Tracking Anonymous Targets using a Robotic Sensor Network

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We address the problem of tracking multiple anonymous targets using a network of communicating robots and stationary sensors. We introduce a region-based approach which controls robot deployment at two levels. A coarse deployment controller distributes robots across regions using a topological map and density estimates, and a target-following controller attempts to maximize the number of tracked targets within a region. A behavior-based system is presented implementing the region-based approach. Intensive simulations were performed to investigate the correlation between our approach and the degree of occlusion in the environment. The region-based approach shows better performance than a 'naive' local-following strategy when the environment has significant occlusion. We performed real-robot experiments to validate the system. These experiments open up a new line of research, which suggests that an optimal ratio of robots to stationary sensors may exist for a given environment with certain occlusion characteristics.