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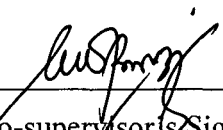


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AN ALTERNATIVE METHOD TO SOLVE COMBINED ECONOMIC EMISSION
DISPATCH PROBLEMS USING FLOWER POLLINATION ALGORITHM

HONG MEE SONG

Thesis submitted in fulfilment of the requirements for the award of the degree of Master
of Engineering in Electrical (Power Systems)

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LIST OF SYMBOLS

F_T	Total generating fuel cost
N	Number of generating units
F_i	Generating cost of each unit i
P_{Gi}	Power generated by each unit i
$F(P_{Gi})$	Total fuel cost
a_i, b_i and c_i	Cost coefficients for i^{th} generator
P_{Gi}^{\min}	Minimum loading limit
P_{Gi}^{\max}	Maximum output limit of a generator
E_{miT}	Total generating emission
E_{mi}	Generating emission of each unit i
$E_{mi}(P_{Gi})$	Total emission
α_i, β_i and γ_i	Emission coefficients for i^{th} generator
P_d	Power demand
P_{loss}	Transmission loss
P_{Gj}	The output generation of unit j (MW)
B_{ij}	The ij -th element of the loss coefficient square matrix
B_{i0}	The i -th element of the loss coefficient
B_{00}	The loss coefficient constant
d_i and e_i	Cost coefficients for i^{th} unit with valve point loading effect
η_i and δ_i	Emission coefficients for i^{th} generator with valve point loading effect
T	Optimal cost of generation
w_i	Weighting factor
h_i	Price penalty factor

N_p	Population of flower
p	Switch probability
x_i^t	Solution vector x_i at iteration t
L	Step size which uses Lévy distribution for $L > 0$
$\Gamma(\lambda)$	Standard gamma function
x_j^t and x_k^t	Pollen from the same plant species but different flower
x	Solutions for CEED
P	Power output for each generating unit
P_j^{\min}	Lower limits of the inequality constraint of objective function
P_j^{\max}	Upper limits of the inequality constraint of objective function
X_{best}	The current best feasible solution
λ	Distribution factor
K	The multiplication factor selected in the range [0,1]
X_i^{new}	New solution
X_j^{old} and X_k^{old}	Different flowers from the same plant type
g^*	Current best solution
F	Scaling factor selected in the range [0,1]

LIST OF ABBREVIATIONS

ABC	Artificial Bee Colony
BCS	Best Compromising Solution
BI	Biologically Inspired
Btu	British Thermal Unit
CE	Controlled Elitism
CEED	Combined Economic Emission Dispatch
CLIM	Classical Lambda Iteration Method
CO_2	Carbon Dioxide
CSA	Cuckoo Search Algorithm
DCD	Dynamic Crowding Distance
DE	Differential Evolution
DED	Dynamic Economic Dispatch
DEED	Cynamic Economic Emission Dispatch
DP	Dynamic Programming
ED	Economic Dispatch
EED	Economic Environmental Dispatch
EmD	Emission Dispatch
EP	Evolutionary Programming
FPA	Flower Pollination Algorithm
GA	Genetic Algorithm
GSA	Gravitational Search Algorithm
GSOMP	Group search optimizer with multiple producers
GWO	Grey Wolf Optimizer
IEEE	Institute of Electrical and Electronics Engineers

IFEP	Improved Fast Evolutionary Programming
LP	Linear Programming
MNSGA-II	Modified nondominating sorting genetic algorithm
MODE	Multiobjective Differential Evolution .
MOEA	Multiobjective Evolutionary Algorithm
MOO	Multiobjective Optimization
MOOP	Multiobjective Optimization Problem
MOPSO	Multiobjective particle swarm optimization
MPSO	Modified Particle Swarm Optimization
MW	Mega Watt
NO_x	Nitrogen Oxide
NPGA	Niched pareto genetic Algorithm
NSGA	Nondominating sorting genetic algorithm
NSGA-II	Nondominating sorting genetic algorithm II
PAES	Pareto Achieved Evolution Strategy
PDE	Pareto Differential Evolution
PF	Penalty Factor
POZ	Prohibited Operating Zone
PSO	Particle Swarm Optimization
QP	Quadratic Programming
SA	Simulated Annealing
SO_2	Sulphur Dioxide
SPEA	Strength Pareto Evolutionary Algorithm
SQP	Sequential quadratic programming
TOPSIS	Technique for Order Preference by Similarity to Ideal Solution