Guidelines for Student Reports

Synthesis of Radio-Astronomy arrays based on ADSs and Genetic Optimizers

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Abstract

The design of thinned arrays is a topic which has been studied for many decades withing the framework of large antenna synthesis. Recently, thinned arrays have found considerable interest in both the scientific and industrial framework (e.g., Satellite communications, radio astronomy) because, unlike most classical phased array architectures, they require a reduced number of elements with uniform excitations (usually unitary) to achieve the desired performance. The advantages of this type of approach are considerable. On the one hand, the reduction of the number of elements results in significant advantages in terms of cost and weight. On the other hand, using elements with uniform excitations allows to simplify the feeding network realization. In this context, most commonly used approaches include statistical and heuristic techniques.These techniques have proven very efficient in the synthesis of arrays with low side lobes. Nevertheless, the presence of interfering or jammer, albeit outside of the region of the mainlobe, can drastically reduce the quality of the communication. In this context, the project aims at defining a new strategy to synthesize reconfigurable thinned arrays able to adapt dynamically and suppress interfering signals by placing a zero in the radiation diagram towards the direction of unwanted signal.The approach considers a "full" (without thinning) array where each element provided with a switch that allows
you to connect or disconnect the radiator from the receiver. By acting on the switches (i.e., turning on and off elements) it is possible, in the presence of an interfering signal, to adaptively reconfigure the array in order to cancel the interferer.

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