Guidelines for Student Reports

Ant Colony Optimization To The Synthesis Of Sub-Arrayed Array Antennas

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Abstract

La tecnica monopulse radar tracking utilizza pattern di tipo somma e differenza per ricavare la posizione (direzione e distanza) di un oggetto. Questi tipi di pattern sono generati utilizzando array lineari (2D tracking) o planari (3D tracking) di elementi. Nel caso si disponesse di reti di alimentazioni indipendenti, le eccitazioni sono calcolate utilizzando tecniche di sintesi analitiche di Dolph-Chebyshev o Taylor (pattern somma) e di Zolotarev o Bayliss (pattern differenza). Tale soluzione non è di norma utilizzata per l'elevata complessità circuitale e costosità.
Si preferisce dunque generare un pattern somma ottimo e considerare invece un pattern (caso lineare) o due pattern (caso planare) differenza approssimati, ottenuti raggruppando tra loro gli elementi dell'array in sub-array ed assegnando ad ogni sub-array un guadagno appropriato. Tale tecnica di sintesi di antenne compromesso è detta tecnica del sub-arraying. Il problema è definito come la definizione della configurazione in sub-array ed il peso da associare ad ogni aggregazione.
La soluzione può essere trovato considerando il percorso a costo minimo all'interno di un grafo, detto DAG (Direct Acyclic Graph). Il percorso ottimale all'interno del grafo va ricercato per mezzo di un algoritmo cooperativo ad intelligenza distribuita (Ant Colony Optimizer, ACO). L'algoritmo si ispira al comportamento delle formiche in cerca di cibo. Le formiche esplorando lo spazio trovano il percorso più adatto, che nel problema di sintesi identifica la miglior soluzione.

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