Line in the Sand

Objectives

- Given an ad hoc large, open, possibly denied line or area, provide a wireless sensor network consisting of sensor nodes that can:
  - Detect targets, classify among several classes, and track multiple simultaneous instances / trajectories
  - Simultaneously lower false alarm rate and miss rate
  - Be a “force multiplier” and enable access to denied area
  - Allow ease of concealment and deployment
  - Offer long life, low cost, and low power
  - Avoid a single point of failure

- In a manner that is:
  - Robust – fault tolerant and self stabilizing
  - Accurate – low false alarm rate and low miss rate
  - Scalable – distributed algorithms for sensor networks of 100 to 100,000 nodes
  - Cost Effective – many cheap sensors vs. sparse set of resource rich sensors (e.g. Steel Eagle)
  - Deployable – through a variety of means including artillery shells, launched canisters, airborne deployment, and hand emplacement.

Crossing the Line

1. Intruder crosses line / enters area protected by Line in the Sand.
2. Multiple sensors detect intruder and collaboratively classify.
3. Sensor network tracks intruder and exfiltrates the data.
4. Remote terminal can display target trajectory and re-task network.

The Line Under Fire

1. One or more nodes are depleted of power or destroyed.
2. The network reforms around the dead nodes and continues to work.
3. Nodes are moved, swapped, or perturbed.
4. Nodes re-establish communication through new neighbors and continue to work.

The Anatomy of a Sensor Node

MICA2 (XBOW) + MICASB (UCB) + MICAPB (OSU) + MIR (Advantaca) = Self-righting Enclosure