

Cooperative Sensing for Wireless Sensor Networks

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Abstract : Wireless Sensor Networks (WSNs), which sense environmental data with battery-powered nodes, require multi-hop communication. This power-demanding task adds an extra workload that is unfairly distributed across the network. As a result, nodes run out of battery at different times: this requires an impractical individual node maintenance scheme. Therefore we investigate a new Cooperative Sensing approach that extends the WSN operational life and allows a more practical network maintenance scheme (where all nodes deplete their batteries almost at the same time). We propose a novel cooperative algorithm that derives a piecewise representation of the sensed signal while controlling approximation accuracy. Simulations show that our algorithm increases WSN operational life and spreads communication workload evenly. Results convey a counterintuitive conclusion: distributing workload fairly amongst nodes may not decrease the network power consumption and yet extend the WSN operational life. This is achieved as our cooperative approach decreases the workload of the most burdened cluster in the network.

Keywords : cooperative signal processing, signal representation and approximation, power management, wireless sensor networks

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