Guidelines for Student Reports

Synthesis of Monopulse Antenna by means of a Game Theory Approach

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Abstract

The synthesis of monopulse antennas is not a trivial task because of the need of generating two different patterns (namely, a sum and a difference pattern) by means of the same array structure. Such a difficulty further increases for large arrays. As a matter of fact, the optimal solution of implementing two independent feed networks is almost impracticable due to the required costs, the architecture complexity, and the spatial extension especially when dealing with large structures. In order to overcome such a drawback, some methods based on sub-arraying techniques have been proposed in the literature.

However, even if those techniques simplify the feed network, it remains still complicated; as an example let us consider a sub-arrayed monopulse antenna with N elements and Q sub-arrays; it needs N amplifiers for the sum pattern (one for each element of the array) and other Q amplifiers for the difference pattern (one for each sub-array).

As a matter of fact, the simplest feed-network consider that the sum and the difference pattern are generated by means of the same excitations, with concordant phases and opposite phases for the sum and the difference pattern, respectively. The synthesis of such kind of network is not easy because the objectives of the two patterns are discordant and the patterns have to share common resources, i.e., the array excitations. However, the Game Theory seems to be an useful tool to overcome the aforementioned problems because it deals with any problem focused on the resources competition. More specifically, the synthesis of monopulse antenna can be seen as a competitive game in which two players, the sum and the difference beams modify the excitations of the elements of the array in order to achieve some operating constraints.

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