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Improve the Performance in Vehicular Ad-hoc Network using Classification Techniques

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ABSTRACT

Vehicular ad hoc networks (VANETs) are an important communication paradigm in modern-day mobile computing for exchanging live messages regarding traffic congestion, weather conditions, road conditions, and targeted location-based advertisements to improve the driving comfort. In such environments, security and intelligent decision making are two important challenges needed to be addressed. In this paper we present the cooperative communication between the nodes and reduce the collision or suspended nodes for the network, moreover also increase the successful ration for the vehicle node communication while the number of node increases and also increase the value of nodes reachability and decrease the value of delay in between nodes.

Keywords: Wireless Broadcast, Intelligent Transportation Systems, Vehicular Ad-hoc Network, On-Board Unit, Support Vector Machine.

INTRODUCTION

Wireless communication and networking is a rapidly emerging technology in recent years, which regardless of geographic position allows devices to interconnect with each other [1]. There are several types of wireless networks depending on the application, like Wireless Personal area networks (WPANs), Wireless local area networks (WLANs), Mobile ad-hoc networks (MANETs) etc. There are two types of wireless networks depending on facilities or not, infrastructure based the cellular network and infrastructure less wire-less networks.

Increasing road accidents and vehicle traffic congestions have led to the evolution of intelligent transportation systems (ITS) [2] and other applications that improve road safety, increase transportation efficiency, and provide on-board infotainment. To make these applications possible, vehicles are equipped with sensors and communication devices such that they can gather and exchange information to maintain road safety as well as to optimize vehicle-traffic efficiency. Moreover, wireless technology makes communication among vehicles possible, forming a vehicular ad hoc network (VANET). The National Highway Traffic Safety Administration (NHTSA) of the United States Department of Transportation (USDoT) has predicted that traffic accidents, specifically vehicle collisions, can be reduced by approximately 80% through the deployment of safety applications enabled by VANETs.

Vehicular Ad Hoc Network (VANET) is a form of Mobile Ad Hoc Networks (MANET) [4]. VANETs provide us with the infrastructure for developing new systems to enhance drivers' and passengers' safety and comfort. VANETs are distributed self organizing networks formed between moving vehicles equipped with wireless communication devices. This type of networks is

developed as part of the Intelligent Transportation Systems (ITS) to bring significant improvement to the transportation systems performance. One of the main goals of the ITS is to improve safety on the roads, and reduce traffic congestion, waiting times, and fuel consumptions.

The integration of the embedded computers, sensing devices, navigation systems (GPS), digital maps, and the wireless communication devices along with intelligent algorithms will help to develop numerous types of applications for the ITS to improve safety on the roads. The up to date information provided by the integration of all these systems helps drivers to acquire real-time information about road conditions allowing them to react on time. Vehicular networks are composed of mobile nodes, vehicles equipped with On Board Units **(OBU),** and stationary nodes called Road Side Units **(RSU)** attached to infrastructure that will be deployed along the roads. Both OBU and RSU devices have wireless/wired communications capabilities. OBUs communicate with each other and with the RSUs in ad hoc manner. There are mainly two types of communications scenarios in vehicular networks: Vehicle-to-Vehicle (V2V) and Vehicle-to-RSU (V2R).

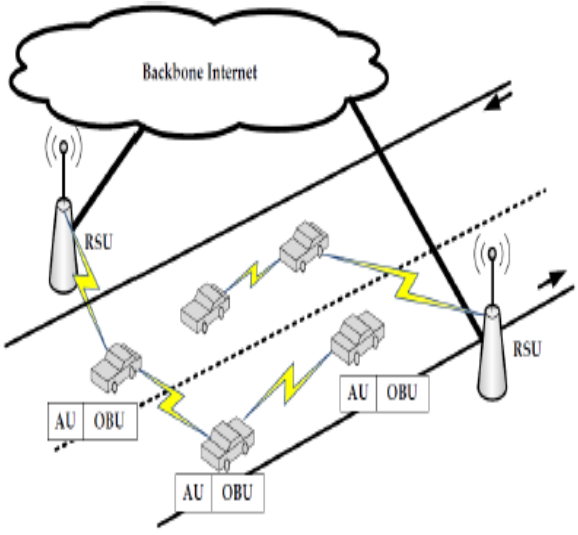

Figure 1: An illustrative network architecture of a VANET.

Both safety applications and commercial applications are important for VANETs. Safety applications relate to human life, health, and well being, and commercial applications often benefit companies in the industry [8]. Thus, the development of safety and commercial applications can encourage the evolution of VANETs.

For safety applications, the periodic broadcasting of beacons plays an important role because the status of neighbours such as their geographical positions, speeds, directions, and other important information are usually provided by the beacons of neighbours to discover each other in time. The accurate and efficient neighbor-hood discovery link layer services guarantee the safety of the road environment. For commercial applications, the effective transmission of various application data (such as data from so called ‘infotainment’) is desirable. For example, it is available for passengers to watch television shows or use the multi person video conferencing application in the vehicles [3].

Vehicular Ad-hoc Network (VANET) is a special type of ad-hoc network that is like MANET (Mobile Ad-hoc Network) [11]. It can be utilized to improve vehicle safety, enhance traffic efficiency and provide infotainment in vehicles. VANET has several distinguishing characteristics that differentiate it from MANET. In VANET topology is very dynamic because vehicles move at a high speed. There is some difference between the like multi-hop paths in VANET are very short lived because vehicles move at very high speed, as compared to the MANET. Unlike MANET, the mobility of vehicles is regular and predictable in VANET, and there are no power constraints. Vehicles can be equipped with some positioning systems (GPS) through which vehicles' position can be predicted. This predictability allows an improvement in link selection.

The rest of this paper is organized as follows in the first section we describe an introduction of about

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the vehicular ad-hoc network and mobile ad-hoc network. In section II we discuss about the heterogeneous mobile ad-hoc network, In section III we discuss about experimental comparative result analysis, finally in section IV we conclude and discuss the future scope.

II HETEROGENEOUS MANETS

MANETs can be either homogeneous or heterogeneous. Homogeneous means that the nodes have identical capabilities, such as processing power, battery life, hardware/ software, transmission range, etc. Heterogeneous MANET means that the mobile nodes have asymmetric capabilities, that is to say different hardware/ software, transmission range and rate, battery life, movement speed, processing power, etc [8]. The majority of the routing protocols in MANETs assume that the network is homogeneous, which in fact is easier to analyze. However, in reality this isn't always the case. In an ad hoc military network, heterogeneous mobile devices may exist. Powerful devices could be installed in vehicles or light weight devices could be carried by soldiers, which at the same time could communicate with an aircraft. In a network with heterogeneous nodes, most of the routing traffic flows through the powerful nodes, because they have more capabilities and battery capacity. Despite the fact that this approach can reduce the number of hops and delay and extend the lifetime of the network, if a powerful node gets disconnected, it may cause critical problems. As in the previous military example, if the powerful node is a vehicle, it may get destroyed or damaged on the transceiver and the ground forces' communications will be disrupted. Thus, in a network formed of heterogeneous devices this issue should be considered.

III EXPERIMENTAL RESULT ANALYSIS

Vehicular Ad Hoc Network (VANET) is a form of Mobile Ad Hoc Networks (MANET). VANETs provide us with the infrastructure for developing new systems to enhance drivers' and passengers' safety and comfort. VANETs are distributed self organizing networks formed between moving vehicles equipped with wireless communication devices. This type of networks is developed as part of the Intelligent Transportation Systems (ITS) to bring significant improvement to the transportation systems performance. In this paper we used the classification methods such as support vector machine to improve the performance of network and the quality of services such as number of node increase, decrease the delay and improve the throughput etc.

Support vector Machine is binary classifier, the performance of classification of support vector machine is high in compression of another binary classifier such as decision tree, KNN and Bay's classifier. Support Vector Machine (SVM) is a novel machine learning method based on statistical learning theory and it has been successfully applied to numerous classification and pattern recognition problems.

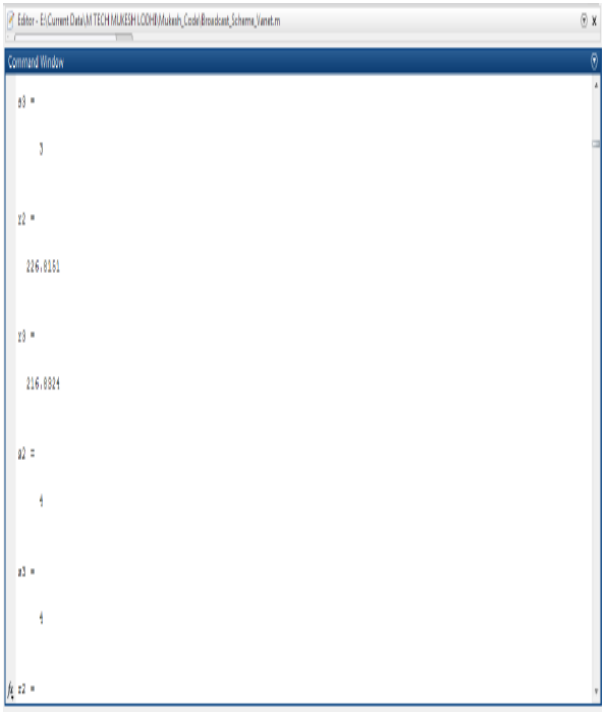

Figure 2: Shows that simulation scenario of previous method for the vehicular ad-hoc network, and show the status of vehicle nodes.

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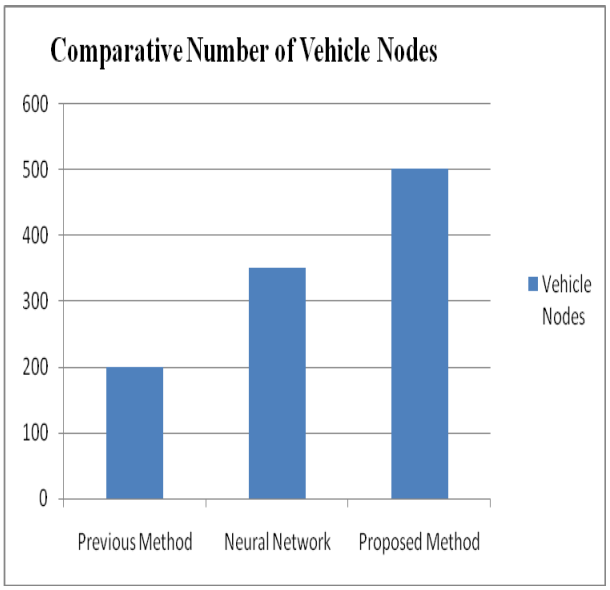

Figure 3: This image shows that the comparative aanlysis for the number of vehcile nodes used in a different number of methods, and our proposed method shows that the better result than the existing methods.

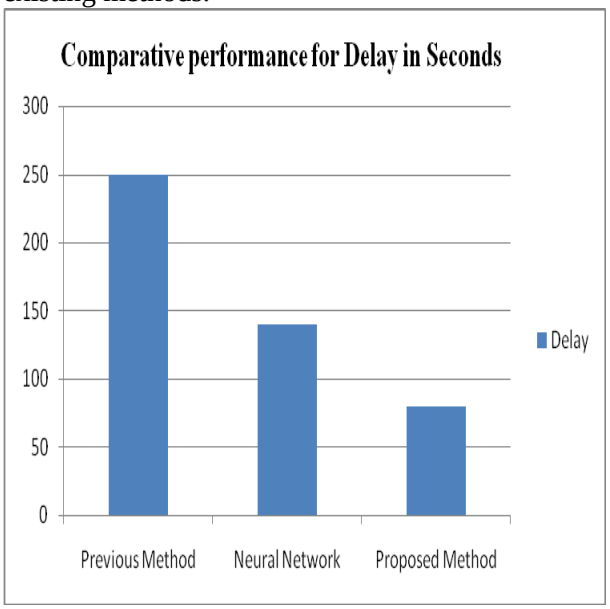

Figure 4: This image show that the comparative analysis for the Delay in a different number of methods, and our proposed method shows that the better result than the existing methods.

IV CONCLUSIONS AND FUTURE SCOPE

Wireless communications and networking is a rapidly emerging technology in recent years due to the ease of use and transportation of light weight mobile devices. VANET is one of the domains of wireless sensor network (WSN) and mobile ad hoc network (MANET), which is popular for mobile sensing, computation, and communication. In this paper we present the cooperative communication between the nodes and reduce the collision or suspended nodes for the network, moreover also increase the successful ratio for the vehicle node communication while the number of node increases and also increase the value of nodes reachability and decrease the value of delay in between nodes.

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