Multi-Objective Clustering Optimization for Multi-Channel Cooperative Sensing in CRNs  
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Cooperative spectrum sensing (CSS) has been extensively studied in the literature to mitigate the weakness of spectrum sensing against hostile propagation phenomenon. Especially for large networks, clustered CSS is preferred to alleviate the energy efficiency, delay and overhead problems. In this study, reporting and sensing channels are first modeled with the consideration of path loss and fading. Then, CSS is divided into three phases: 1) In sensing phase, optimal sensing time is obtained for each local user subject to local detection and false alarm probability thresholds, 2) In reporting phase, adopting Dijkstra’s algorithm, multi-hop paths with the maximum success rate and cluster head (CH) selection which gives the mimimum total error rate within each cluster is computed, and 3) In decision phase, collecting independent but unidentically distributed (i.u.d.) member decisions, the CH decides on channel occupancy based on an optimal voting rule for i.u.d. reports. Next, following the phases above, a multi-objective clustering optimization (MOCO) is formulated to select SUs into cluster seeking energy and throughput efficiency goals subject to global detection and false alarm probability constraints. Finally, the Non-dominated Sorting Genetic Algorithm-II (NSGA-II) is employed to solve MOCO. Results based on our approach are presented and the merits of this approach are demonstrated.