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An Improved Data Transmission Protocol for VANETS Using Link State Information

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Abstract: Efficient data delivery in vehicular ad hoc networks (VANETs) with high mobility is a challenging issue due to dynamic topology changes and unstable wireless links. The opportunistic routing protocols can improve the reliability of routing by making full use of the broadcast characteristics and assist in data transmission through additional backup links. In this paper, to improve the Data Transmission Protocol for Link State Information which exploits a combination of geographic location and the link state information as the routing metric? The IDTP aims to improve the reliability of data transmission in a highly dynamic environment, which selects the forwarders and prioritizes them based on the vehicle's geographic location and the link's quality. By performance of LSGO with GpsrJ + which removes the unnecessary stop at a junction and greedy traffic aware routing protocol (GyTAR) using OMNET++. The simulation results show that it opens more nodes to participate in the opportunistic data forwarding and increases a connection's throughput while using no more network capacity than traditional routing. In the simulation, compared with other two protocols, when the number of vehicles and the average vehicle velocity increase, IDTP's packet dropping rate is reduced and the network throughput is improved
Keywords: Global positioning system, Data transmission, Node Selection Mechanism

I. INTRODUCTION

Vehicular ad hoc networks (VANETs) are first designed for safety applications; afterwards, a series of applications for increasing traffic efficiency and providing comfort to the vehicle's passengers are proposed. The network layer has received the most attention when working on VANETs. Existing routing protocols of VANETs fall into two major categories: topology-based and geographic routing. Topology-based routing uses the information about links that exist in the network to perform packet forwarding. Since link information changes in a regular basis, topology-based routing suffers from routing breaks, so this kind of routing protocols is not suitable for VANETs Geographic routing uses neighboring location information to perform packet forwarding. In this kind of routing protocols, nodes are unnecessary to maintain a topology map or exchange link state information or maintain established routes as they do in a conventional mobile ad hoc routing protocol. Therefore, geographic routing can better adapt to network size and topology changes. Greedy forwarding is the most widely used strategy in geographic routing. The fundamental principle is that a node forwards its packet to its neighbor that is closest to the destination. But the forwarding strategy can fail if no neighbor is closer to the destination than the node itself, and through this way, we can get the next hop which is nearly located beyond the transmission range of the forwarder. In this case, the established link is unstable and the signal strength may be reduced, which may cause an increase of the packet dropping rate. As the packet is forwarded using this kind of links, the probability of packet transmission failure is great. So, it will spend more resources on retransmissions. As a result, the network throughput is declined and the end-to-end delay is prolonged. Proposed a new measure called the expected transmission count (ETX) which is the predicted number of data transmissions required to send a packet over the source to the destination link, including retransmissions.

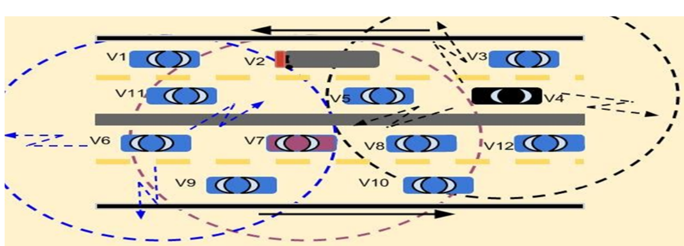

Figure1.1: V2V Communication

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The objective of the project involves,

A. Location based advertisements emphasizes reliability in order to achieve higher coverage of vehicles, while warning delivery which broadcast emergent information to approaching vehicles.

B. To enable the best nodes to transmit the packet without waiting.

C. To provide a forwarders according to Receiver Consensus.

D. To enable the best nodes to transmit the packet without waiting.

II. LITERATURE SURVEY

The authors (1) is proposed for Robust and efficient data delivery in vehicular ad hoc networks (VANETs) with high mobility is a challenging issue due to dynamic topology changes and unstable wireless links. The opportunistic routing protocols can improve the reliability of routing by making full use of the broadcast characteristics and assist in data transmission through additional backup links. In this paper, we propose a Link State aware Geographic Opportunistic routing protocol (LSGO) which exploits a combination of geographic location and the link state information as the routing metric.

In this paper (2) proposed VANET, vehicles move non-randomly along roads and exchange information with other vehicles and roadside infrastructure within their radio range. A VANET has unique characteristics including the high and frequently changing velocities of vehicles. From the characteristics, VANETs are influenced by frequent network topology changes according to the density of neighboring vehicles. Therefore, a VANET should accommodate these frequent changes to vehicle mobility, vehicle density, and network topology. From these characteristics, link breakages occur repeatedly and the packet loss rate increases. 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. This position is made available to the direct neighbors via periodic transmissions from beacons.

Opportunistic routing (OR) protocols (3) for *ad hoc* networks basically consist of selecting a few forwarders between the source and destination and prioritizing their transmission. The performance of OR protocols depends on how these two steps are performed. The aim was to reduce the number of transmissions to deliver packets to the destination. In this paper, we first present a mathematical model to compute the total number of packets including duplicate packets generated by OR protocols. We use the model to analyses well-known OR protocols and understand the reason behind their increase in number of transmissions. Next, we propose an OR scheme *transmission-aware opportunistic ad hoc routing* (TOAR) protocol, which attempts to minimize retransmissions. Our proposed OR protocol uses tree structures to select forwarders and prioritize them. The use of tree structures helps in identifying *primary* forwarders which carry packets farthest to the destination during each transmission round. TOAR also helps in choosing *secondary* forwarders which will transmit packets missed out by the forwarder. The optimized selection of forwarders results in significant reduction in retransmissions, a smaller forwarder list set, and improvement in good put.

Geographic stateless routing schemes (4) such as GPSR have been widely adopted to routing in vehicular ad hoc networks (VANET). However, due to the particular urban topology and the non-uniform distribution of cars, the greedy routing mode often fails and needs a recovery strategy such as GPSR's perimeter mode to deliver data successfully to the destination. It has been shown that the cost of planarization, the non-uniform distribution of cars, and radio obstacles make GPSR's perimeter mode inefficient in urban configurations. Some enhancements have been proposed such as GPCR, which uses the concept of junction nodes to control the next road segments that packets should follow. However, the concept of junction nodes itself is problematic and hard to maintain in a dynamic urban environment. we describe GpsrJ+, a solution that further improves the packet delivery ratio of GPCR with minimal modification by predicting on which road segment its neighboring junction node will forward packets to.

The author is development of vehicular networking technologies brings the promise of improved driving safety and traffic efficiency. Cooperative communication is recognized as a low-complexity solution for enhancing both the reliability and the throughput of vehicular networks. However, due to the openness of wireless medium, the vehicular wireless communications (VWC) is also vulneble to potential eavesdropping attacks. To tackle with this issue, we in this paper propose a novel user-cooperation scheme with anti-eavesdropping capabilities. Specifically, prior to any frame transmission, a source-relay pair is jointly selected to maximize the achievable secrecy rate. After that, the selected relay assists the source to deliver its data to the destination. The proposed selection scheme can be realized in a fully distributed manner, and the security is guaranteed without using any encryption techniques at the upper layers. The closed-form expressions for the secrecy outage probability and the intercept probability are derived, and the achievable diversity order is also analyzed. Simulation results show that the proposed scheme outperforms the competing counterparts in terms of both the secrecy outage probability and the average secrecy rate.

III. EXPERIMENTAL SETUP

The IDTP protocol covers both the routing and the data transmission range. A data will be produced full use of broadcast metrics. This protocol aims to implement the neatest node selection mechanism. Data forwarding for shortest path will be identified. Information bearer in either phase. We design IDTP with simplicity in mind; in particular, we do not make use of outside information that may not be readily (if at all) available to mobile nodes.

Source node to send the information for destination node in between transmission message dropping rate will be challenging for VANETs Application. So we using for IDTP protocol in vehicle network application. Then we use the part of IDTP is cache memory, extract information updated local network information database &position monitoring system, set node status positioning. Source to send the information

Source node to send information message from cache memory then cache information to store the data for storage section and to move data for extract information update port. This port to directly connected source node so the message will be transmitted in both ways then updated message transmitted in set node states region. This is to collect the information for local network database & position monitoring system states. Then collected information are to receive destination node.

A. Candidate Node Set Selection Mechanism

IDTP main objective is to use opportunistic routing to ensure VANET transmission reliability, while reducing the number of transmissions, and therefore, the selection of the candidate node set needs to ensure that the number of backup links can provide the required delivery rate. Seen from the estimation of link quality, each node can calculate the link transmission rate r(t) of all links between itself and all its neighbors. The candidate nodes can be selected by the link transmission rates of the links that are formed by the sending node to its neighbors. As shown in Figure 2, r1(t) and r2(t) are the transmission rates of the source node S to its two candidate relay nodes X and Y. Then, the probability that S sends data to the next hop successfully is $1 - (1 - r1(t))(1 - r2(t))$.

Here is how the candidate node set selection mechanism works. For node S, the current time t, the number of neighbor nodes is N. ri(t) $(1 \leq i \leq N)$ is the transmission rate of the link that is formed by S to its neighbor node i, and di(t) $(1 \leq i \leq N)$ represents the distance from the destination to node i. S(t) is the distance from the current node to the destination, and r is the required data delivery rate of a single link.

The receiver oriented approaches are based on local timers, which differentiate the broadcast time of each node by setting different timeout. The duration of waiting time is tuned according to their local knowledge such as cardinality of neighbors that did (did not) receive the same message so far. Timeout differentiation resolves the broadcast storm problem. Sender oriented approaches achieve instant retransmissions. Sender dedicates one or more forwarders which are then able to retransmit immediately. This appears promising approach for warning delivery.

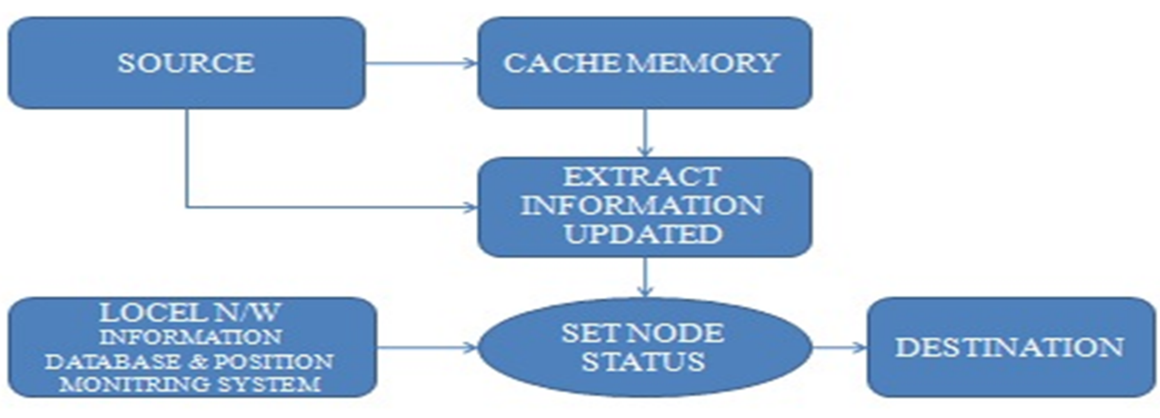

Figure 3.1: Communication protocol for data transmission

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The source sends the existing information database updated message to any receiver, here the receiver checks their connected sets which all are nearer to the accident, and then it performs location ranking where re transmissions takes place and the neighbor elimination is used for acknowledgement of the message.

B. Highly Dynamic Environment

The safety applications require an efficient data dissemination technique to broadcast the data to the vehicles on the road side environment. VANET safety applications include cooperative collision warning, intersection collision warning, cooperative driver assistance system, approaching emergency to vehicles etc., Also non-safety applications involve data transfer, traffic management applications, parking lot payment, and traffic information. The comfort applications include optimum route calculation with real time traffic data and applications for administration e.g. Vehicle identification also requires broadcasting.

C. Dynamic Topology Changes

Vehicular Adhoc Networks (VANETs) are dedicated to improve the safety and efficiency of transportation systems through vehicle to vehicle or vehicle to road side communications. VANETs exhibit dynamic topology and intermittent connectivity due to high vehicle mobility. These distinguished features declare a challenging question: how to detect on the fly vehicular networks such that we can explore mobility-assisted message dissemination and topology control in VANETs. As being closely related to network dynamics, vehicle mobility could be explored to uncover network structure. In this paper, we have observed that mobility of vehicle, rather than being random, shows temporal locality and spatial locality. First examine temporal locality using a campus trace, then measure temporal locality similarity between two vehicles based on the relative entropy of their location preferences. By further incorporating spatial locality similarity, we introduce a new metric, namely dual locality ratio(DLR), which represents the mobility correlation of vehicles.

D. Geographic Location and Link State Information

To Propose an opportunistic routing called Link state aware Geographic Opportunistic routing protocol (LSGO) which takes a combination of geographic location and the link state information as the forwarder selection mechanism. The protocol aims to ensure a highly dynamic network packet delivery rate and improve the reliability of data transmission. Besides, it also aims to reduce the number of transmissions (including retransmissions) and the transmission delay. Traditionally propose simple yet effective scheme, which can identify misbehaving forwarders that drop or modify packets. Extensive analysis and simulations have been conducted to verify the effectiveness and efficiency of the scheme. This schema effectively detect dropped packets from misbehaving users but dynamic changes of the topology in wireless sensor networks less communication process can be done wireless sensor networks.

IV. RESULTS AND DISCUSSION

The result shows the dynamic environment of vehicles mobility flow modeling diagram which imported in OMNET++. The output is proposed in how to transmitted the packets for source to destination in IDTP protocol.

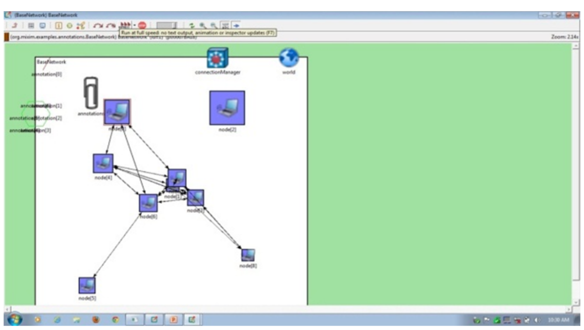

Fig 4.1 transmission range between source to destination.

The below graph is combining LSGO with IDTP, it finds the packet dropping ratio for transmission range from nodes. In IDTP protocols packet dropping rate will be less compare then LSGO protocol.

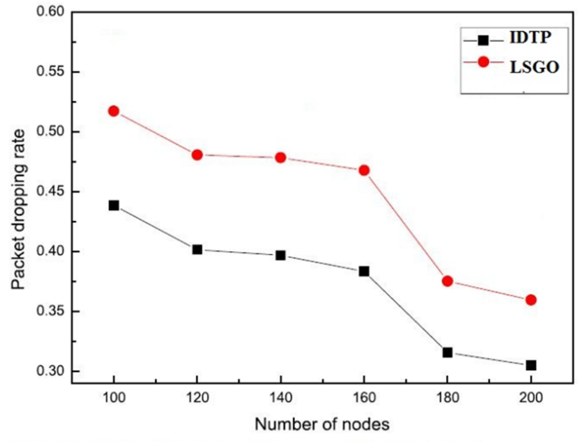

Fig 4.2 packet dropping rate vs number of nodes.

V. CONCLUSION

New routing protocol for VANETs called An Improved Data Transmission Protocol [IDTP] for Vanets Using Link State Information which takes a combination of geographic location and the link state information as the forwarder selection mechanism. The protocol aims to ensure a highly dynamic network packet delivery rate and improve the reliability of data transmission. Besides, it also aims to reduce the number of transmissions and the transmission delay. IDTP uses an improved ETX mechanism to calculate the link transmission rate.

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