Secure Communication in Heterogeneous Sensor Network

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Security: Sensor Network?

- Limited resource constraint – No traditional security measures
- Data aging – No heavy security schemes
- Mission driven application – Performance parameter based protocols
- Adaptive & Distributive – Learning techniques

Cognitive Intelligence (CI)

CI = Ant Colony Optimization + Bayesian Inference Model

Ant Colony Optimization System - Swarm intelligence

- E. O. Wilson in 1953 studied the social behavior of ants at Harvard University
  - Communicate through pheromone
  - Different fixed action responses to different pheromones – Normal & Benevolent traffic
  - Isolated ants act completely randomly and do not survive
  - Masses of ants thrive and defend each other

Bayesian Inference Model

- Adaptive weights on each ‘performance’ parameters.
- Reduced false alarm detection
- Prognostic Intrusion measures using training data

Why Cognitive Intelligence?

- Decentralized & resource aware approach
- Self adaptive nature – (Minimal human intervention)
- Hypothesis testing based on node characteristics

Summary

- The robustness of cross-layer algorithm is analyzed simulated scenario - noisy & fading channel, MUI.  
- Designed cross-layer protocol is application dependent – affects parameter’s weight
- The feedback characteristic of the ant system – Pheromone deposition can be used to penalize the attacked nodes
- The performance parameters such as energy, Pd, Pl, BER and location of jammer & its characteristics influence the DoS attack
- Hypothesis testing helps in setting a threshold, which can be varied depending on the environment and the node’s characteristic
- An energy efficient cross layer detection and countermeasure scheme increases the lifetime of the sensors and application