Modeling & analyzing Location Routing in Sensor Networks.
&
Design & Analysis of (HIT) for Sensor Networks

Ahmed Gaffar
Email: ahmed_gaffar@yahoo.com

Telematics Group
Institute for Informatics
University of Göttingen, Germany
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1-Introduction

Why Modeling analyzing Impact location inconsistence?

- wireless communication devices are gaining more popular.
- Location information has important meaning especially in Sensor networks.
- In mobile ad-hoc networks nodes moving, routing is a challenging task.
- Geographic routing for it several merits is better than topology-based routing.
2- Background and related works

- Existing ad-hoc protocols can be divided into two approaches
  1. topology-based routing, uses link information of the networks to perform packet forwarding.
  2. Position-based routing, uses physical location information to perform packet forwarding.
2.2 – geographic routing can be categorized into three approaches depending on the forwarding strategies:

2.2.1 – Greedy packet forwarding.
2.2.2 – restricted directional flooding.
2.2.3 – Hierarchical routing.
3- Inconsistency metrics

3.1 – Absolute Location Inaccuracy
3.2 – Relative Distance Inaccuracy.
3.3 – Absolute Location Inconsistency.
3.4 – Relative Distance Inconsistency.
<table>
<thead>
<tr>
<th>Inaccuracy</th>
<th>Absolute Location Inaccuracy</th>
<th>$\sqrt{(x_i - (x_i + \Delta x_i))^2 + (y_i - (y_i + \Delta y_i))^2}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Relative Distance Inaccuracy</td>
<td>$\Delta Dist \cdot \Delta Dist_{error} \leq 0$</td>
</tr>
<tr>
<td>Inconsistency</td>
<td>Absolute Location Inconsistency</td>
<td>$\sqrt{(x_k^i - x_k^j)^2 + (y_k^i - y_k^j)^2}$</td>
</tr>
<tr>
<td></td>
<td>Relative Distance Inconsistency</td>
<td>$\Delta Dist_{error}^i \cdot \Delta Dist_{error}^j \leq 0$</td>
</tr>
</tbody>
</table>
4 – Simulation of Greedy Forwarding

- Tools
  1- the original NS-2 code for GPSR was used.
  2- 250m of radio range.
  3- Gaussian distribution (with zero mean), with different standard deviation to generate location inaccuracy.
  4- Location inaccuracy is added to true location.
### 4.1- Simulation Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radio Range</td>
<td>250m</td>
</tr>
<tr>
<td>Standard Deviation of Inaccuracy</td>
<td>0,10,20,30,40,50m</td>
</tr>
<tr>
<td>Location error</td>
<td>0,5,10,15,20 %</td>
</tr>
<tr>
<td>Node Degree</td>
<td>5,8,19 (area: 1350mx1350m)</td>
</tr>
<tr>
<td>Network Diameter</td>
<td>750mx750m, 1050mx1050m, 1350mx1350m</td>
</tr>
<tr>
<td>Traffic Sources</td>
<td>30</td>
</tr>
</tbody>
</table>
4.2 – Impact in Drop Rate
4.3 – Impact on Optimal Path
4.4 – Impact on looping
## Conclusions

<table>
<thead>
<tr>
<th>Inaccuracy Metrics</th>
<th>Problem</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inaccuracy</td>
<td>Absolute Location Inaccuracy</td>
<td>Wrong Neighbor Information</td>
</tr>
<tr>
<td></td>
<td>Relative Distance Inaccuracy</td>
<td>Wrong Greedy Decision</td>
</tr>
<tr>
<td>Inconsistency</td>
<td>Absolute Location Inconsistency</td>
<td>False Local Maximum</td>
</tr>
<tr>
<td></td>
<td>Relative Distance Inconsistency</td>
<td>Wrong Greedy Decision</td>
</tr>
</tbody>
</table>
Design and Analysis of (HIT) in Micro Sensor Networks

1 – Introduction.
2 – Basic Models.
3 – HIT Protocol Description.
4 – Performance Evaluation.
5 – Future Application of HIT.
6 – Conclusion.
1 – Introduction and Related Studies

1 – The sensor networks task is to sense the environment, and relay the information back to a remote base station, where the user can access it.

2 – Reducing the energy consumption is very important in these networks.

3 – the purpose of this paper:
   - Introduce Hybrid Indirect Transmission (HIT)
   - Testing (HIT) with a simulation test.
2 – Basic Models

2.1 – Data Delivery Model
2.2 – Radio Model
2.3 – Analysis of Direct and Indirect Transmission
2.4 – Parallel Transmission.
2.5 – Analysis of TDMA versus CSMA.
3 – HIT Protocol Description

- Clustering Phase
  1. One or more cluster-head are selected.
  - Single Cluster, Rotation
  - Single Cluster, Rotation, Additional Selection Criteria.
  - Multiple Clusters, Random.
  2. Cluster-head Advertisement.
  3. Cluster Setup using (CSMA)
3 – HIT Protocol Description

- Routing Phase
  1- Route Setup: each node know the upstreams from the neighbor, from the last Phase.
  2- have a knowlidig which is downstream neighbor, and which is upstream neighbor.
  3- Blocking Set Computation(CSMA): each node computes the blocking set for it´s downstream neighbor.
3 – HIT Protocol Description

- Schedule Phase
  1- TDMA Schedule Setup: allows close the maximum number of nodes to communicate in parallel, computed by each node.

  2- Data Transmission (TDMA): sensing the environment and transmits to the upstream neighbor, following the TDMA schedule.
5 – Future Application for HIT

- Bioelectric Computer Interface
- HIT for EMG Sensing in Bioelectric Computer Interface.
6- Conclusion

- The paper has described HIT (and HIT\textsubscript{m} for multiple cluster).
- Performance evaluation has shown that HIT provides energy savings over LEACH and PEGASIS.
- This advantage becomes more significant for large areas or large number of nodes.
- HIT reduces the delay required to gather data.
Thank you for your attention!