A APPRAISAL ON MEMO CARRIAGE IN TEMP GRIDS OVER LORRY-PASSAGE BUILT WAY-MIDDLE OVERPOWERING TECHNIQUES

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Abstract: Rural to urban migration has dynamically changed todays vehicular networks which give rise to immense pressure on transportation infrastructure, especially on traffic management practices in urban areas. This paper, attempts to understand the application of Intelligent Transportation System (ITS) as a solution to the current traffic management practices and focuses on the routing algorithm for communication between vehicles and places un urban VANET. Considering the basic transportation media BUS, which periodically run along their fixed routes and framing a sub map within the city widely cover city streets, as a major communication media between vehicles and places in urban VANET, we propose a Bus Course Based street-equidistant routing algorithm (BCSE). In BCSE a routing graph defining the busses following different paths under specified streets of bus courses is used to identify routing path for message delivery which aims to choose most efficient path crowded with large number of buses having lower probability of diverge from transmission direction. We use bus based two tier VANET model defining secondary relay working in co ordination of main relay with ant colony optimization for packet delivery through carry forward mechanism.

Index Term:- InVANET, ITS, BCSE (Bus course based street-equidistant routing), carry forward mechanism, Two tier model for VANET, Ant colony Optimization.

I.INTRODUCTION

VEHICULAR Ad-hoc Network (VANET), a special type of mobile ad hoc network, is an important component of the Intelligent Transportation Systems (ITS). VANETs contain some fixed infrastructures and some vehicles, where vehicles act as mobile nodes that can carry and relay data. Each vehicle can communicate with other vehicles directly forming vehicle to vehicle communication (V2V) or communicate with a fixed road side unit (RSU), forming vehicle to infrastructure communication (V2I) [1]. V2V allows automobiles to "talk" to each other over one or multiple hops using short-range communication. V2I is a viable solution when V2V communications are not available, but its performance depends on specific wireless technology and communication coverage of RSUs. Due to the limitations of V2V and V2I, we consider the use of hybrid vehicular communication, named Vehicle-to-X (V2X), to enable the seamless vehicular network connectivity in Figure 1. Two vehicles on the road can communicate either through V2V or V2I, depending on the available connections and path selection criteria.Fig. 1: Vehicular communications in ITS The potential of hybrid communications not only helps to increase the chance of connectivity in disconnected scenarios, but also to improve the performance of message dissemination in VANETs. The performance of V2X communication, how- ever, mainly depends on how well the messages are routed. Different from conventional networks, disconnections are the norm in VANETs. A VANET has the following salient characteristics [2]: (a) trajectory-based movements with predicable locations and time-varying topology, (b) varying number of vehicles with independent or correlated speeds, (c) frequent topology partitioning due to high mobility, and (d) reduced power consumption requirements. Consequently, conventional routing protocols based on the existence of an end-to-end connection cannot be adopted directly in this unique vehicular environment as intermediate nodes cannot always be found between a source and a destination.

Clubbing the features of Intelligent transportation system with vehicular ad hoc networks (InVANETs) give a definite solution for easy and effective communication between vehicles with dynamic mobility using wave standards. This will provide effective measures such as media communication between vehicles and also facilitates to track automotive vehicles which can be used as electronic maps using specialized software which will b helpful to locate a vehicle in larger area of context .InVANET can effeciently use this technique to identify an optimally minimal path for navigation with minimal traffic intensity. Communication capabilities in vehicles plays a vital role in InVANET or intelligent transportation systems (ITS) for tracing a routing path during communication. Vehicles can communicate among themselves in two different ways (vehicle-to-vehicle, V2V) which is expected to contribute to safer and more efficient roads by providing timely information to drivers, making travel more convenient. and other one is via roadside access points (vehicle-to-roadside, V2R) also called as Road Side Units (RSUs) which enable direct communication for small to medium distances/areas. The integration of V2V and V2R communication is beneficial as it clubs the merits of both V2V and V2R even at those locations where roadside access points are not available.

II. RELATED WORK

A. Bus-based Routing Protocol.

In the existing studies of Bus-based VANET, along with a communication node, bus plays a vital role of router holding the contact relationship between bus lines by summarizing the information of bus routes. Based on the content of routers, a sequence of bus lines is selected to transmit information from source node to destination node in a way of store-carry-forward. In such techniques information carrier timing is far greater than the amount of time to forward information during routing. Therefore, to improve routing performance one should increase the frequency of contact between relay buses.

In [3], Jiang et al. proposed BUSVANET a two-tier architecture in which non-bus vehicles form the low tier and the high tier consist of bus and RSU. All the high-tier nodes dynamically form interconnected topology for Packets delivery to destination

In [4], Zhang et al. proposed a bus-based routing scheme in the VANETs where bus itself was working as routing backbone. Authors modeled the contact graph of bus lines reflecting the overlapping relationship of bus lines, then established a community-based routing system namely inter-community routing and the intra-community routing to divide bus lines into different community over the contact graph and allowing bus lines of same community to contact each other frequently and select them preferentially as the relay, thus reducing delay of routing and increasing the delivery ratio.

In [5], Zhang et al. Introduced a new terminology geocast in bus-based VANETs routing scheme analyzing the regularity of bus travel-time and its mode encounter in spatial, building a spatial-temporal pattern, basing on which feasible routing paths with the best possible QoS for data delivery requests.

In [6], Chang et al. Analyses the trajectories of bus lines, designed a contact graph, extracted routing graph from it basing on the position of packet destination. For every packet, individual routing graph is made adaptive to dynamic urban traffic. However, the disadvantage of exiting routing algorithm is excessively depending on bus relay which are much smaller than the number of common cars; 2) while adopting the mechanism

B. Street-Centric Routing Protocol

In VANETs, two categories of routing protocols are node-centric routing protocol where the routing path consists of some moving vehicles and the street-centric routing protocol which uses a sequence of streets as the routing trajectory and the movement of vehicles is restricted by the road topology and traffic conditions. Exiting works have proved that the street-centric routing mechanism has better performances than the node-centric routing mechanism [7]. The street-centric routing protocol mainly considers two aspects: the selection of routing path and the forwarding strategy designed for relay vehicles to deliver packets from its sender to its recipient along the routing path. In [8], Zhang et al. utilized a Wiener process to predict link probability between vehicles, built a link model. Selecting routing streets dynamically according to the link status.

III. PROPOSED WORK

A.System Model

In this paper, we propose a two-tier architecture of VANET where vehicle nodes consisting of buses and common cars) are divided into two layers, i.e. lower tier and higher tier.

Both buses and non-bus vehicles can send, receive and relay packets in our proposed architecture of VANET, which is different from the existing bus-based VANET architectures where only buses can relay the messages.

● Upper tier: consists of all the bus nodes equipped with on-board units (OBUs), GPS, digital map and the information of bus lines in city and on-board processing units which is larger than common car's. As the main relay, buses can make the plan of routing path for packets by finding the next available relay bus for packets and forward packets.

● Lower tier: consists of all the common cars equipped with on-board units and GPS. As the secondary relay, it is mainly used as a mediator for communication between two main relays which cannot directly communicate with each other because of distance. When the main relay cannot find the next available main relay in its communication range, it can find the next eligible and available relay bus and multi-hop links űbetween them with the help of secondary relays.

B. Communication technology

Vehicles has the ability to communicate with each other within its communication range by using dedicated short-range communication technology (DSRC) and periodically broadcasts informative messages consisting of vehicle ID, position, velocity and moving direction stored at NeighborTable defined at each vehicles. To maintain NeighborTable, every vehicle will periodically delete overdue information .

C. Communication protocols

For making two vehicles communicate with each other, we assume they are equidistant from each other at a distance of R. For any two vehicles Ci and Cj, the position and velocity of $Ci$and Cj are , $\boldsymbol{V1}$, $\boldsymbol{P2}$ and $\boldsymbol{V2}$ respectively, and the velocity difference and the distance between Ci and Cj are respectively denoted by $\Delta\boldsymbol{D}$ and $\Delta\boldsymbol{V}$. Vectors $\boldsymbol{P1}$, $\boldsymbol{V1}$, $\boldsymbol{P2}$, $\boldsymbol{V2}$, $\Delta\boldsymbol{D}$ and $\Delta\boldsymbol{V}$ are represented as below:

$$\mathbf{P}_1 = \begin{bmatrix} x_1 \\ y_1 \end{bmatrix}, \mathbf{V}_1 = \begin{bmatrix} v_{x_1} \\ v_{y_1} \end{bmatrix}, \mathbf{P}_2 = \begin{bmatrix} x_2 \\ y_2 \end{bmatrix}, \mathbf{V}_2 = \begin{bmatrix} v_{x_2} \\ v_{y_2} \end{bmatrix},$$

$$\Delta\mathbf{D} = \mathbf{P}_2 - \mathbf{P}_1 = \begin{bmatrix} x_2 - x_1 \\ y_2 - y_1 \end{bmatrix}, \Delta\mathbf{V} = \mathbf{V}_2 - \mathbf{V}_1 = \begin{bmatrix} v_{x_2} - v_{x_1} \\ v_{y_2} - v_{y_1} \end{bmatrix}.$$

The distance between Ci and Cj changes over time, which is given as below:

$$\begin{aligned} D(t)^2 &= [x_2(t) - x_1(t)]^2 + [y_2(t) - y_1(t)]^2 \\ &= |\Delta\mathbf{V}|^2 \times t^2 + 2\cdot(\Delta\mathbf{D}\cdot\Delta\mathbf{V})\times t + |\Delta\mathbf{D}|^2 \end{aligned}$$

If $(t)2 \leq R$, Ci is within the communication range of Cj it can then communicate with Cj directly at time t. If the initial distance$|\Delta\boldsymbol{D}| \leq R$, the duration of connection between Ci and Cj is denoted by $(li,)$ and its calculation formula is as follows.

$$T(l_{i,j}) = \begin{cases} 0, & if\ |\Delta\mathbf{D}| = R, \cos(\Delta\mathbf{D}, \Delta\mathbf{V}) \geq 0 \\ \infty, & if\ \Delta\mathbf{V} = 0 \\ \dfrac{-B + \sqrt{B^2 - 4\times A\times C}}{2\times A}, & otherwise \end{cases} \quad (2)$$

where,

$$\begin{cases} A = |\Delta\mathbf{V}|^2 \\ B = 2\Delta\mathbf{D}\cdot\Delta\mathbf{V} \\ C = |\Delta\mathbf{D}|^2 - R^2 \\ \cos(\Delta\mathbf{D}, \Delta\mathbf{V}) = \dfrac{\Delta\mathbf{D}\cdot\Delta\mathbf{V}}{|\Delta\mathbf{V}|\times|\Delta\mathbf{D}|} \end{cases} \quad (3)$$

D. ***Algorithm Design***

In this section, we introduce our proposed Bus Course-based street-equidistant routing algorithm (BTSC) which consist of principal features of street-equidistant routing algorithm consist 1) making a plan of routing path that is a sequence of streets actually; 2) routing packet along the routing path with the help of vehicles. In the process of routing, vehicles use the carry-and-forward mechanism to delivery packets. In this paper, buses are the main relays to delivery packets from sender to destination, and common cars work as the secondary relays used to build multiple-hop link between two main relay which cannot communicate with each other directly. Our proposed routing algorithm is mainly made up of three parts: building a routing graph, selecting a routing path and forwarding packets along the routing path. Out of these three this paper proposes the routing path algorithm with routing scenario

1: Building a routing graph

Since buses always follow the main road in city, we can frame a sub map guiding the courses of all bus lines as show in fig.2 and then identifying the correlated bus lines and street to calculate the probability of bus appearing on the street.

Consider that the traveling map of bus B includes street R, then the probability of bus B appearing on street R is the ratio of the length of street R named as L_r to the length of the traveling course map of bus B named as L_b, and the probability will be named as

$$P_r(r) = \frac{L_r}{L_b} \times f_b(r)$$

where

$$f_b(r) = \begin{cases} 1, & if\ bus\ b\ passes\ street\ r \\ 0, & otherwise \end{cases}$$

2: Selecting routing path

Probability calculated through routing graph gives an idea about which routing paths will b having higher density of vehicles will b selected to implement carry and forward mechanism for packet delivery. There are two novel concept defined for efficient path selection for routing, 1) Probability of street consistency (PSC) defining the consistency of bus lines between adjacent street and second is 2) Probability of path consistency (PPC) higher the PPC lower the probability of bus deviating from its path and hence resulting in best routing path

Algorithm: Selection of Routing Path

S1 = the position of source bus;
D1 = the position of destination;
RP = the set of available routing path.
Bus:
1: Compute shortest path from S1 to D1 by using shortest path algorithm;
2: Put all the shortest paths into RP;
3: for each path in RP do
4: Compute the probability of path by using routing graph
5: end for
6: Choose the path with maximum the probability of path as the routing path;

IV. CONCLUSION

In this paper considering the basic transportation media BUS, which periodically run along their fixed routes and framing a sub map within the city widely cover city streets, as a major communication media between vehicles and places in urban VANET, we have proposed a Bus Course Based street-equidistant routing algorithm (BCSE) which implicates a routing graph defining the busses following different paths under specified streets of bus courses is used to identify routing path for message delivery which aims to choose most efficient path crowded with large number of buses having lower probability of diverge from transmission direction. The algorithm works in three parts: building a routing graph, selecting a routing path and forwarding packets along the routing path. Out of which algorithm for Selection of Routing Path is designed where probability of routing path is identified and one with maximum probability is considered. The other two part if algorithm ios under process will be represented in further paper.

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