

Synthesis of Reconfigurable Arrays for Radar Systems and Base Stations

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Abstract

La sintesi di array riconfigurabili è uno tra i problemi più classici nella sintesi di array di antenne. Nell'ambito di applicazioni radar o per sistemi di comunicazioni terrestri, esiste la necessità da un lato di avere antenne in grado di generare fasci con main lobe ampi (shaped beams) al fine di coprire un ampio settore angolare. Dall'altro lato, l'interesse nel sintetizzare fasci più direttivi con main lobe stretti (sum beams) per comunicazioni di tipo punto-punto.

In questo ambito, il presente progetto ha l'obiettivo di definire una strategia innovativa che permette di sintetizzare un array riconfigurabile in grado di generare sia "shaped beams" sia "sum beams" dove la rete di alimentazione dedicata ai due pattern è in parte o del tutto condivisa. L'obiettivo infatti è quello di minimizzare il numero di eccitazioni che cambiano nel passare dalla generazione di uno shaped beam ad un sum beam (e.g., sintesi in sola fase). La tecnica si basa sull'integrazione di un Algoritmo Generico (GA) con una procedura di tipo Convex Programming (CP) al fine di garantire la sintesi di sistemi di antenna quasi "ottimali".

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The synthesis of reconfigurable array is one of the most classic problems in the synthesis of arrays of antennas. In the framework of radar and communication systems, there is the need to have antennas able to generate beams with large main lobe (or shaped beams) in order to cover a large angular sector. Second, there is the need in synthesizing more directive beams with narrow main lobe (sum beams) for point-to-point communications.

In this context, the aim of the project is to define an innovative strategy for synthesizing reconfigurable array that can generate both "shaped beams" and "sum beams" where the beam forming network is partially or fully shared. The objective is to generate the shaped beam and the sum beam reconfiguring the minimum number of elements. The technique is based on the integration of a genetic algorithm (GA) with a Convex Programming (CP) procedure able to synthesize "optimal" patterns.

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*This report is submitted in partial fulfillment of the degree of the course "ACM".
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