MOZO: A MOVING ZONE BASED ROUTING PROTOCOL TO IMPROVE RELIABILITY IN VANETS

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ABSTRACT

In the recent developments in wireless communication technologies along with plunging costs of hardware allow both V2V and V2I communications for information exchange. Such a network is called Vehicular ad Hoc Network (VANET) and this is very important for a variety of road safety and non-road safety related applications. However, Due to the wireless scenery of announcement in VANETs, it is also horizontal to a range of security attacks which are originally present in wireless networks. Hence to appreciate the highest potential of VANET, the network should be free from attackers, there by all the information exchanged in the network must be unswerving i.e. should be originated from authenticated source. VANETs are a talented field, whereby vehicle-to-vehicle infrastructure can allow lots of new applications such as safety and other services. To develop the unique characteristics of VANET nodes, we design a moving-zone based architecture in which vehicles is combined together with one another to form dynamic moving zones so as to assist information dissemination. We propose a novel approach that introduces moving object modeling and several techniques from the theory of great moving object databases into the design of VANET routing protocols. Our proposed method also preserves the isolation of the vehicle but can reveal the identity in liability issue. The security analysis of the proposed scheme shows that it can indeed operate with limited support of infrastructure and can become a fully self-organized system.

Keywords: Moving Zone, Vehicle Clustering, MoZo Routing Protocol, VANETs

INTRODUCTION

Vehicular Ad hoc Networks (VANETs) are special kind of Mobile Ad Hoc Networks (MANETs) that are formed between moving vehicles and/or the nearest Road Side Units (RSUs). VANET is a rising technology, which enables a general range of applications, includes road safety, passenger convenience, self-driven vehicles, and intelligent transportation. Wireless communication among moving vehicles is increasingly the focus of research in our modern life. Automobile industry is now driven by the condition of self-driven vehicles that need the exchange of information among vehicles to improve the safety, and console of drivers and passenger. Changing in rapid topology and recurrent disconnection paths makes it tricky to intend an efficient routing protocol for routing data among vehicles. There are two type of communications in VANETs Vehicle to Vehicle (V2V) communication and Vehicle to road side Infrastructure (V2I)

A key requirement for the realization of VANET applications is the accessibility of competent and effectual routing protocols for communication dissemination. Existing Internet or MANET routing protocols are not appropriate, due to the sole characteristics of VANETs, which comprise elevated mobility of VANET nodes, frequent changes in topology, and limited life time. To address these issues, several VANET routing protocols have been proposed, which can survive broadly confidential into five main categories, namely broadcasting protocols, route-discovery protocols, position-based protocols, Fig. Moving Zone Based Architecture in VANETs, clustering-based protocols and infrastructure-based protocols. Among all types of protocols, clustering based protocol materialize to be the most promising one as they attempt to capture the mobility of VANET nodes in a natural technique and provide quite stable units (i.e., the clusters of vehicles) for communication. However, the development of clustering-based protocols is still at a premature stage. Previously proposed clustering strategies are relatively undemanding in that they use simple clustering criteria, require a great amount of message exchange between member vehicles and cluster heads, and require implementation details. Moreover, to date only a few easy message distribution protocols have been planned.

Routing in Vehicular Ad hoc Networks is a challenging mission due to the exclusive individuality of the network such as soaring mobility of vehicles, energetically changing topology and highly partitioned network. It is a challenge to ensure reliable, continuous and seamless announcement route in the attendance of moving vehicles. In unicast routing protocols data packets are transmitted from a single source to a sole destination. Unicast routing protocols are the most fundamental protocols in ad hoc networks and they form the basis for construct other types of protocols. Unicast routing protocols are supplementary confidential into topology based, location based, cluster based and hybrid protocols

RELATED WORKS

In [1] Prince Samar, Marc R. Pearlman, and Zygmunt J. Haas et al presents to effectively support communication in such a dynamic networking environment as the ad hoc networks, the routing framework has to be malleable to the spatial and temporal changes in the characteristics of the network, such as traffic and mobility patterns. Multiscoping, as is provide through the concept of the Zone Routing Protocol (ZRP) for example, can serve as a basis for such an adaptive behavior. The Zone Routing framework implements hybrid routing by every network node proactively maintaining routing information about its local neighborhood called the routing zone, while reactively acquiring routes to destination beyond the routing zone. we suggest the Independent Zone Routing (IZR) skeleton, and increase of the Zone Routing structure, which tolerate distributed and adaptive configuration for the best size of each node's routing zone, on the per-node basis. We demonstrate that the presentation of IZR is significantly improved by its capability to automatically and energetically tune the network routing operation, so as to flexibly and robustly support changes in the network characteristics and operational conditions. As a point of reference, through this form of adaptation, we show that the volume of steering manage traffic overhead in the network can be abridged by an arrange of magnitude, under some set of parameter values. Furthermore, the adaptive nature of IZR enhances the scalability of these networks as well.

In [2] Christian S. Jensen, Dan Lin, Beng Chin Ooi et al presents the trouble of efficiently maintain a clustering of a dynamic set of data points that shift continuously in two-dimensional Euclidean space. This trouble has received little attention and introduces novel challenge to clustering. The paper proposes a new scheme that is capable of incrementally cluster moving objects. This proposal employ a view of entity difference that believe object movement across a period of time, and it employs clustering features that can be continue efficiently in incremental fashion. In the proposed scheme, an eminence quantify for incremental clusters is used for identifying clusters that are not compact enough after convinced insertions and deletions. An extensive experimental study shows that the new scheme performs significantly faster than traditional ones that regularly rebuild clusters. The learn also shows that the new system is effectual in preserving the quality of moving-object clusters.

In [3] Zhigang Wang, Lichuan Liu, MengChu Zhou et al presents Intervehicle communication is a key method of intelligent transport systems. Recently, ad hoc networking in the vehicular environment was investigated intensively. This paper propose a new clustering technique for large multihop vehicular ad hoc networks. The cluster construction is determined by the geographic position of nodes and the priorities connected with the vehicle transfer information. Each cluster elects one node as its cluster head. The cluster size is controlled by a predefined maximum distance between a cluster head and its members. Clusters are independently controlled and dynamically reconfigured as nodes move. This paper presents the stability of the proposed cluster structure, and communications overhead for maintain the structure and connectivity in a request context. The simulation is performed with comparative studies using CORSIM and NS-2 simulators.

In [4] Khaleel Mershad, Hassan Artail, and Mario Gerla et al presents Vehicular ad hoc networks (VANETs) enable vehicles to converse with each other but necessitate competent and robust routing protocols for their success. In this paper, we develop the communications of roadside units (RSUs) to competently and reliably route packets in VANETs. Our arrangement operates by using vehicles to carry and forward messages from a source vehicle to a nearby RSU and, if needed, direction these messages through the RSU network and, finally send them from an RSU to the aim vehicle. Our system is mostly critical for users who are far apart and want to communicate using their vehicles' aboard units. Many new paradigms, like social networks, will very much benefit from a system like ours to enable users on the road to exchange dissimilar types of data. We evaluate the performance of our method using the ns2 simulation platform and compare our method to existing solutions. The results verify the feasibility and competence of our scheme.

In [5] Xianghui Cao, Lu Liu, Yu Cheng, Lin X. Cai et al presents In vehicular ad hoc networks (VANETs), the IEEE 802.11p is a popular and also standardized protocol for the communications among vehicles and infrastructure (e.g., road side units). However, because of limited communication range and the randomly access nature of the CSMA/CA mechanism, the end-to-end delay could be high due to both store-and-catch-up (SAC) delay when the network is temporally disconnected and the channel access contention delay. In this paper, we propose a new method based on the 5G device-to-device (D2D) technology to improve the delay performance of VANETs. The basic idea is that direct D2D-based communications among vehicles remove the contention delay and they support longer distance. Specifically, we design a hybrid system with both D2D- and IEEE 802.11pbased communications where the D2D links are controlled by the cellular base stations in the overlay scheme. Each vehicle periodically checks its packet lifetime and requests the base stations to establish D2D links if needed.

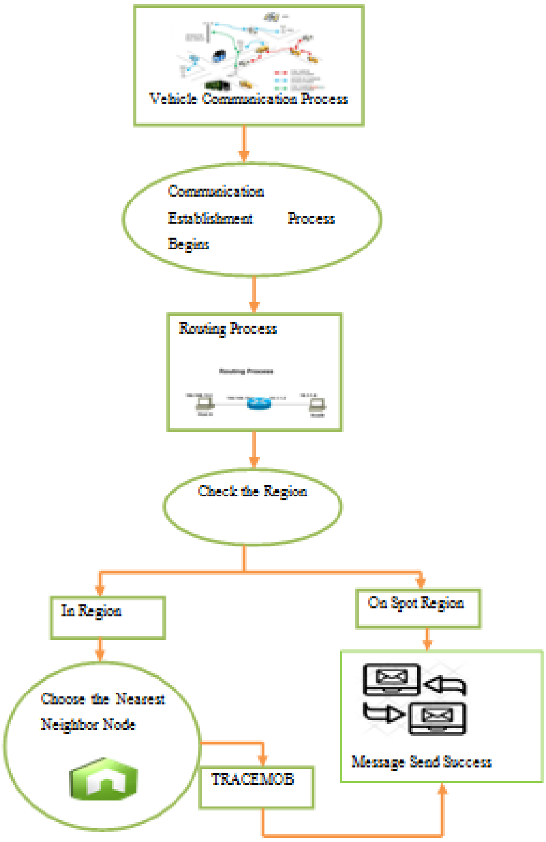
VEHICULAR AD HOC NETWORKS

Vehicular Ad hoc Networks (VANETs) are considered subclass of Mobile Ad Hoc Networks (MANETs) that are formed between moving vehicles and/or the nearest fixed Road Side Units (RSUs). VANET is an emerging technology, which enables an extensive range of uses, including road safety, passenger convenience, self-driven vehicles, and intelligent transportation. Efficient routing protocols help to make roads safer by spreading information about the road conditions and traffic scenario among the contributing vehicles within a very short period of time. VANETs enable also automated both city and highway applications, where the vehicles are able to voyage without the help of their drivers; such applications have yet become realistic and demanded. VANETs possess unique characteristics such as high mobility of vehicles, highly divided network, time varying density of vehicles, dynamically changing and repeated disconnections for networks topology, which makes them more challenging. It is a challenge to build robust networks between vehicles and ensure continuous, secure, and reliable communication paths among the neighbor vehicles in motion.

VANETS Routing Protocols

Reliable and fast routing in VANETs are the challenging tasks due to the unique characteristics of the network such as high mobility of vehicles, dynamically changing topology and highly partitioned network. It is a challenge to ensure reliable, continuous and seamless communication in the presence of fast-moving vehicles. The performance of VANETs routing protocols depends on many internal factors such as mobility of vehicles and external factors such as road topology. This demands a highly adaptive approach to deal with the dynamic circumstances by selecting the best routing and forwarding strategies and by using appropriate transmission and mobility models.

ARCHITECTURE DIAGRAM



Vehicle-to-vehicle (v2v) communication:

It will be an expensive thing if we are installing a permanent infrastructure on roads. In such cases by the support of GPS devices that have an effective range of connected vehicles, the V2V communication will be cost less. V2V communication is mostly used in safety applications like traffic information, safety warning, road obstacle warning, intersection collision warning etc. In vehicle to vehicle communication each vehicle in the cluster is equipped with GPS (Global Positioning System), sensors, networking devices, digital map which has the computing devices and road segment information. Vehicles sense its own traffic messages and communicates with its neighboring vehicles by broadcasting beacon messages periodically.V2V communication uses both unicast and multi-cast packet forwarding techniques between source and destination vehicles. In unicast forwarding, a vehicle can only send/ receive packet to/from its direct neighbors. In multi-cast forwarding, the vehicle enables the exchange of packet with a remote vehicle using the intermediate vehicles as relays

MOVING ZONE BASED VEHICLE MANAGEMENT ARCHITECTURE

The MOving-ZOne-based (MoZo) architecture consists of multiple moving zones that are formed by vehicles with similar movement patterns. A captain vehicle is elected for each zone and is responsible for managing information about other member vehicles as well as the message dissemination. In the following subsections, we first introduce how to model vehicle movement, and then present the detailed algorithms for zone construction.

MOZO

The Moving-zone based designs have been designed by the investigators in which vehicles cooperate with one another to form dynamic moving zones with the intention of simplifying data distribution. They have proposed a new method that presents moving object demonstrating and indexing methods from the concept of huge moving object databanks into the design of VANET routing procedures. In each zone a captain vehicle (cluster head) is elected which is responsible for managing information about other member vehicles in the zone as well as the message dissemination. The captain vehicle maintains a moving object index that manages up to-date information about all its member vehicles in its zone. Moving zone construction starts from a vehicle logging onto the cluster zone. The vehicle will execute the joining protocol to find a nearby moving zone or form its own zone. The zone forming criteria is based on the similarity of vehicle movement. This novel cluster model greatly reduces communication overhead and improves message delivery rate compared to other existing approaches in VANET. The outcomes on actual road maps validate the dominance of the method which is equated with both clustering and non-clustering based routing procedures

ROUTING PROCESS

Routing is the process of selecting best paths of hop in a network. The term routing also meant forwarding network traffic among networks. However, that latter function is better described as forwarding. Routing is working for many kinds of networks, including the electronic data networks (such as the Internet), telephone network (circuit switching), and transportation networks. This article is explaining primarily with routing in electronic data networks using packet switching technology.

In packet switching networks, routing directs packet forwarding (the transit of logically addressed network packets from their source toward their ultimate destination) through intermediate nodes. Intermediate nodes are typically network hardware devices such as routers, bridges, gateways, firewalls, or switches. General-purpose computers can also forward packets and perform routing, though they are not specialized hardware and may suffer from limited performance. The routing process usually directs forwarding on the basis of routing tables, which maintain a record of the routes to various network destinations. Thus, constructing routing tables, which are held in the router's memory, is very important for efficient routing. Most routing algorithms use only one network path at a time. Multipath routing techniques enable the use of multiple alternative paths.

Vehicle Movement Modeling

Each vehicle is equipped with an onboard unit (OBU) for networking and computing messages, a global positioning system (GPS), and a digital map. Vehicles communicate with one another using data link technology within a range of 10s minimum travel time (the minimum range is 110 meters and maximum is 300 meters). Further, we assume each vehicle has a unique identity which can be either a pseudonym or a real identity. Existing security and privacy protection techniques can be integrated with our approach while a detailed discussion of this possibility is beyond the scope of this paper. We represent the road network as a graph whereby edges represent roads and vertexes represent intersections. The two ends of the roads are designated as the starting and ending points respectively. We model vehicle's movement as a linear function of time. Specifically, let r(st, ed) be a road segment, where st is the starting point of the road and ed is the end point of the road. Given a vehicle on road r, let lu be the vehicle's distance to st at time tu, and let v be vehicle's speed at tu. Let δ denote the vehicle's moving direction, which has value 1 if the vehicle moves toward ed, otherwise -1 if the vehicle moves toward st. Let t 0 u denote the next possible update timestamp when the vehicle changes its moving speed or direction.

Moving Zone Construction

Moving zone construction starts from a vehicle logging onto the VANET. The vehicle will execute the joining protocol to find a nearby moving zone or form its own zone. The zone forming criteria is configured based on the similarity of vehicle movement. The captain vehicle of each zone maintains a moving object index that manages up-to-date information about all its member vehicles. In what follows, we discuss the operations that need to be conducted at member vehicle side and the captain vehicle side respectively.

MOZO ROUTING PROTOCOL

In particular, suppose that a vehicle has a piece of information (I) that it would like to share with vehicles around location l(x, y). The overall routing protocol is summarized in Figure. It specifically consists of the following steps.

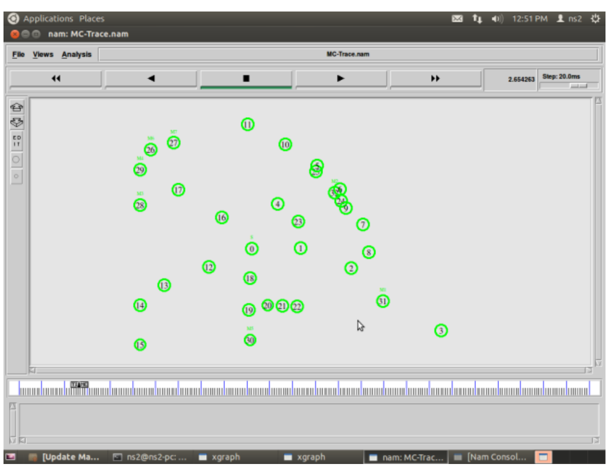
Step 1: The sender vehicle sends a message in form of hIDs, I, l(x, y)i to its captain vehicle, where IDs is the sender vehicle's unique identity, I is the message and l(x, y) is the location of the message destination

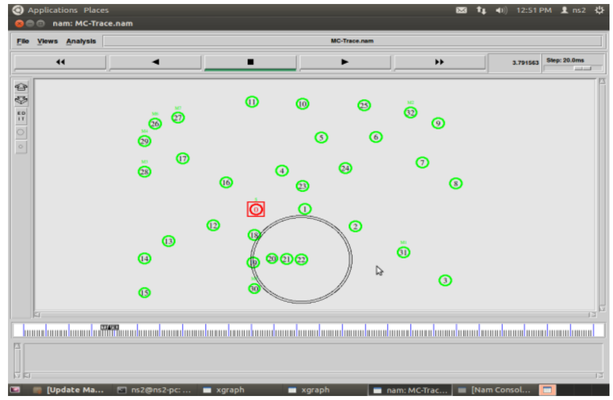
Step 2: Upon receiving the message, the captain vehicle first checks if the message destination is within its moving zone. If not, it looks for the member vehicle in its moving zone which is closest to the message destination, and forwards the message to the selected member vehicle

The algorithm for finding a good candidate vehicle for the message propagation (or propagation vehicle) is the following. The captain vehicle first computes the shortest route to the destination l(x, y) using the

Dijkstra's algorithm, and then computes the intersection point le of the shortest route and its communication range as shown in Figure 7. Member vehicles which are around this location le and move towards the message destination are considered good candidate vehicles for propagating the message. To find such vehicles in the moving zone, the captain vehicle will execute a query algorithm. Specifically, the captain vehicle generates a query key by encoding the expected location le and the desired moving direction. The obtained query key will be treated as the key belonging to a virtual vehicle. A virtual insertion algorithm will be conducted to locate the leaf node in the index for this virtual vehicle. Once the leaf node is found, this virtual insertion algorithm will stop, which is unlike the regular insertion algorithm that actually inserts a data to the index. The vehicles in the resulting leaf node contain similar keys to the virtual vehicle. In other words, they are likely to be near the location le. For further verification, the location of each vehicle at the current timestamp will be computed based on their latest moving function. The vehicle which is closest to le is chosen as the propagation vehicle (denoted as Vp). Figure 8 outlines the search algorithm. If not any candidate vehicle can be reached, the captain vehicles will wait for μ seconds and then try to find the candidate vehicle again. Up to three attempts will be made to deliver one message.

OUTPUT RESULT





CONCLUSION

A novel moving-zone based architecture and a corresponding routing protocol for message dissemination in VANETs by using vehicle-to-vehicle communications only (i.e., without using vehicle-to-infrastructure communications). To the best of our knowledge, this is the first study that applies moving object techniques to vehicular networks. The moving object modeling and indexing techniques have been leveraged in various tasks including zone construction and maintenance as well as information dissemination. The proposed approach greatly reduces communication overhead and improves message delivery rate compared to other existing approaches.

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