INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

Monitoring of delay-sensitive events, such as fire and intrusions, in unsafe regions is an important class of wireless sensor network (WSN) applications. In event-driven WSNs, sensor nodes are densely deployed and they operate with a low duty-cycle to reduce their energy consumption in *idle listening*. The following two characteristics of duty-cycled contention based synchronous MAC protocols make them the very suitable for delay-sensitive event monitoring applications, (1) they are robust to dynamic topology changes, and (2) in such protocols, a data packet can travel multiple hops in one cycle. However, in the existing contention based synchronous MAC protocols, in a low duty-cycle WSN, very few nodes can schedule the forwarding of their data packets when multiple sensor nodes with data packets to send lie in the carrier sensing range of each other and a node cannot schedule a longer flow. Therefore, they encounter long end-to-end transmission delays (E2ETD) in reporting the detected event to the sink node in a dense multi-hop WSN. In this thesis, we propose two new contention based synchronous MAC protocols and a new framework to reduce the E2ETD in event-driven dense multi-hop WSNs. The first protocol proposed by us reduces the E2ETD by allowing multiple nodes to forward their data packets through a single scheduled flow. The new framework proposed in this thesis improves the E2ETD performance of implemented contention based synchronous MAC protocols by mapping their m (>1) cycles data transmission processes in a single duration cycle. In this framework, dense deployment of sensor nodes is exploited to reduce idle listening. Our second proposed protocol reduces E2ETD by providing multiple chances to each node to succeed in data transmission scheduling in a cycle. Algorithms proposed in this protocol help in reducing the energy consumption in transmission, reception, and idle listening.