Distributed Guiding Navigation Protocol

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Distributed Guiding Navigation Protocol

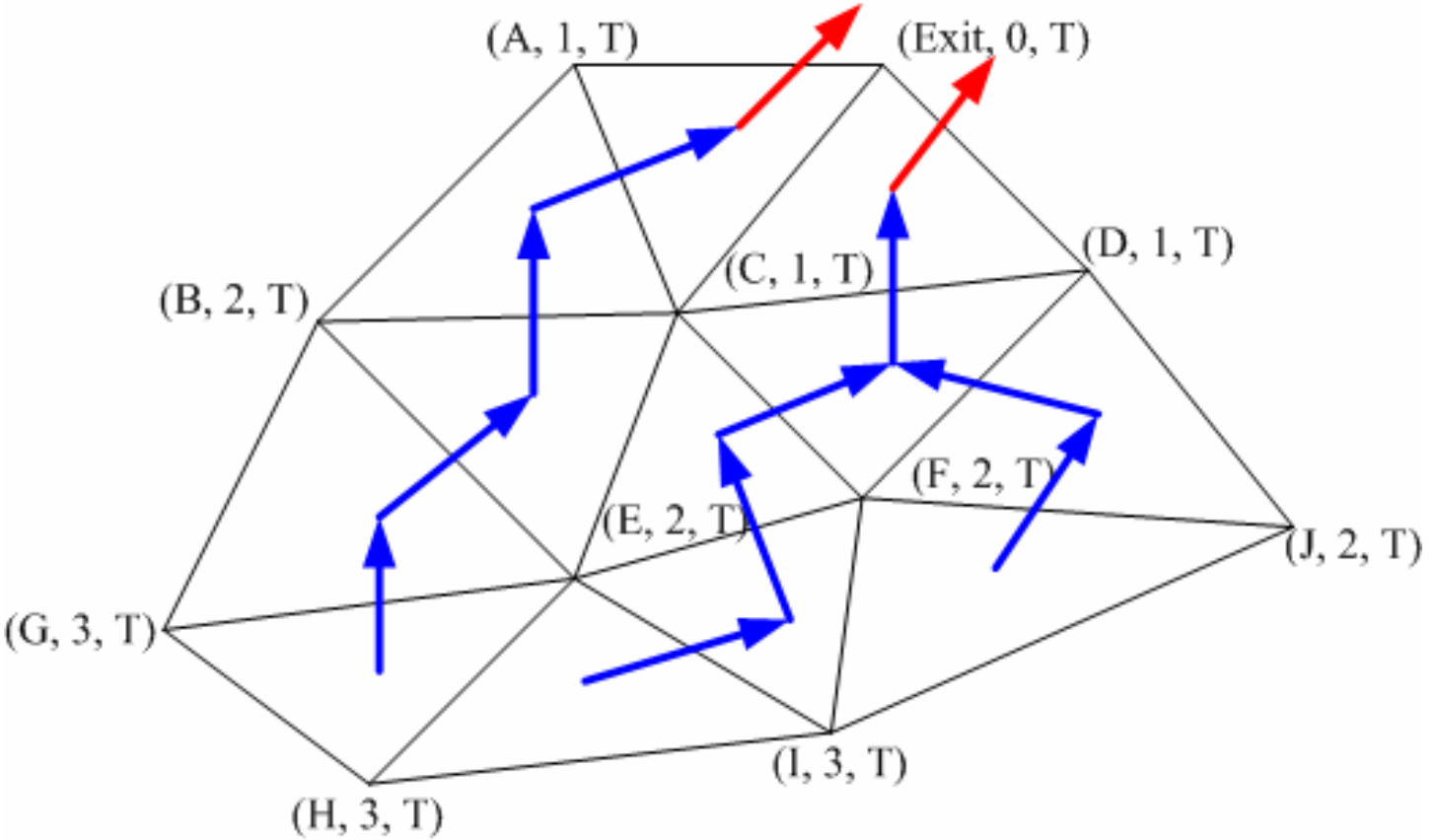
- Goal:
  - Maintain a optimal-like safe path to the exit.
  - Given a temperature threshold $T_{threshold}$, the temperature along the safe path must under this threshold.
  - The safe path must be the shortest path from any point to the exit.

Distributed Guiding Navigation Protocol

- Area maintenance
  - Sensor nodes are deployed in a space in advance
  - The sensor network is partitioned into many triangles by Localized Delaunay Triangulation (LDel)
  - Each node exchanges its information, includes node ID (NID) and temperature (T).

Distributed Guiding Navigation Protocol

- Path maintenance



Distributed Guiding Navigation Protocol

- Reaction to the fire
  - Define the unusual states in the sensor network
  - Reset the guiding directions of areas in the network.
  - $T_{threshold}$
    - When the temperature exceeds the threshold, it means that the environment enters an unusual state

Distributed Guiding Navigation Protocol

- Path reset
  - The exits will broadcast message periodically.
  - All the paths in the network will reset to new directions to reach the exits.
- Load-balance
  - An area will maintain several paths to different exits.
  - Example:

  If there are n paths to n exits in an area, the probability of exit ***i*** to be selected is:

$$P_i = \frac{\sum_{1,j\neq i}^{n} H_j}{\sum_{1}^{n} H_i}$$

On-going works

- Mathematical analysis
  - A smooth shortest path
- Implementation
  - MICA Mote
  - Guiding GUI interface