Density-based Link State Assisted Geographic Routing in Vehicular City Scenarios

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Motivations

1. Wireless Access in Vehicular Environments (WAVE) standards for V2V and V2I wireless communications, enabling a Vehicular Ad hoc NeTwork (VANET)
2. Potential VANET applications: e.g., real-time traffic reports, content distribution
3. Multi-hop routing protocol is a must to support such applications

Taxonomy of VANET Routing Protocols

<table>
<thead>
<tr>
<th>VANET routing protocols</th>
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<tbody>
<tr>
<td>Proactive (table-driven)</td>
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<tr>
<td>Reactive (on-demand)</td>
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<tr>
<td>Geographic position assisted routing</td>
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<tr>
<td>OLSR</td>
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<tr>
<td>Greedy</td>
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<td>GPSR</td>
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Proposed Solution: Density-Based Link State (DBLS) Assisted Geo-routing

1. Exploit stable vehicle traffic pattern -- reliable
2. P2P collection of per road density information
3. Find robust road density threshold and build Road Based Link State Table -- scalable
4. DBLS: Table driven routing to a destination road; Greedy geographic forwarding within a road -- efficient

Experimental Results

- 82 nodes, 30 mobile nodes, 1000m x 1000m
- DBLS’ PDR 20% higher with 50% less hop count
- Run 4 and 13 shows GPSR’s inefficiency

DBLS Optimizations

- Recovery mode in case of missing junction nodes
- Hierarchical DBLS to further improve scalability
- Reduction in the frequency of density information utilizing density stability

Future Work

- Comparison with other hybrid routings
- Mapping density to quality of links

Problem Statement

Protocol Design Challenges in VANETs:

- High mobility
- Non-uniform (yet stable) vehicle distribution

Potential Problems:

- Table-driven routing: scalability problem
- On-demand routing: expensive flooding and frequent route breaks
- Geo-routing: inefficient recovery mode
- DTN routing: long delay

RED - GPSR/GPCR
BLUE - DBLS