

Abstract

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Optimum and Quasi Optimum Adaptive Planar Arrays Design Using Evolutionary Algorithms

— In this paper, a design procedure for the adaptive beamforming planar arrays under multiple constraints using the evolutionary algorithms, namely the Genetic Algorithm (GA) and Particle Swarm Optimization (PSO) is introduced. Both algorithms seek optimum values of weight coefficients and inter element spacing. The constraints are divided into two categories, one deals with the array parameters, and the other deals with the evolutionary algorithm. The constraints dealing with array parameters are the first null beam width, the first side lobe level, and a null imposed at certain direction, whereas those of the evolutionary algorithms deal with the weights of the cost functions, the limits of array weight coefficients and the spacing between array elements. For the ease of implementation, quasi-optimum weights are devised which are quantized values of the optimum weights. For this purpose, an additional constraint is imposed to the cost function of the algorithms. Computer simulations have been carried out to evaluate the performance of using GA and PSO algorithms in the design of the planar array and to investigate the effect of the used quasi optimum values on the planar array performance. The evaluations indicate that the PSO superior performance over that of the GA in both optimum and quasi optimum arrays.