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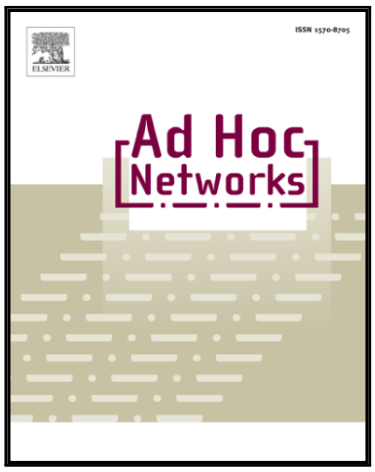

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Efficient Data Association to Targets for Tracking in Passive Wireless Sensor Networks

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Abstract

We have developed an algorithm for efficient data association to targets, the two-way cluster association (TWCA) algorithm, for tracking multiple targets in passive wireless sensor networks (PWSNs). PWSN applications require that the sensors have low computational and communication loads as the sensors are battery powered. We choose PWSNs as each sensor node triggers target detection and tracking only in the presence of the signals. However, the PWSNs make the association difficult because the detected signal by a passive sensor may come from targets nearby and/or far from the sensor depending on the target signal powers. The difficulty for the data association is further amplified when multiple targets undergo complex maneuvers including merging and split. The TWCA algorithm solves the association problem with very simple operations by using the clusters of the detecting sensors aggregated around the targets. The TWCA is a significant improvement over the previous studies including our previous rule based cluster association (RBCA) which works only for targets in linear motions and the number of targets being constant during tracking. TWCA can track unknown number of targets in a wide range of non-linear maneuvers with very low computation load and high track accuracy as demonstrated by our simulation.

Key Words: Wireless sensor networks, multiple target tracking, data association, target localization

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