



Solution of Economic Dispatch Problem using BBO for Power system optimization

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ABSTRACT: This paper presents the biogeography based optimization (BBO) algorithm to solve economic load dispatch problem. Economic load dispatch problem is basically an optimization problem where objective function may be highly nonlinear, non-convex, and no differentiable and may have multiple local minima. The models of biogeography explain how an organism arises, immigrate from an environment to another and gets eliminated. This method is based on two steps mutation and migration. This paper provides to show the minimum cost of the system constraint for each generating system also if the power demand increases the minimum cost also increases with the standard deviation. BBO technique is implemented in MATLAB environment.

KEYWORDS: Biogeography-Based Optimization (BBO), Economic Load Dispatch (ELD), GA, Migration, Mutation, Power Demand (PD).

I. INTRODUCTION

Economic Load Dispatch (ELD) are designed and operated to meet the continuous variation of power demand. ELD seeks the best generation schedule for the generating plants to supply required demand at minimum cost of production [1]. In recent years certain artificial intelligence (AI) techniques such as Fuzzy Logic (FL)[2], Differential Evolution (DE) [3], Genetic Algorithm (GA) [4], Particle Swarm Optimization (PSO) [5], Bacteria Foraging Optimization (BFO)[6], etc. have been successfully applied to the ELD problems for units having non-linear cost functions. A new population based evolutionary algorithm of optimization has been proposed, based on biogeography by Simon in year 2003[7]. Biogeography is the nature's way of distributing species. Let us consider an optimization problem with some trial solutions of it. In BBO, a good solution is analogous to an island with a high Habitat Suitability Index (HSI), and a poor solution represents an island with a low HSI. High HSI solutions resist change more than low HSI solutions. Low HSI solutions tend to copy good features from high HSI solutions. The shared features remain in the high HSI solutions, while at the same time appearing as new features in the low HSI solutions. This is as if some representatives of a species migrating to a habitat, while other representatives remain in their original habitat. Poor solutions accept a lot of new features from good solutions. This addition of new features to low HSI solutions may raise the quality of those solutions. This new approach to solve a problem is known as biogeography-based optimization (BBO).

II. OPTIMIZATION OF ECONOMIC LOAD DISPATCH FORMULATION

The ELD problem having an objective function minimizes the total generation cost, F_T , while fulfilling various constraints when supplying the required load demand of a power system [1]. The objective function is given by Eq. 1:

$$\min F_T = \min(\sum_{i=1}^n F_i(P_{Gi})) = \min(\sum_{i=1}^n A_i P_{Gi}^2 + B_i P_{Gi} + C_i) \quad \dots\dots\dots (1)$$

where, P_{Gi} is the output power generated by the i th generator, $F_i(P_{Gi})$ is the Generation cost function of i th generator and A_i, B_i, C_i are the Cost coefficients of i th generator, n is the number of generators.

Two constraints are considered in this problem, i.e., the generation capacity of each generator and the power balance of the entire power system.

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