VADD : Vehicle Assisted Data Delivery In VANET

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Introduction

- Multi-hop data delivery through vehicular ad hoc networks is complicated by the fact that vehicular networks are highly mobile and frequently disconnected.
- Different from existing carry and forward solutions, we make use of the predicable vehicle mobility, which is limited by the traffic pattern and the road layout.

Preconditions and Assumptions

- Vehicles communicate through short range wireless channel.
- A vehicle knows its neighbors positions by beacon messages.
- Vehicles are equipped with digital maps.
- A Vehicle defines the packet header.

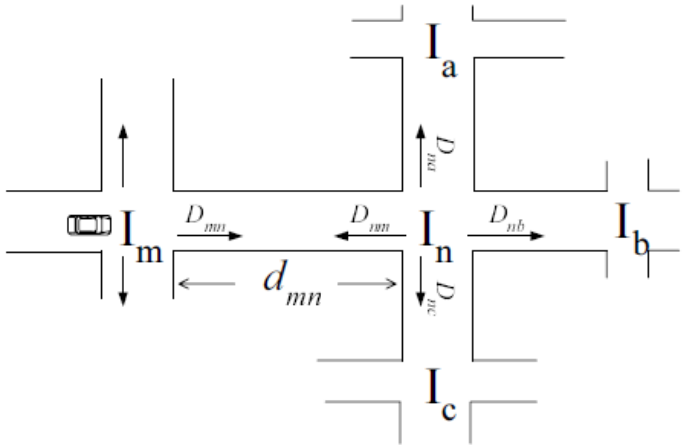
Basic Principles

Proposed VADD follows three principles

- Use wireless transmission as much as possible.
- Always choose the road with highest speed (lowest expected data delivery delay).
- Continuous execution of dynamic path selection during packet forwarding process.

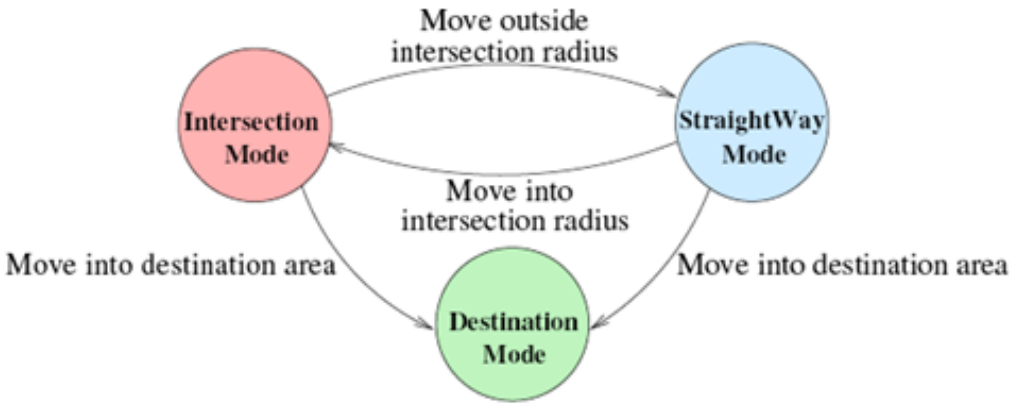
VADD Model

- Find out the next forwarding direction with probabilistically the shortest delay.
- Probabilistic Method-
  1. Estimate the expected delivery delay from current intersection to the destination for each possible forwarding directions.



$$D_{mn} = d_{mn} + \sum_{j \in N(n)} (P_{nj} \times D_{nj})$$

Three Modes Of VADD

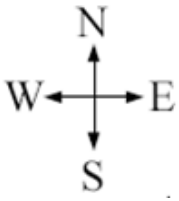


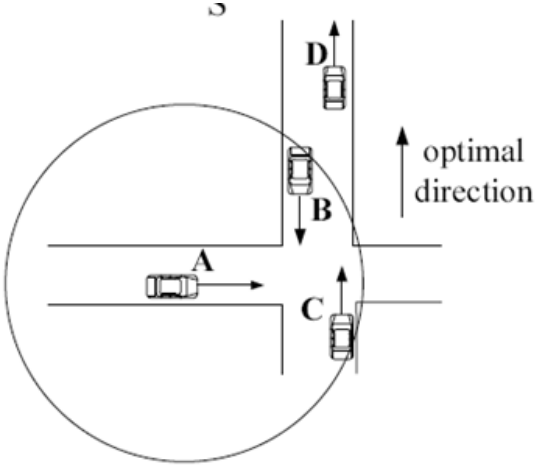
- Intersection Mode - Optimize the packet forwarding direction
- Straight Way Mode - Geographically greedy forwarding towards next target intersection
- Destination Mode - broadcast packet to destination

Intersection Forwarding Protocols

There are four types of Intersection Forwarding Protocols

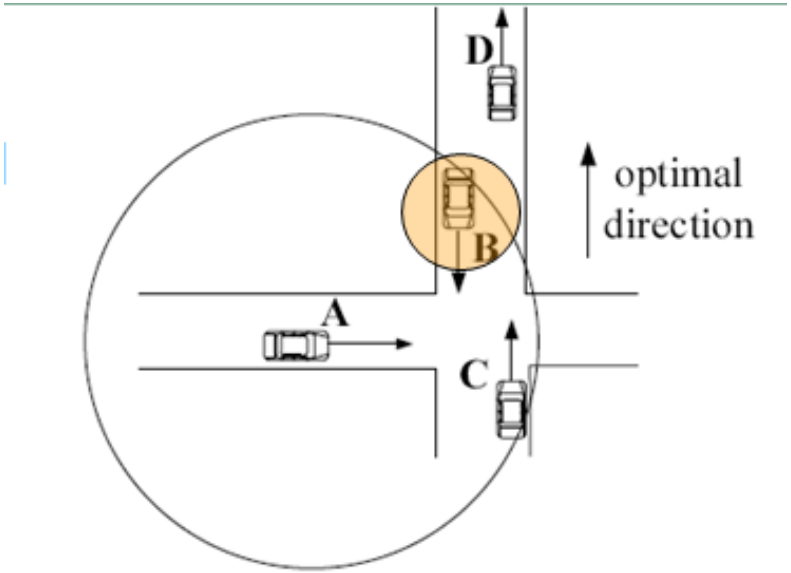
- Location First VADD (L-VADD)
- Direction First VADD (D-VADD)
- Multi-Path D-VADD (M-VADD)
- Hybrid VADD (H-VADD)





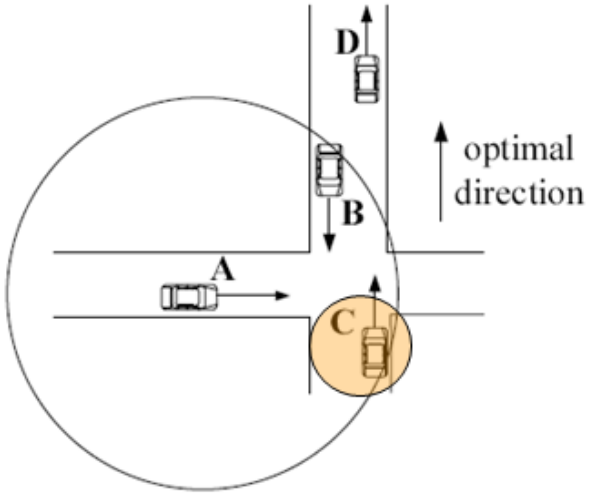
Location First VADD (L-VADD)

- Simple L-VADD
  1. The closest carrier towards the preferred direction in term of location as the next hop, whatever the moving direction of the chosen carrier. e.g. A to B
  2. Vulnerable to Forwarding Loop



Direction First VADD (D-VADD)

- Basic Idea
  1. Only probe the carrier moving towards the preferred direction.
  2. Pick the one closest towards the preferred direction as the next hop.
  3. e.g. A to C
- Can be proved no Forwarding Loop



Multi-path D-VADD (MD-VADD)

- Continue holds the packet after the packet is forwarded to sub-optimal direction.
- Extends the staying time of a packet at the intersection to increase the opportunity of meeting contact towards better direction

Hybrid VADD (H-VADD)

- Basic Idea-
  1. Hybrid of L-VADD and D-VADD/MD-VADD
  2. Try and Error - Try L-VADD first, switch to D-VADD/MD-VADD when L-VADD fails

Advantages

- Comparing with GPSR (with buffer), epidemic routing and DSR , VADD performs high delivery ratio.
- VADD is suitable for multi-hop delivery.
- VADD protocols, the helper node technique is better than the other technique.

Disadvantages

- VADD has the less end to end delay as compared to the existing approach.
- Dependent on GPS service.
- Reduces the network bandwidth.

Applications

- Co-operative Collision warning.
- Intersection Collision Warning.
- Work Zone Warning.
- Approaching Emergency Vehicle.
- Electronic Toll Collection.

Conclusion

1. VADD adopts the idea of carry and forward, and also explores the predictable vehicle mobility.
2. Four VADD protocols to forward the packet towards the optimal direction/path at the intersection.
3. Simulation results shows that the VADD protocols are better suitable for the multi-hop data delivery in VANET.

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Thank You..