International Journal of Innovative Computing, Information and Control
Volume **4**, Number **9**, September **2008**

ICIC International ©2008 ISSN 1349-4198
pp. **2391–2403**

OPTIMAL RADIATION PATTERN DESIGN OF ADAPTIVE LINEAR PHASED ARRAY ANTENNA USING MEMETIC ALGORITHMS

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Received August 2007; revised December 2007

Abstract. *This study proposes an innovative method based on the memetic algorithm to determine the optimal radiation pattern for an adaptive linear phased array antenna. The adaptive antenna in an optimal radiation pattern design can adjustably suppress interference by placing nulls at the interfering source directions and provide a maximum main lobe in the direction of the desired signal at the same time. The proposed method maximizes the Signal to Interference Ratio (SIR). The memetic algorithm is applied to find the optimal radiation pattern for the proposed adaptive antenna using a two-way convergent method. The memetic algorithm combines the advantages of efficient heuristics incorporating domain knowledge and population-based search approaches for optimization problems. This study shows the usefulness of a memetic algorithm for global search and flexible stopping criteria. The memetic algorithm is an easy and effective approach that can be used to search for the optimal phase weighting vector of the adaptive array factor. Two examples are provided to justify the proposed memetic algorithm approach. The performance of the proposed algorithm is demonstrated using simulations and experimental data.*

Keywords: Adaptive linear array antenna, Phase perturbations, Memetic algorithms

1. **Introduction.** The radiation pattern is a graphical depiction of the relative field strength transmitted from or received by an antenna. The variation in antenna field intensity is an angular function with respect to the axis. In a field antenna design the radiation pattern most commonly refers to the radiation directional (angular) dependence on the antenna [1]. Radiation pattern optimization techniques are very important to suppress undesired interferences and enhance desired signals. Adaptive beam-forming techniques are used to obtain the desired antenna radiation pattern by adjusting antenna parameters such as the antenna array phase weights. The optimal Radiation pattern can be used in practical wireless communications.

Phased arrays are steered by applying a linear-phase progression across the array's transmission or receiving elements. Because this simple beam-forming technique is used in many different systems, the availability of element phase control is commonplace. To exploit this existing capability to inexpensively mitigate electromagnetic interference, phase perturbation algorithms have been proposed, which place nulls in the interference direction [2]. The design for an adaptive antenna optimal radiation pattern can adjustably