TO-GO: TOpology-assist Geo-Opportunistic Routing in Urban Vehicular Grids

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Motivation: unreliable wireless channel nature in vehicular urban grids

Unreliable delivery, packet loss: Conventional geographic routing lack required robustness

Exploit spatial diversity for robust networking

Geographic Routing in Vehicular Urban Grids

Greedy Perimeter Coordinator Routing (GPCR)

Nodal planar graph: Recovery mode is expensive
Road topology: use greedy forwarding in a road segment

Greedy forwarding: forward a packet to its neighbor closest to the destination
But greedy forwarding is unreliable due to channel errors

GPCR: always forwards packets to a junction node

GpsrJ+: 2-hop Junction Prediction

2-hop neighbor info based prediction enables a forwarder to decide whether to bypass junction area

TO-GO: Geo-Opportunistic Routing in Vehicular Urban Grids

Exploit spatial diversity in urban grids
Forwarding set selection method

Existing schemes only considered the direction to the destination: less efficient in vehicular urban grids
TO-GO: forwarding direction is determined using GpsrJ+ prediction

Finding a max set w/o hidden terminals: clique problem \( \Rightarrow \) NP-hard

Choose a set that can hear the target
Find a neighbor node with largest neighbors
Filter its neighbors to avoid hidden terminals

Simulation Results

Wireless-free channel
Wireless error-prone channel

- To-Go obtains consistently high PDR with lower hop count
- At node 150, high density helps GPSR and GPCR in delivery
- GPCR always stopping at junctions hurts its delivery
- GpsrJ+ has highest PDR b/c it is oblivious to hidden terminals

- Higher standard deviation, higher channel errors
- TO-GO's PDR remains high while GpsrJ+ decreases
- GpsrJ+ hop count: [5.05, 7.47]; TO-GO hop count: [5.85, 8.35]