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Application of Improved Particle Swarm Optimization(IPSO) to Antenna Array Synthesis and Design

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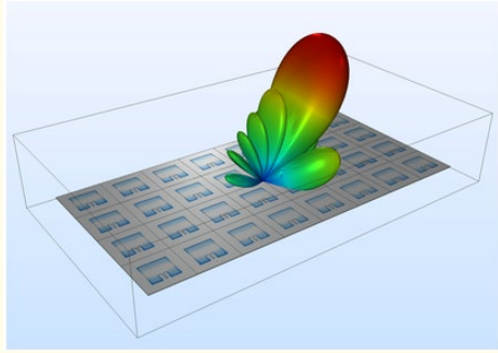
Antenna designers are constantly challenged with the temptation to search for optimum solutions for complex Electromagnetic device designs. The ever- increasing advances in computational power have fuelled this temptation. The well-known brute force design methodologies are systematically being replaced by the state-of-the-art optimization techniques. The ability of using numerical methods to accurately and efficiently characterize the relative quality of a particular design has excited the EM engineers to apply stochastic global Evolutionary optimizers (EO). The EO techniques have been applied with growing applications to the design of Electromagnetic systems of increasing complexity. The recent popularity experienced by EO methods is not unique to the field of Electromagnetics. Among various EO techniques, the Improved particle swarm optimization (IPSO) has attracted considerable attention. These schemes are finding popularity within Electromagnetic community as design tools and problem solvers because of their versatility and ability to optimize in complex multimodal search spaces applied to non-differentiable cost functions. The overall radiation pattern of the antenna array can be shaped by the structure of the array, distance between the elements and its amplitude and phase excitations. Synthesis of linear arrays have been extensively studied from the past decades. Applied to linear antenna array optimization to optimize the excitation weights and element positions for better side lobe level reduction and advanced null control have been studied. IPSO has been used to non-uniformly optimize the element positions to produce a minimum side lobe level with no back lobes pattern of the linear antenna array. The design of linear array for applications in Wi-Max (World wide Interoperability for Microwave access) base stations for improved signal to interference ratio, lower cost, resistance to multipath and fading, improved co-channel Interference, enhanced frequency reuse, improved spectral efficiency and space-time diversity for MIMO channels in Wireless communications is a burning topic of discussion nowadays in the Electromagnetic Community.



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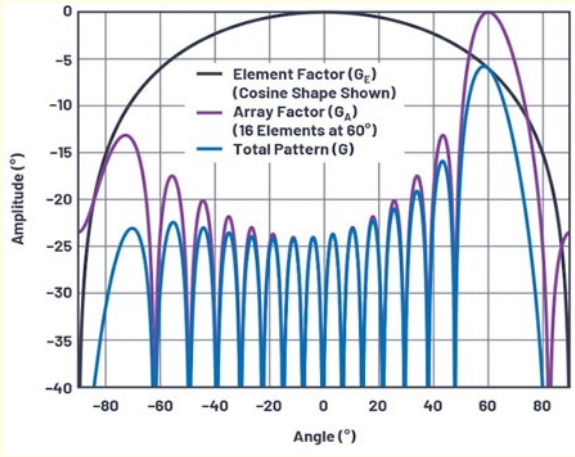

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