Information Dissemination between nodes of different intersections in city Environment using hop greedy routingprotocol (BAHG)

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Abstract: **Routing of data in vehicular ad-hoc network is challenging task in dense areas of cities. Vehicular ad hoc networks (VANETs) are valuable for their wide variety of applications, road safety, multimedia content sharing, comfort on wheels, etc. Multi-hop information distribution in VANETs is limited by the high movement of vehicles and the frequent disconnections. Currently, someof geographic routing protocols are considered forVANETs and with connectivity awareness, routing protocols perform well in terms of reliable data delivery. To obtain destination position, some routing protocols use flooding, which are harmful in city environments. Further, in the case of sparse and voidregions, use of the recovery strategy elevates hop count. Some geographic routing protocols make useof the minimum weighted algorithm based on distance or connectivity to select intermediate intersections. However, the shortest path or the path with higher connectivity may include numerous intermediate intersections. In this paper, a hop greedy routing scheme is introduced that yields a routing path with the minimum number of intermediate intersection nodes while taking connectivity into consideration backbone nodes are considered providing connectivity around an intersection. Apart from this, by tracking the movement fromsource to destination, the back-bone nodes enable a packet to be forwarded in the changed direction. Simulation results help to ensure higher packet delivery ratio and shorter end-to-end delay.**

1. INTRODUCTION:

Wireless communication among moving vehicles is increasingly the focus of research in both of the academic community and automobile industry, driven by the vision that exchange of information among vehicles can be exploited to improve the safety and comfort of drivers and passengers. Several technical problems need to be solved before installing vehicular networks; in the near future, large scale vehicular networks will be available to provide people with more conveniences in their driving experience. For example, through such networks, people can query the price and services provided by gas stations in a certain region, or remotely control their smart houses while driving home. Drivers can even download a real-time traffic image from traffic camera located at a certain point, or connect to access points of parking lots to inquire the number of available parking slots. If the information could be successfully retrieved from the remote server, it would be very helpful and desirable to drivers [2].
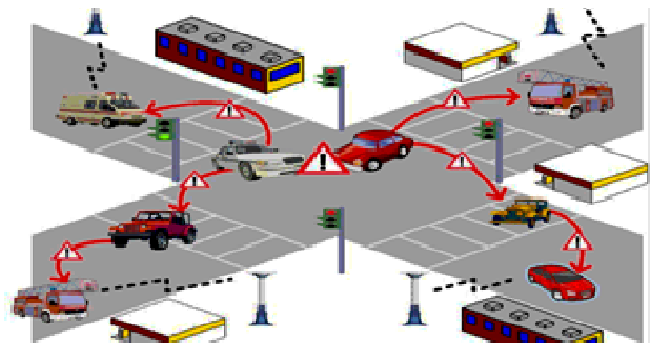

Fig illustrates how the information is disseminates between different vehicles at the intersection. A vehicle at one side of boundary of the road collects the geographical information and sends information to other vehicles.

The current domain of vehicularresearch includes routing, congestion control, collision avoidance, safety message broadcast, vehicular sensing, security, etc.Different terrains pose separate challenges to vehicular routing.It is a most difficult job to predict the exacttraffic density of a region. The structure of the road (i.e., straight or curved), number of intersections, number of lanes, length ofthe road (i.e., based on road ID), availability of public transport,and driver behavior have a great impact on the node density andnetwork connectivity of a vehicular network[1].

Routing has been a challenge in VANETs because of the rapid movement of vehicles and frequent changes in the topology of VANETs. From these weaknesses, greedy routing protocols are known to be more suitable and useful to VANETs.Finding the routing path is key challenge to routing protocol. Greedy forwarding is one of the most suitable solutions for routing in VANETs because it maintains only the local information of neighbors instead of per-destination routing entries. Greedy routing algorithms require that information about the physical position of the participating nodes be available. Greedy routing algorithms require that information about the physical position of the participating nodes be available. This position

is made available to the direct neighbors via periodic transmissions from beacons.

A sender can request the position of a receiver by means of a location service. The routing decision at each node is then based on the destination's position contained in the packet and the position of the forwarding node's neighbors. Greedy routing thus does not require the establishment or maintenance of routes. Greedy routing protocols use the geographic position of vehicles to determine the direction for forwarding a data packet. Traditional greedy routing protocols use beacon messages: each vehicle announces its address and geographic position to all of its neighbors via a radio broadcast. Whenever a vehicle receives such a beacon message from a neighbor, it stores the address and position of that vehicle in its neighbor table. When a vehicle has to forward a packet, it uses the table to determine the neighbor the packet should be forwarded to in order to make progress toward the final destination[3].

When routing path is shortest distance path which involves higher number of change of direction which leads higher hop counts. Inour approach, we choose hop count as the metric to find the routing paths. The hop greedy routing protocol exploits the transmission range and avoids intersections that are used to change the direction of the routing path. As the sender decides the routing path proactively, it is not possible to predict the actual connectivity value without probing the whole network.

We adopt an indirectmethod to compute the connectivity parameter for each intersection[2]. We found thatconnectivity increases with the increase in the number of lanes. We therefore obtain the connectivity parameter based on the number of lanes. However, packet congestion will occur as the path with the highest connectivity may be used by multiple source–destination (src–dst) pairs. Alongwith the routing algorithm, we introduce a back-bone mechanism in which some specialized nodes perform functions such as tracking the movement of end nodes, detecting void regions on road segments, storing packets on unavailability of forwarding nodes, and selecting the most suitable intersection node as the forwarding node. Since the routing algorithm selects a path using destination position, we employ a unicast request-reply-based destination probing mechanism. As the position of each boundary intersection is known, the unicast request messages initiated by the source can be easily sent to each boundary intersection. The back-bone nodes stationed at boundary intersections then take the responsibility to spread the request messages within the respective zones. The fact that unicast packets do not provide burst traffic and is shielded by request to send/clear to send (RTS/CTS) handshake is the basic motivation to adopt unicast to carry out all controlpacket transmissions. Once the destination receives the request message, it finds a suitable path to the source and sends the reply. On receiving the reply message, the source forwards data on a routing path computed by the hop greedy routing algorithm.

2. RELATED WORK AND MOTIVATIONS

The VANET has witnessed several endeavors toward the development of suitable routing solutions. Originally, manyrouting protocols were solely designed for mobile ad hoc networks and later enhanced to suit the VANET scenarios GPSR, DSR, AODV. Later on, few novel protocols were developed for adverse VANET environments CAR, GPSR, MOPR, DDOR. Some researchers are working on a more concrete version of routing protocols greedy perimeter stateless routing (GPSR), greedy perimeter coordinator routing (GPCR), geographic source routing (GSR), vehicle assisted data delivery (VADD) , anchor-based street- and traffic-aware routing (A-STAR) connectivity-aware routing (CAR), greedy traffic-aware routing (GyTAR), road-based using vehicular traffic (RBVT) , static-node-assisted adaptive data dissemination in vehicular networks (SADV), etc.have laid the foundation for routing in VANETs.

The position-based routing protocol GPSR relies on thelocation service to acquire the position information of the destination. Greedy perimeter stateless routing (GPSR)[3] is the best known greedy routing protocol for VANETs. GPSR makes greedy forwarding decisions using only information about a router's immediate neighbors in the network topology. GPSR consists of two methods for forwarding packets: greedy forwarding and perimeter forwarding. When a packet reaches a region where greedy forwarding is impossible, the algorithm recovers by routing around the perimeter of the region. GPSR uses greedy forwarding to forward packets to nodes that are always progressively closer to the destination. This process repeats at each intermediate node until the intended destination of the packet is reached. Since GPSR only maintains location information of all of its 1-hop neighbors, it is nearly stateless and leads to better scalability in a per-router state than shortest-path ad hoc routing protocols. GPSR may increase the possibility of getting a local maximum and link breakage because of the high mobility of vehicles and the road specifics in urban areas. GPSR also suffers from link breakage with some stale neighbor nodes in the greedy mode because of the high node mobility and rapidly-changing network topology. The local maximum and link breakage can be recovered in perimeter mode forwarding, but packet loss and delay time may occur because the number of hops increases in perimeter mode forwarding. These characteristics of greedy forwarding decrease VANET reliability. In GPCR[3], packets are forwarded by applying a restricted greedy forwarding procedure. GPCR consists of two parts: a restricted greedy forwarding procedure and a repair strategy and junctions. Therefore it does not need a graph planarization algorithm. In the restricted greedy forwarding of GPCR, junctions are the only places where actual routing decisions are made. Therefore, packets should always be forwarded to a node on a junction rather than being forwarded across a junction. A coordinator broadcasts its role along with its position information. If the forwarding node is located on a street and

not on a junction the packet is forwarded along the street towards the next junction.During the selection of a forwarding node, a junction node termed as the coordinator node is preferred over a non-junction node. Note that the coordinator node is not necessarily the closest node to the destination. However, the recovery strategy in GPCR remains the same as GPSR.

Greedy traffic aware routing (GyTAR)[3] is an intersection-based geographical routing protocol capable of finding robust routes within city environments. GyTAR considers vehicle direction, vehicle velocity, multi-directional roads, and the changing traffic environment into its routing strategy. It consists of two modules: (1) Selection of the junctions through which a packet must pass to reach its destination, and (2) an improved greedy forwarding mechanism between two junctions. Hence, using GyTAR, a packet moves successively closer towards the destination along streets where there are enough vehicles to provide connectivity. Similar to GPCR and position-based source routing, GyTAR adopts the anchor-based routing approach with street awareness. However, unlike GSR and A-STAR, where the sender statically computes a sequence of junctions that the packet has to traverse in order to reach the destination, intermediate junctions in GyTAR are chosen dynamically and one by one, considering both vehicular traffic variation and distance to destination using the map. Once the destination junction is determined, the improved greedy strategy is used to forward packets between the two involved junctions. Each vehicle maintains a neighbor table in which the position, velocity, and directionof each neighbor vehicle are recorded. Thus, when a packet is received, the forwarding vehicle computes the new predicted position of each neighbor using the recorded information. Routing protocols like GPSR, GPCR, GSR, A-STAR, and GyTAR work well in city environments. However, these protocols encounter different problems that motivate us to design a new robust scheme. Here, we discuss those problemsand the corresponding motivations.

1. Searching nodes at intersections:

In city environments, intersections play crucial roles for data communications. As the intersection region is small and the probability of change of direction is very high, it will be risky to choose an unstable node as the forwarding node from this region. This happens when a vehicle speeds up after sending its beacon packet. Vehicle flows are controlled by traffic lights. When a vehicle crosses the intersection without having another vehicle arrive at the intersection, a disconnection may occur. Such a situation arises only when a fleet of vehicles has crossed the intersection and when another fleet of vehicles has not been arrived at the intersection. Although CAR addresses connectivity issues, it could be affected as the average connectivity does not ensure connectivity in individual road segments in a routing path. Protocols such as GPSR, GPCR, and GSR do not ensure connectivity, and hence, the foregoing problem can have a serious impact on their performances.

2. Location Service Requirement

Traditionally, position-based routing protocols are assumed to be aware of the destination position through location services. However, fetching the position information of the source or the destination is nearly impossible as that information has to travel a number of hops in a city area, which is generally very large in size. Further, reducing the end-to-end delay is crucial for any routing protocol. Moreover, the location service is found to be superfluous for the nodes that do not take part in any communication. Protocols like GPSR [3] and GPCR [4] take the aid of proactive location services like hierarchical location service (HLS) and grid location service (GLS) In these location services, the lower beacon interval is the key factor for higher accuracy. Apparently, increased beacon messages create havoc in dense city scenarios. Although the reactive location service used in GSR is an exception, neither the source nor the destination can keep a tab on each other if they change their position in the middle of data communications. Sensors are deployed at the intersections to provide the actual position information of the destination. Aggregating and disseminating the position information throughout the entire network involve both computational and communication overheads. For every minor movement of the destination, there is a need for the computation of a new path to the destination from the intermediate intersection. As a result, the hop count may be increased.

3. Packet Swinging in Greedy Forwarding
In greedy forwarding, a sender chooses a forwarding node that is closest to the destination. Normally, in cities,the distance between two intersections is far less. Further,plenty of intersections are located in a small area. In such a case, the destination may move across many intersections while a data packet is on the way. Assuming that a location service provides real-time position information of the destination, the forwarding node selection depends on the updated position information of the destination. Apparently, new routing paths are computed at every hop. Hence, the packets keep on moving in search of the destination.We term this phenomenon as packet swinging in greedy forwarding.

3. PROPOSED SYSTEM:

System architecture
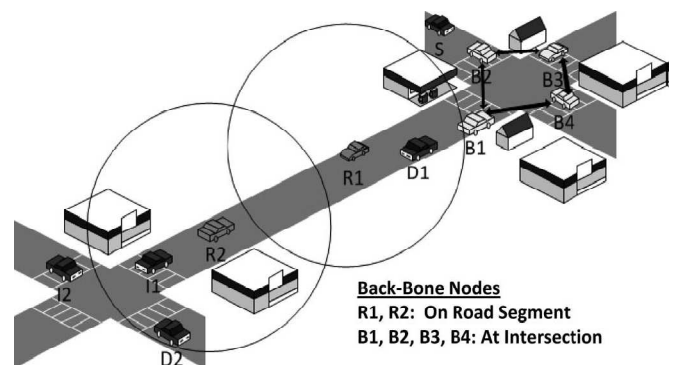
Back-Bone Nodes
R1, R2: On Road Segment
B1, B2, B3, B4: At Intersection

We present a position-based connectivity aware back-bone-assisted hop greedy (BAHG) routing protocol for VANET's city environments. The proposed routing protocol finds a routing path consisting of the minimum of intermediate intersections. The protocol is designed considering certain features in a city map, such as road segments, intersections, etc. To maintain connectivity at the intersections and to detect void regions, we rely on a group of nodes called back-bone nodes as shown in fig above. Basically, we adopt a request-reply scheme to obtain destination position, which is then used to compute the routing path.To avoid the impact of mobility on routing decisions, an update procedure is specifically designed to supervise the movement of source as well as destination. Overall, the objectiveof the hop greedy routing algorithm is to reduce the hop count, which ultimately reduces the end-to-end delay.

1.   Zone Formation and Boundary Intersection Selection:

This section explains how a city map is divided into several zones and how some of the intersections are chosen to be the boundary intersections that are located on the outline of a zone. By "major roads," we mean roads having more than two lanes. These zones share major roads with the adjacent zones. Many minor roads are running inside a zone. By "minor roads" we mean roads having less than or equal to two lanes. As major roads meet there, it is highly probable that at least one node will be present at that intersection. Apart from the corner intersections, major roads may also meet with a cluster of minor roads on the zone border, creating wider intersections.Wider intersections at the corner as well as on the zone border are termed as the boundary intersections. Basically, the boundary intersections will act as the entry points for the packets sent to a zone. In our system, intersections, major roads, and minor roads are assigned unique IDs.

2.   Back-Bone Nodes and Connectivity Preservation:

Connectivity is the key requirement for any routing protocol for reliable and fast delivery of packets. This section4. describesmechanisms to ensure connectivity of a routing path. A routing path involves many intermediate intersections at which the packet direction is changed. Selection of a wrong intermediate intersection may result in the dropping of packets. Similarly,
if the source or destination changes its original position, the ongoing communication may get disrupted.In our approach, we allow some of the nodes to take care of the foregoing connectivity issues. Such nodes are called as back-bone nodes. Based on the specific action they perform, they are classified into back-bone nodes at intersection and back-bone nodes at road segments.

3.   Two-Phase Destination Discovery:

This section explains show a request message is forwarded to different zones, and later within the zones, in two phases to probe the destination location. When a source has some data, it gathers destination information and uses this information to compute a routing path. Although obtaining destination information is one of the key requirements, it is more important that the information should be of the highest precision and is obtained with minimum message overhead in the system.In this approach, unicast is preferred again over the broadcast as the packets are vulnerable to collision at the intersections and may refrain from further spreading. The back-bone nodes that carry the request messages take the responsibility to spread within their respective zones. Hop Greedy Algorithm in Destination Reply and Data Dissemination

This section demonstrates how the reply message is forwarded to the source and the data packet is forwarded to the destination by adopting the hop greedy algorithm. On receiving a request message, the destination decides the reply path to the source using the hop greedy algorithm. The reply path is not necessarily the same as the path followed by the request message. The destination is aware of the source position; hence, a direct path to the source is computed without involving any boundary intersection. The reply message contains the list of intersections through which it has to traverse. If the source moves to a new position before the reply message is received, an update procedure discussed later renders a new path to the reply message.

On receiving the reply message from the destination, the source transmits the data packets by computing a path to the destination adopting the same hop greedy algorithm. The update procedure also handles the change of position of the destination if the data packets do not locate it at the old position. In addition to that, the data packet carries the source position information. Such information enables the destination to decide whether to send a new reply message to the source if the destination has moved to a different zone.

BAHG Position Update
Before receiving the reply message, the source may change its position. Some back-bone nodes must be aware of the direction of the source movement. When a forwarder chosen among the back-bone nodes learns about such changes, it forwards the reply message toward the new direction. Ultimately, the source is able to receive the reply message. Likewise, the destination may change its position before receiving the data packet, and its movements are tracked by the back-bone nodes. The destination may move substantially far from its original position. In such cases, the hop count will be elevated if the packet is forwarded using the updates received from the back-bone nodes. Thus, a fresh reply message is forwarded to the source if the destination changes its zone. On receiving this reply message, the source can compute a better path to the destination. This can marginalize the hop count, irrespective of the destination movement.

4. CONCLUSION:

In this paper a hop greedy routing protocol is introduced which finds the best possible path to destination in terms of both hop count and connectivity. A unicast request messages are forwarded to intended destination. For connectivity issues the concept of backbone node is introduced. The hop greedy routing also helps to reduce congestion, packet loss while broadcasting the message. In this paper we also compare the results of GyTAR and GPAR with BAHG in terms of packet delivery ratio and end to end delay.

5. REFERENCES:

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