

Progettazione Di Thinned Arrays Mediante Un Approccio Ibrido Basato Su Almost Difference Sets E Particle Swarm Optimizers

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Abstract

Applicazioni quali i sistemi per comunicazioni satellitari, per l'imaging biomedicale, per il telerilevamento e la diagnostica elettromagnetica, per il radar e sonar tracking richiedono la realizzazione di array di grandi dimensioni in grado di garantire elevata direttività. L'utilizzo di allineamenti equispaziati in tali applicazioni permetterebbe di raggiungere le prestazioni desiderate, ma avrebbero un peso, costo, ingombro e complessità eccessivi. Le tecniche di thinning (assottigliamento) si pongono l'obiettivo di ridurre il numero di elementi radianti in un'antenna ad array, al fine di permettere la realizzazione di array ad elevata direttività con costi e peso ridotti.

In questo ambito, algoritmi quali il Particle Swarm Optimizer (PSO) sono spesso utilizzate a causa della loro efficienza e capacità di ridurre i lobi secondari degli array. Il limite di tali tecniche è dovuto al fatto che per array di grandi dimensioni (diverse migliaia di elementi) i tempi di convergenza alla soluzione desiderata possono essere molto lunghi. Di conseguenza tali tecniche sono alle volte ibridizzate con altre metodologie per migliorarne le prestazioni. Scopo della presente attività è quella di integrare una metodologia di progettazione di thinned arrays basata sul PSO con una tecnica analitica

di sintesi di array di grandi dimensioni basata sugli Almost Difference Sets. Obiettivo dell'attività sarà quella di valutare l'incremento di prestazioni permesso dall'utilizzo dell'approccio ibrido ADS-PSO rispetto al solo PSO, in particolare in termini di velocità di convergenza per array di grandi dimensioni.

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