Ad Hoc Networks Seminar WS 08/09

Computer Networks and Telematics

University of Freiburg

"Distributed Mobility Management for Target Tracking in Mobile Sensor Networks" by

Y. Zou, IEEE Member, and K. Chakrabarty, IEEE Senior Member in IEEE Transactions on Mobile Computing, August 2007

- Final Presentation -

Presenter: Salek Talangi

Freiburg, 2009-02-16

Agenda

- Introduction
- General MANET Characteristics
- Difference between Mobile Ad Hoc and Mobile Sensor Networks
- Purpose of presented work
- Algorithm and simplifications
- Results of simulation
- My opinion and questions

Authors

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General MANET Characteristics

- Members joining and leaving the network.
- No base station.
- Difficult to create scheme for handover.
- No dedicated routers.
- Communication connectivity is “weak”.

Difference between Mobile Ad Hoc and Sensor Networks

- MANET: **random** movement
- Mobile Senor Network: **purposeful** movement

Purpose

Creation of an algorithm that

- estimates the consequences of node movement.
- as result: Autonomous decision of a node if it should move.

that suits to the general MANET Characteristics and needs as few communication as possible.

Consequences of Movement

Positive

but also

Negative

Consequences of Movement

Following changes

- S/N
- Communication connectivity
- Surveillance area
- Remaining power

Processing possibilities

- One centralized processing node (cluster head)
- Changing cluster heads
- Local sensor integration
- **Local sensor integration + one-hop neighborhood**

Algorithm

- Aim: S/N improvement at minimal costs.
- Prerequisite: Data about one-hop neighborhood present in all nodes.

Algorithm (simplified)

(1) Predict possible sensor results for all possible new sensor positions (also from one-hop network).

(2) Treat them as true results.

(3) Calculate which movement of which node gives best results.

(4) If processing node is the best node to move, move to computed position.

Algorithm

- Algorithm is executed locally in every node sensing a target.
- “Best results” refers to positive and negative consequences of movement.
- Movement decision problem becomes a problem of selecting the best sensor (which is researched in prior work).

Simplifications

- Constant speed.
- Small sampling intervals.
- Candidate locations defined by a grid.
- Nodes move iff a target is detected.
- Nodes move always successful.

Simplifications (cont.)

- Only one-hop neighborhood.
- Neighbor nodes don't change.
- Nodes have neighbor data (no protocol for exchange).
- Only a few costs are considered.

Advantages

- No communication required at decision time.
- No overhead for communication (HELLO messages are sent anyway).
- Almost no energy consumption for communication.
- Only knowledge about one-hop neighborhood required.

Problems

- Number of needed calculations increases with neighborhood.
- Not all sensing nodes in one-hop neighborhood.

Application

- Tested with MatLab with 20 identical nodes deployed at random
  - Sensing: 9m radius
  - Communication: 18m radius
  - 20m x 20m grid
  - Speed 1m/s, Sampling interval 1s

Application results

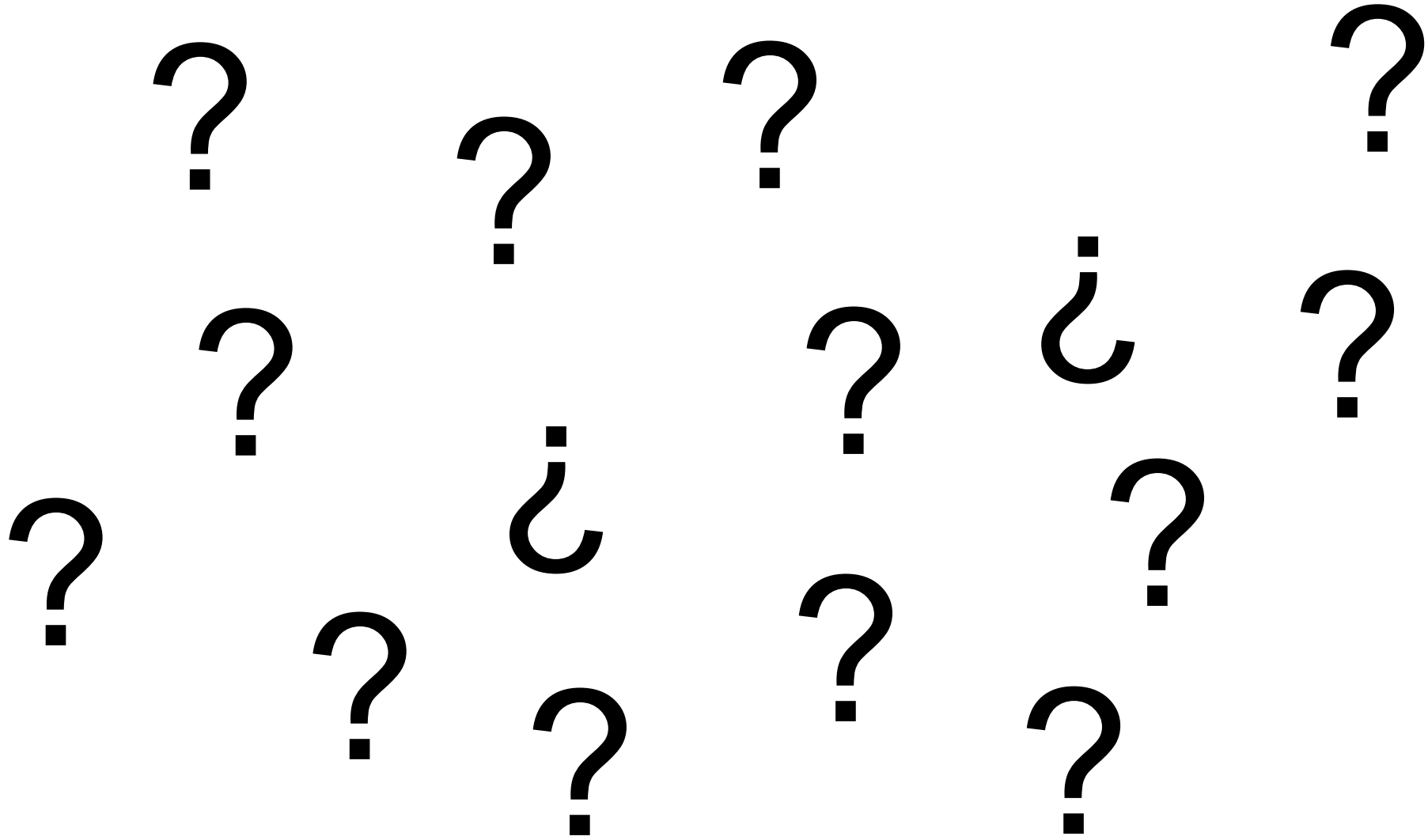
Comparisons with other methods show better results towards selected criteria. Methods compared in simulation:

- Static Sensor Networks (tracking results).
- Random Mobile Sensor Network (tracking results).
- Centralized implementation of MSN (energy consumption).

My demurs

- Chosen simulation values seem weird.
- Energy consumption for communication not that important.
- Calculations done multiple times at different nodes.
- No information on how nodes know their position.
- No information on data exchange.
- Only one target considered.

Questions ?!?



Thank you for your attention