thus save significant fuel input and cost. However, a larger amount of fuel cost can potentially be saved by spreading this optimization process to decide which of these thermal units would participate in the optimal allocation. It is vital to determine whether the current unit must be ON/OFF and committing thermal generating units among the available ones in this mode is popular as Unit Commitment (UC). In general, UC schedules are determined a day ahead. On the other hand, optimally allocating the generation among the set of units already committed/scheduled for operation is familiar as Economic Dispatch (ED).

In power generation, the operational planning is a major activity. UC is a significant economic problem in thermal generation systems with main condition is meeting the load demand under a specific time horizon while all the unit operational constraints are taken in account. The UC is highly composite problem in power generation system operational planning. The deterministic (conventional) techniques comprise priority listing (PL), DP (dynamic programming), simulated annealing, IP and mixed-integer programming, lagrangian relaxation, tabu search etc. The non-conventional techniques include expert system, genetic algorithms, fuzzy system, artificial neural network, particle swarm optimization, evolutionary programming etc. The conventional and nonconventional optimization techniques are not capable to effectively solve this complex system.

In this thesis, a Hybrid Algorithm is used in solving the UC problem. Hybrid algorithms are developed by combining both conventional and nonconventional optimization methods. Hybrid techniques are reduced number of variable and problem size. The implementation time of the hybrid methods growths approximately linearly according to problem dimension, hence takes less overall execution time. In this research, Hybrid Algorithm has been tested on different standard test systems and its effectiveness has been confirmed by comparing the simulation results with those of other algorithms in literature. Simulation results have been calculated by using MATLAB.

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List of Abbreviations

NTDC	National Transmission and Dispatch Company Limited
UC	Unit Commitment
UCP	Unit Commitment Problem
DP	Dynamic Programming
EP	Evolutionary Programming
ES	Expert System
PSO	Particle Swarm Optimization
GA	Genetic Algorithm
ACO	Ant Colony Optimization
ANN	Artificial Neural Networks
ED	Economic Dispatch
ELD	Economic Load Dispatch
MW	Mega Watt
Btu	British Thermal Units
SA	Simulated Annealing
SR	Spinning Reserve
EPSO	Elite Particle Swarm Optimization
RCPSO	Real Coded Particle Swarm Optimization
NPSO	New Particle Swarm Optimization
BPSO	Binary Particle Swarm Optimization
BRPSO	Binary & Real Particle Swarm Optimization
MPSO	Multi-Particle Swarm Optimization
EPSO	Enhanced Particle Swarm Optimization