Efficient Network Exploration and Fire Detection using Mobile Agents in a Wireless Sensor Network

Chien-Liang Fok
Gruia-Catalin Roman
Chenyang Lu

Two-Step Algorithm
1. Route Preplanning by a genetic algorithm:
   - Server decides:
     - Number of mobile agents
     - Basic itineraries of each agent

2. In-Network Localized Decisions:
   Mobile agents adapt to:
   - Unexpected network topologies
   - Node failures

Individual Mote Cost (Energy-Wise) of the Genetic Algorithm Best and Worst Solutions

Fire Tracking Agent
Scours the sensor network looking for fire, swarming around and forming a virtual barrier when it is detected.

Dynamically adjusts barrier based on the spreading of the fire.

Fire Detection
Upon detecting fire, the fire tracking agent clones itself to all neighbors within a distance of 1.5 of the fire forming a barrier.
Agents continuously monitor temperature and jump away when it gets too hot, and jumps towards the flames when it gets too cold, thus forming a dynamic barrier.

Wireless Sensor Networks
Ubiquitous and Large Resource-constraint Faulty

Mobile Agents
Flexibility Robustness Load Distribution

This research has been supported by the US Office of Naval Research under MURI research contract N00014-02-1-0715 and by the Generalitat de Catalunya, the Patronat of Escola Politècnica Superior at the Universitat de Girona and the Baisells Program at UCI through a Girona fellowship.