Collaborative Two-Level Task Scheduling for Wireless Sensor Nodes with Multiple Sensing Units

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***Abstract*— A sensor node with multiple sensing units is usually unable to process simultaneously the data generated by multiple sensing units, thereby resulting in event misses. This paper presents a collaborative task scheduling algorithm, called CTAS, to minimize event misses and energy consumption by exploiting power modes and overlapping sensing areas of sensor nodes. The novel idea of CTAS lies in that it employs a two-level scheduling approach to the execution of tasks collaboratively at group and individual levels among neighboring sensor nodes. CTAS first implements coarse-grain scheduling at the group level to schedule the event types to be detected by each group member. Then, CTAS performs fine-grain scheduling to schedule the tasks corresponding to the assigned event types. The coarse grain scheduling of CTAS is based on a new algorithm that determines the degree of overlapping among neighboring sensor nodes. Simulation results show that CTAS yields significant improvements in energy consumption up to 67% and reducodes6y**

used to determine the type of task scheduling (sensing / data transmission) for each one of the node's sensing

quirements while scheduling the tasks within a sensor node

Algorithm 2 *CTAS*

Require: ρ : The coverage QoS threshold in percentage

Ensure: Scheduling of sensing and data transmission tasks of a sensor node

1: **for all** round R

FUNCTION 3 *FineGrainTaskScheduler*

Require: e : The event to be processed

TDM : The Task Delegation Mask advertised by the sensor node for the current round

Ensure: The scheduling of event processing tasks within the sensor node

1: $task_i \tilde{A}$ The task currently in execution at the sensor node

2:

Fig. 10. CTAS resolves the contention for limited resources of a sensor node