

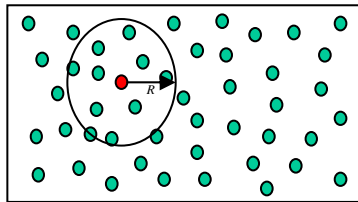
Sentry Based Power Management (SBPM) in Wireless Sensor Networks

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Problem Statement

Scenario

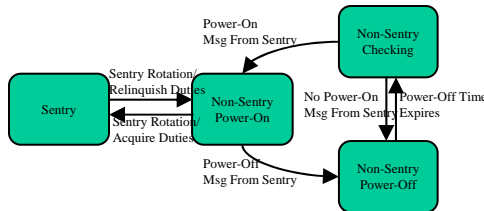
- Intruder detection and localization.
- Distributed wireless sensor network.
- Nodes have strict resource constraints.



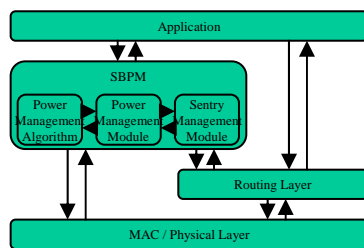
Problem

- Maximizing the lifetime of the sensor network while still sufficiently completing the given task.

SBPM Design



SBPM State Transition Diagram

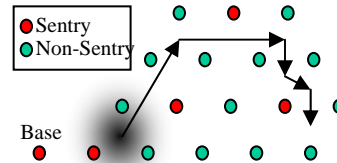


SBPM Architecture

Experiment

Intruder Detection and Tracking

- Intruder simulated as light-projected circular gradient.
- Light sensor on each node used to detect the distance of the intruder from the mote.
- Intruder moves through a predefined path at constant speed.



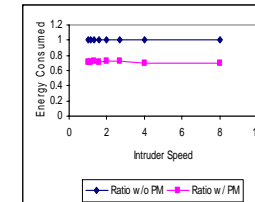
- Sentries are predefined and fixed to guarantee sensor coverage and communication backbone.
- Tracking computation and power management decisions centralized on computer.

Setup

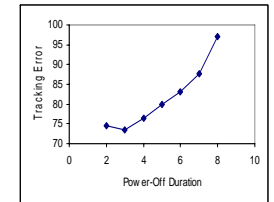
- 18 UCB MICA motes with photoresistors running TinyOS
- Laptop directly connected to base mote
- LCD Projector to simulate intruder



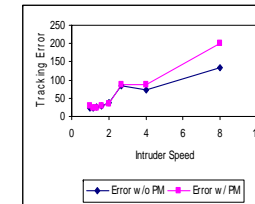
Results



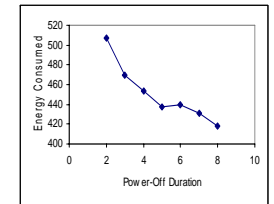
Effect of intruder speed on total energy consumption.



Effect of power-off duration on tracking error.



Effect of intruder speed on tracking error with and without SBPM.



Effect of power-off duration on total energy consumed.

Current Work

Distributed Dynamic Sentry Selection

- Geographic-Based Approach.
 - Implementation low in complexity.
 - Ratio of sentries to non-sentries not minimized and requires accurate localization information.
- Non-Geographic-Based Approach
 - Not limited to uniform distribution of nodes and more adaptable to non-uniform node distributions.
 - Implementation more complex and does not guarantee communication backbone.

