Motivation

Wireless Sensor Networks have been widely employed in many applications. Intruder detection is a very important long-term field surveillance application.

In intruder detection, sensors are deployed in a long belt field to detect intruders. An intruder’s objective is to traverse the monitored area. For example, in a battlefield, an enemy may try to traverse a protected area to conduct some malicious tasks, the successful detection of which before he passes through is essential.

As a tiny electronic device, an on-duty sensor node which is usually deployed outside is vulnerable to many environmental attributes or detriments, such as rain, which is considered here.

To increase the survivability of a sensor node outdoor, one way is to equip it with additional protection to make it robust, for example waterproof in rain.

Network Model

It is a new type of wireless sensor network, a mobile survivability-heterogeneous sensor network composed of both static regular sensors without protections and mobile robust sensors with protections.

A mobile robust sensor is reliable, moveable and can work under both sunny and rainy weather.

Goal

Our goal is to construct a barrier to detect intruders outdoors and to maintain it working as long as possible under different weather conditions.

We propose a greedy barrier construction algorithm to solve the problem. A minimum energy consumption in either minimizing the number of moving robust sensors or the total distance of moving robust sensors is considered during each barrier construction to increase the network lifetime.

Evaluation Setup

Regular and robust sensors are randomly deployed in a 10000m×10m long-belt area.

The density of regular sensors is 0.01 while the density of robust sensors is changeable.

The sensing and communication ranges are 10m and 20m, respectively.

The results are the average of 100 simulations.

Evaluation Results

The number of moved robust sensors when rain comes once.

The total moving distance of robust sensor when rain comes once.

The lifetime of the barrier.

Results