Abstract

Biogeography-Based Optimization (BBO) is a population based algorithm which has shown impressive performance over other Evolutionary Algorithms (EAs). BBO algorithm is based on the study of distribution of biological organisms over space and time. Yagi-Uda antenna design is most widely used antenna at VHF and UHF frequencies due to high gain, directivity and ease of construction. However, designing a Yagi-Uda antenna, that involves determination of optimal wire-lengths and their spacings, is highly complex and non-linear engineering problem. It further complicates as multiple objectives, viz. gain, and impedance, etc., are required to be optimized due to their conflicting nature, i.e., reactive antenna impedance increases significantly as antenna gain is intended to increase. In this paper Non-dominated Sorting BBO (NSBBO) is proposed and where standard and blended variants of BBO are investigated in optimizing six-element Yagi-Uda antenna designs for multiple objectives, viz., gain and impedance, where ranking of potential solutions is done using non-dominated sorting. The simulation results of BBO variants and Particle Swarm Optimization (PSO) are presented in the ending sections of the paper that depict clearly that NSBBO with blended migration operator is best option among all.
Multi-objective Gain-Impedance Optimization of Yagi-Uda Antenna using NSBBO and NSPSO

References

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Antenna Gain

Antenna Impedance