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A Review on Clustering Based Transmission in VANET's

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ABSTRACT
Vehicular ad hoc network (VANET) technology has been identified as one of the key research area in these days. Improving road safety in VANETs requires efficient and reliable MAC protocols. These MAC protocols can be based on TDMA schemes. This paper, which presents an extensive overview of research related to Clustering-based Data Transmission for VANETs, shows how well these protocols can satisfy the stringent requirements of safety and user oriented applications.

Keywords: Vehicular Adhoc Network, Clustering, Local Area Network, Inter-Vehicle Communication.

INTRODUCTION

Recent advances in wireless technologies and embedded systems extended the use of communications to new domains. Taking advantages of such technological advances, vehicle and equipment manufacturers have recognized the opportunity of enhancing the surface transportation by using the communication capabilities of the Vehicular Ad-hoc Networks (VANET) to offer an Intelligent Transportation System (ITS) to the drivers [10]. VANETs, which are made up of mobile nodes (vehicles), can be considered as a special case of MANETs. They are both characterized by the movement and self organization of the nodes, but they also differ in some ways such as network infrastructure components and a highly dynamic topology [7].VANET can also be used to improve traffic management conditions and to provide on-board infotainment such as Internet access, video streaming, etc. VANETs are an example of Mobile Ad hoc Networks (MANETs) but with their own specificities: high node mobility with constrained movements and the mobile nodes have ample energy and computing power (i.e. storage and processing) [8]. Applications for VANETs can be divided into the following broad categories namely, safety related, traffic management and transportation efficiency, user infotainment services and Internet connectivity [4]. The possibility of direct exchange of kinematic data between vehicles over an ad-hoc network environment called a vehicular ad-hoc network (VANET) has been widely perceived by governments, car manufacturing industries and academia as a promising concept for future realization of intelligent transportation system (ITS) thereby achieving safety and efficiency in our nearly overcrowded motorways.

The VANET is a sub-class of MANET where the mobile nodes are vehicles. When compared with Mobile Ad-Hoc Network (MANET) and other cellular systems, inter-vehicle communication (IVC) has four major advantages: broad coverage area, relatively low latency due to direct wireless communication, little or no power issue as well as no service fees [2]. VANETs comprise of two main modes of communication, Vehicle to Infrastructure (V2I) and Vehicle to Vehicle (V2V) [4]. Inter-vehicular communication (IVC) is an important emerging field of research that takes advantage of the latest advances in micro processing and electronic circuitry that are installed inside moving vehicles (MVs) as well as the increase in wireless communication

capabilities of such devices with their environment [9].

Clustering algorithms have been originally proposed for Mobile Ad-hoc Networks (MANETs), such as Lowest-ID clustering algorithm, weighted clustering algorithms WCA, and highest connectivity based clustering algorithm HCC [7], which have been proven to effectively solve the network scalability problem [1]. In a clustering algorithm, vehicles are usually located inside clusters; each cluster has at least one cluster head, and many cluster members. Generally, cluster stability is the average link connection time of a cluster; higher cluster stability indicates a better clustering algorithm [1]. Some cluster-based approaches have been applied in VANETs, because the clusters reduce the overhead and delay, solving the scalability problem, providing an efficient resource consumption and load balance in large scale networks [11].

The rest of this paper is organized as follows in the first section we describe an introduction of about the Vehicular Adhoc Network. In section II we discuss about the Medium access Control Layer protocol. In section III we discuss about the rich literature for the Vehicular Adhoc Network and their applications. In section IV we discuss about the problem formulation and statement as we getting from the rich literature survey, finally in section V we conclude the about our paper which is based on the literature survey and specify the future scope.

II MEDIUM ACCESS CONTROL

In any networking environment, one of the key aspects of the communication protocol stack is the Medium Access Control (MAC) layer. The MAC layer determines the node which is given access to the physical medium. MAC mechanisms could be categorized as contention-based and contention-free. Contention-based approaches rely on carrier sensing, back-offs and retry schemes, while contention-free approaches rely on time division multiple access and synchronization schemes. MAC mechanisms could also be categorized based on the entity in which the control of the medium access resides. The importance and the strong need for a highly optimized MAC layer is demonstrated by the fact that the time two vehicles are within communication range could be as low as 30 seconds for two vehicles each traveling at 120km/hr in opposite directions, with a range of 1000m [4].

In order to provide QoS and reduce collisions in VANET networks, MAC protocols must offer an efficient broadcast service with predictable bounded delays. They must also handle frequent topology changes, different spatial densities of nodes and the hidden/exposed node problem [7]. They have to support multi-hop communication and nodes (vehicles) moving in opposite directions. The relevance of these issues has been confirmed by the development of a specific IEEE standard to support VANETs. Structured approaches could be a combination of the fundamental multiplexing techniques: Time Division Multiple Access (TDMA), Frequency Division Multiple Access (FDMA), Code Division Multiple Access (CDMA) and Space Division Multiple Access (SDMA).

III RELATED WORK

In this section we discuss about the rich literature survey for the VANET protocol in Adhoc network using Clustering Based Data Transmission approach.

[1] In this paper, they propose a unified framework of clustering approach (UFC), composed of three important parts: 1) neighbor sampling; 2) backoff-based cluster head selection; and 3) backup cluster head based cluster maintenance.

[2] This paper provides an overview on current research state, challenges, potentials of VANETs as well the ways forward to achieving the long awaited ITS. research interest in the field of VANETs over the past few years. Vehicular Network consists of vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications supported by wireless access technologies such as IEEE 802.11p.

[4] They present a survey of V2V MAC methods (including various VANET standards) that have been proposed for VANETs over the last few

years. They focus on the benefits and limitations of the proposed MAC techniques as well as their ease of implementation in practice and future deployment. They also discuss some of the challenges that still need to be addressed to enable the implementation of highly efficient and high performance MAC protocols for V2V communications.

[6] In this paper, they study the adaptation problem from a distributed control perspective and present a general joint adaptation framework (JAF). Leveraging the multiple-input-multiple-out control model, JAF is scalable, which embraces all controllable variables as its inputs and target performance metrics as its outputs. Moreover, based on the closed-loop control theory, JAF adapts the optimal combination of variables through the feedback of the real-time measurements.

[9] This paper provides a survey of the latest advances in the area of inter-vehicular communication (IVC) including vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) functions and services. In addition, the paper presents the most important projects and protocols that are involved in IVC systems as well as the different issues and challenges that exist at each layer of the networking model.

[10] In this study they will survey the existing position-based routing protocols. Unlike other studies we will emphasize on their applicability to different environments. they start by characterizing the vehicular network environment, namely the urban and the highway environments. Afterwards, topology-based protocols are compared to position-based protocols and to the latter are identified the different used strategies and their performances are qualitatively evaluated relatively to different metrics.

IV PROBLEM STATEMENT

The current key research challenge of VANETs is the lack of central communication co-coordinator associated with all the existing wireless access technologies earmarked for VANET set-up, implementation and deployment. Deploying wireless communication in vehicular environment effectively requires that some intrinsic issues ranging from technical application development and deployment up to economic concerns must be resolved. There are some other challenges are like transmission power for mobile node, cluster formation, assignment of frequency etc.

V CONCLUSIONS AND FUTURE WORK

VANET is no longer a remote feasibility, given that heavy investments are already in the pipeline from several sectors including government agencies, automobile industries, navigation safety and public transport authorities. VANET potentials, areas of application and prospects are growing rapidly including several kinds of services with multiple requirements and goals. Fast and reliable MAC protocol support is crucial to enable the broad range of envisioned VANET applications. In this paper we presents the rich literature survey for the vehicular Adhoc network, in future we plan to implement the best solution for the problem discussed in problem statement.

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