Geographic Clustering with Coarse-Grained Localization

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Abstract — **Life science automation can benefit extremely from the usage of wireless autonomous sensor networks. After random deployment, the nodes have to organize themselves in order to avoid redundant sensor and transmission tasks and to ensure energy efficiency of the network. By combining local knowledge of the activity of adjacent nodes with its position, one particular node is able to determine its own importance for the whole network. A former approach, called XGAF (Extended Geographic Adaptive Fidelity), divided the network into regular cells with one cluster in each cell. Provided that only one node in each cell is active, the chosen size of the cells guarantees full sensing coverage and network connectivity while all other nodes are switched off to save energy. This energy-efficient approach has one major drawback: Position of nodes in real sensor networks is inaccurate due to measurement errors and noise. Therefore, division into square cells will unavoidably lead to wrong cell estimation for several nodes.**
The CL (Centroid Localization) algorithm is an already used approach which localizes an unknown at the centroid of neighboring beacons. Depending on several parameters, an area will be divided into subareas where all unknowns are located at the same point. These kinds of cells differ in shape and size. In the current work, we combined the CL and the XGAF algorithms to achieve a geographic clustering structure with realistic cells and keep the advantages of the network using redundancy detection. Thereby, we guarantee connectivity, coverage and energy-aware network activity.