Current Routing Strategies to Adapt the Characteristics

Prof. Ananad L.Mothghare,
H.O.D. Dept Of M.C.A. ,
Priyadarshini College of Engineering, Nagpur-440015.(Maharashtra) India.

ABSTRACT:
The VANET characteristics including high-speed node movement, frequent topology change, and short connection lifetime especially with multi-hop paths. These three characteristics degrade the performance of some popular topological routing protocols for ad hoc network significantly. This is because topological routing needs to maintain a path from the source to the destination, but the path expires quickly due to frequent topology changes. The frequently changed topology suggests that a local routing scheme without the need to keep track of global routing information scales better in VANET. In addition, the popularity of GPS also makes position-based routing, which maintains only local information about the node's position, a popular routing strategy. A successful VANET routing solution also needs to handle issues such as sparse network density, interfering environment, long path length, latency etc. In this Paper, we look at the current routing proposals that address the characteristics of VANET. We select the routing strategies designed and tested on VANET simulation and categorize them into (1) position-based, (2) enhanced topological-based, and hybrid approach.

Position-based Routing

Position-based routing usually performs well in a highway environment in which nodes are moving quickly and transmission area has few obstructions.

Cluster Based Location Routing (CBLR)[22]:

This algorithm assumes all vehicles can gather their positions via GPS. The algorithm divides the network into multiple clusters. Each cluster has a cluster-head and a group of members within the transmission range of the cluster-head. The cluster-head and members are formed as follow:

1. A new vehicle transmits a Hello Message.
2. If the vehicle gets a reply from the cluster-head vehicle, the new vehicle would become a member of the cluster. If not, the new vehicle becomes the cluster head.
3. The cluster-head is responsible to send a message every second to let the members know its existence.

To reduce message flooding in the global networks, members of the cluster transmit packets to the cluster-head only and the cluster-head is responsible to forward message to other clusters. The cluster head knows the routing information within the cluster. Between the cluster-heads, at least one bridge node is needed to take care of the communication between the cluster-heads. A cluster-head must at least know one bridge node, so the packet can be send outside the cluster. The cluster-head then send message to a bridge node. The bridge node would transmit the message to another cluster-head. The chapter gives examples on how to recover from the loss of member, cluster-head, or bridge node. Simulation was used to verify the algorithm. The authors indicate that the simulations assume that transmission of packet is synchronized, which would not be the case in a real scenario. The test results show that the algorithm shows good performance when the speed of vehicles is less then 89 miles per hour (30 m/s). The end-to-end delay is 8 msec on average.

Enhanced Topological-based Routing

As mentioned, topological-based routing is believed to be less scalable in VANET environments. Suetal propose an algorithm to predict the future state of network topology and perform route reconstruction proactively . Their goal is to address the problems of rapid topological changes by reconstructing a usable route rapidly. The basic idea is that connection time can be approximated if the velocities of two nodes, distance, and transmission ranges are known. The proposed equation finds the amount of time two mobile hosts will state connected using the velocity differences, moving directions, transmission range and the current distance at a given time.

Hybrid Approach

The Hybrid approach makes use of node position information and also information on the paths from the source to the destination. The algorithms with this approach usually assumes every vehicle not only has an on board GPS but also have the digital maps ready in storage. This may not be realistic during the early deployment of VANET. However, there exists location-identifying scheme without GPS or digital maps .

Lochertetal algorithm :

Lochert contributes in two areas in this chapter:
(1) their simulation model consider the effects of obstructions in vehicular ad hoc network,
(2) they propose a routing strategy for a city environment.

A microscopic simulator Videlio, developed by DaimlerChrysler AG is used to simulate the traffic flow. A small part of the city of Berlin was modeled as a graph of streets and movement of 955 vehicles are simulated. The city obstruction is achieved by extending the simulator to consider the spaces between streets as buildings. As a result, two nodes can only communicate directly when they are in their respective transmission range and also they are within the 'line of sight' of each other. The network model is simulated using NS-2.

They propose Geographic Source Routing (GSR), which combines position and topological information in routing decision. The scheme requires an on board GPS system that contains the digital maps of current areas. The sender computes a sequence of junctions the packet has to traverse to reach the destination using the underlying map of the streets. The current implementation selects the path between source and destination by a Dijkstra's shortest path calculation based on the street map. The simulation shows GSR outperforms the topological-based algorithms, DSR and AODV, with respect to delivery rate and latency.

Cheng et al algorithm:

This algorithm is very similar to Lochert's algorithm above. It combines the knowledge of position and topology information from digital maps to construct a shortest route from source to the destination. Other than providing an algorithm from a source to one destination node, it enhances the algorithm to route to a destination area.

Tian et al algorithm:

Like the above two algorithms presented in this category, this algorithm makes use of static digital map data to construct a path from the source to the destination instead of maintaining global link information. In addition, the authors point out a situation in which a forwarding vehicle may never find a suitable neighbor because the path information is based on static map data instead of existing links. They propose three ways to recover from this situation: (1) buffer the packets and retry a number of times, (2) switch to greedy forwarding, (3) compute another path using the static map.

DIRECTION OF FUTURE RESEARCH

This section suggests some directions of future research for VANET in general. As seen in some of the studies presented, the transmission range of a vehicle may be too strong or too weak during certain times of the day and in certain city environments. When the transmission is too strong, it creates interference and lowers the system throughput. When transmission is too low, the vehicle cannot reach other vehicles. Smart algorithms that adjust the transmission range according to external factors can help finding the balanced transmission range. Further research is needed to provide these smart algorithms based on the characteristics of vehicular networks. Increasing body of research makes use of GPS data in the routing proposals. The routing proposals often assume that either all nodes have GPS or none has GPS. The most realistic situation is that some nodes have GPS and some do not. We believe more works is needed to address the mixed environment. Current studies in characterization of VANET focus mostly on a simulated highway environment. Vehicle characterization in city and other environments is less studied. Also, most of the characterization study is done with simulation. Actual field experiments to study the characterization on the vehicles moving in highways with actual network layers are potential future works. Programs and tools that can perform automatic communication and data collection in these field experiments are also valuable. Increasing number of users owns varied kind of wireless equipments that make use of varied kind of wireless technology and protocols. Commercial vendors are adapting new wireless protocols quickly while consumers are still making use of older technologies.

For example, a cellular phone may be running Bluetooth, a PDA running Wireless LAN 802.11a and the laptop using Wireless LAN 802.11b and the vehicle is potentially using yet another slightly different protocol. A mixture of old and new wireless technologies and equipments are likely to be used by the consumers. A vehicular ad hoc network that can connect these equipments and technologies together seamlessly will change the way we travel. For example, a passenger can make a telephony phone call via IP using her PDA through the vehicular ad hoc network. The routing solutions need to take care of the forwarding of different kinds of packets and routing protocols in such network. Several studies have focused on understanding time critical safety application. The characterization of VANET indicates that delay-tolerant applications can perform well. Exploring delay tolerant application in the VANET space and the routing implication are future research topics.