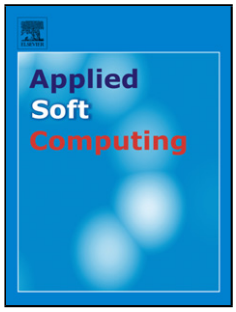

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A hybrid DPSO with Levy flight for scheduling MIMO radar tasks

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Highlights

- An optimization model to schedule multiple input and multiple output (MIMO) radar tasks is established.
- A hybrid discrete particle swarm optimization (DPSO) algorithm with levy flight is proposed for a solution to the problem.
- The optimization model takes the task internal structure, the characteristics of task scheduling in the MIMO radar and the three task scheduling principles into consideration.
- The hybrid DPSO integrates a heuristic task interleaving algorithm for task schedulability analysis of candidate scheduling schemes (particles) and a DPSO with levy flight for exploring the best solution.
- The heuristic task interleaving algorithm not only exploits the wait interval to interleave subtasks, but also incorporates transmit intervals and overlaps receive intervals in order to make a maximum utilization of the MIMO radar timeline.
- The DPSO is combined with levy flight to escape from local optima by utilizing its long jump property.
- The chaos initialization and the linear decreasing inertia weight are designed to enhance the exploration ability and the exploitation ability of the algorithm.

Abstract: In this paper, an optimization model for the multiple-input and multiple-output (MIMO) radar task scheduling is established, and a hybrid discrete particle swarm optimization (DPSO) algorithm with Levy flight is proposed for a solution to the model. The optimization model takes the task internal structure, the characteristics of task scheduling in the MIMO radar and the three task scheduling principles into consideration. The hybrid DPSO integrates a heuristic task interleaving algorithm for the task schedulability analysis of candidate scheduling schemes (particles) with a DPSO with Levy flight for exploring the best solution. The heuristic task interleaving algorithm not only exploits the wait interval to interleave subtasks, but also incorporates transmit intervals and overlaps receive intervals in order to make a maximum utilization of the radar timeline. The DPSO is combined with Levy flight to escape from local optima by utilizing the long jump property. In addition, the chaos initialization and the linearly decreasing inertia weight are designed to enhance the exploration ability and the exploitation ability. The simulation results verify the outperformance of the proposed algorithm compared with the existing ones.