INTERFERENCE REDUCTION USING CLUSTERING ALGORITHM IN VANET

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ABSTRACT

Vehicular ad hoc networks (VANETs) are a subclass of MANETs that is expected to have a key role in the intelligent transportation systems of the future. The mobile nodes can move around, and the network would automatically reconfigure itself to allow connectivity. VANETs provide vehicle-to-vehicle and vehicle-to-roadside communication in order to support safety and comfort applications. Despite being a subclass of MANETs, VANETs fundamentally have different behavior. This paper presents a scheme consisting of a media access control protocol and a clustering algorithm designed to reduce interferences in VANETs. Our scheme, which is intended for safety applications in highway environments, employs dynamic multihop clustering, allows better utilization of network resources and improves network performance.

Keywords: *MANET, VANET, Multihop clustering*

INTRODUCTION

Wireless sensor networks (WSNs), due to the advantage of low-cost and easy deployment have been widely used in many monitoring applications including battlefield surveillance, environmental monitoring and biological detection, Health Monitoring etc. SHM will have a set of N sensors deployed which collects data and sends to base station(BS) where analysis of structural physical properties is carried out.

The objectives of SHM are to determine health status (i.e., damage, which is a remarkable change around a sensor location) of a structure, and provides both long-term monitoring and rapid analysis in response to unusual incidents, e.g., earthquakes, load, etc. In practice, it is often difficult to achieve these objectives in WSN-based SHM, due to requirements of SHM and severe limitations of WSNs.

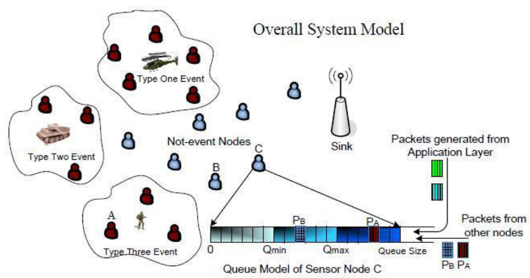

Fig 1: Overall System Model

Clustering in WSN: It is widely accepted that the energy consumed in one bit of data transfer can be used to perform a large number of arithmetic operations in the sensor processor. Moreover in a densely deployed sensor network the physical environment would produce very similar data in near-by sensor nodes and transmitting such data is more or less redundant. Therefore, all these facts encourage using some kind of grouping of nodes such that data from sensor nodes of a group can be combined or compressed together in an intelligent way and transmit only compact data. This can not only reduce the global data to be transmitted and localized most traffic to within each individual group, but reduces the traffic and hence contention in a wireless sensor network. This process of grouping of sensor nodes in a densely deployed large-scale sensor network is known as clustering. The intelligent way to combined and compress the data belonging to a single cluster is known as data aggregation.

Landslide detection: A landslide detection system makes use of a wireless sensor network to detect the slight movements of soil and changes in various parameters that may occur before or during a landslide. Through the data gathered it may be possible to know the occurrence of landslides long before it actually happens.

Challenges to Wireless Sensor Networks: For structural health monitoring, we need to read acceleration signals down to 500μG (1G is the gravity) at a frequency higher than 1KHz synchronously at all nodes. And we need all data. In addition to these real-time, high fidelity performance requirements, there are other ones. Monitoring needs be economical. The cost includes the system itself, installation, and maintenance. We do not want to disturb the structure being monitored, and introduce no hazards. The requirements of structural health monitoring can be challenging to WSN.• High accuracy of sample: It means the final reading needs to detect signals down to 500μG without significant distortion. Sources of distortion include the noise floor of the system (including accelerometer, amplifier, analog to digital converter, etc), installation error, and temperature variation.• High-frequency sampling: This implies low jitter. Jitter is a variation in sampling intervals.• Time synchronization: Sampling needs to start at the same time on all nodes although the sampling should be done over multiple nodes across the entire network. Furthermore, this needs be done in spite of differences in drift of each clock. Otherwise, shifts in signals between different nodes can give a distorted picture of the structure. • Large-scale Multi-hop network: In case the structure spans a long distance (e.g.1 mile) like a bridge, it is impossible to cover the entire structure with single hop communication. So a large-scale multi-hop network is necessary to provide connectivity. (Vasanthy and Jeganathan 2007, Vasanthy et.al., 2008, Raajasubramanian et.al., 2011, Jeganathan et.al., 2012, 2014,Sridhar et.al., 2012, Gunaselvi et.al., 2014, Premalatha et.al., 2015, Seshadri et.al., 2015, Shakila et.al., 2015, Ashok et.al., 2016, Satheesh Kumar et.al., 2016).

LITERATURE SURVEY

Vehicular ad hoc networks (VANETs) are a special form of wireless networks which is formed by vehicles which are communicating among themselves on roads. The conventional routing protocols proposed for mobile ad hoc networks (MANETs) are not suitable for VANETS they work poorly in VANETs. As communication links break more frequently in VANETs than in MANETs, the routing reliability of such highly dynamic networks needs to be pay special attention. A very little research has focused on the routing reliability of VANETs on highways. To propose an evolving graph-based reliable routing scheme for VANETs to provide quality-of-service (QoS) which support in the routing process [1]. It provides a survey of routing protocols in vehicular ad hoc networks. The routing protocols fall into two major categories of topology-based routing. It discusses the advantages and disadvantages of these routing protocols, explores the motivation behind their design and trace the evolution of these routing protocols. Finally, it concludes the chapter by pointing out some open issues and possible direction of future research related to VANET routing [2]. Ad hoc networks formed by travelling vehicles are envisaged to become a common platform that will support a wide variety of applications, ranging from road safety to advertising and entertainment. The multitude of vehicular applications calls for routing schemes that satisfy user-defined delay requirements while at the same time maintaining a low level of channel utilization to allow their coexistence. The proposed algorithms leverage local or global knowledge of traffic statistics to carefully alternate between the data muling and multihop forwarding strategies, in order to minimize communication overhead while adhering to delay constraints imposed by the application. It provides an extensive evaluation of our schemes using realistic vehicular traces on real city map [3]. Wireless sensor networks are networks of devices with restrained resources, used for environmental, military, automation and home applications. Radio transceiver is one of the biggest power consumers in sensor node, so it's usage need to be very efficient in order to maximize nodes operational life. Node can route it's messages towards destination either by using small or large hops. Theoretical knowledge favours using of smaller hops, known as multi-hop, which is considered as more efficient then single-hop. It describes the single-hop is more efficient, when power consumption of real wireless sensor nodes transceivers are taken into account [5]. (Manikandan et.al., 2016, Sethuraman et.al., 2016, Senthil Thambi et.al., 2016, Ashok et.al., 2018, Senthilkumar et.al., 2018,).

EXISTING SYSTEM

• Despite being a subclass of mobile ad hoc networks (MANETs), VANETs have fundamentally different behavior in that their nodes are limited to move along roads, have no power constraints, have small network diameter, and may undergo rapid topology changes.

• VANETs also have different requirements for routing. Most VANET routing algorithms use geographic-based routing and opportunistic carry-and-forward techniques.

• In existing work, some percentage of vehicles transmit safety message at any given time.

• Existing work used Receiver-Centric Model to measure the interference in the network.

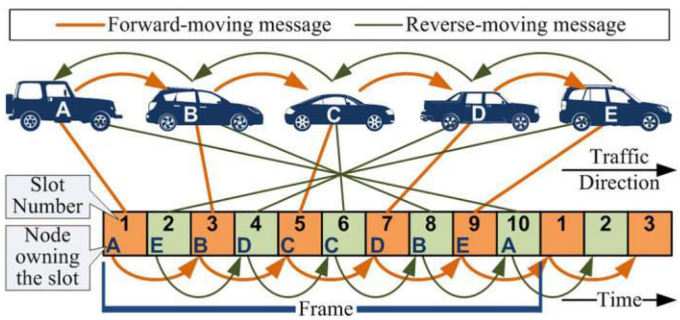

Fig 2: Highway Model

Demerits: • It makes higher interferences • It doesn't always provide safety messages.

PROPOSED SYSTEM

• We propose a scheme for reducing interferences in VANETs in highway environments.
• Unlike some other schemes that assume that only some percentage of the vehicles transmit safety messages at any given time, our scheme guarantees channel access for all of the vehicles, allowing all nodes constantly transmit safety data and enabling even the most demanding safety applications such as crash avoidance. .
• In this paper, we use a combination of the sender and receiver-centric models named Neighbourhood Interference.
• In order to achieve our goal, we propose a scheme consisting of two layers: a TDMA based MAC layer designed for fast multihop channel access and a clustering layer that performs topology control and reduces interference while keeping the network connected.
• We also use two separate channels, i.e., one for communications inside clusters and another of communications between clusters.

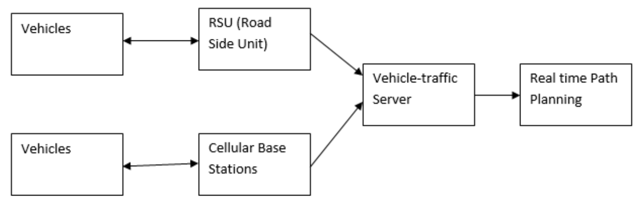

Fig 3: System Design

In our base model, the researchers have considered the node failure with the backup sensor node movement. Indeed our base model working perfectly and recovering the node failure and extend the communication throughout the network level. But the problem is after failure only node moves to recover the communication. So to avoid this problem, we proposed the technique with periodic energy update system. As per our base model, each sensor node will scan the environment by sharing the periodic beacon information. While sharing the beacon message each sensor node can know the neighbor sensor availability and position of each sensor node and each sensor node will store the neighbor sensor availability with limited expire time for neighbor availability and route availability. In periodic interval the neighbor sensor list will be deleted based on the expired time of the sensor beacon information. Each time of data transmission the sensor will check the neighbor sensor availability in the list of neighbor sensor list.

NS 2 Simulation: Network Simulator (Version 2), widely known as NS2, is simply an event driven simulation tool that has proved useful in studying the dynamic nature of communication networks. Simulation of wired as well as wireless network functions and protocols (e.g., routing algorithms, TCP, UDP) can be done using NS2. In general, NS2 provides users with a way of specifying such network protocols and simulating their corresponding behaviors.

RESULTS AND DISCUSSION

It can be seen that, for all vehicle densities, the average cluster size and average number of dual slots in each cluster are near the values expected from a simple chain. The maximum values, on the contrary, tend to be quite high with up to 13 slots per cluster and 20 vehicles per cluster. These can be explained by the existence of Fibonacci chains described above and by the difference of the highway model from reality; real highways usually have several lanes that allow packing more vehicles on a short distance when translated to the highway model.

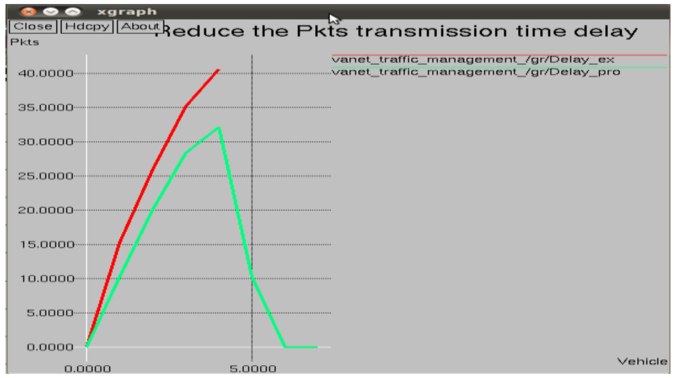

Fig 4: Time Delay Representation

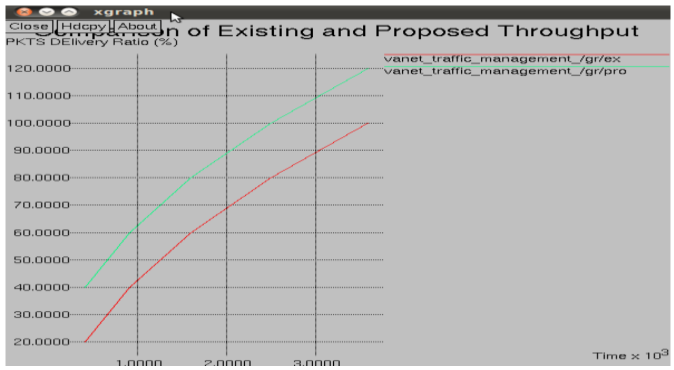

Fig 5: Existing and Proposed System Throughput

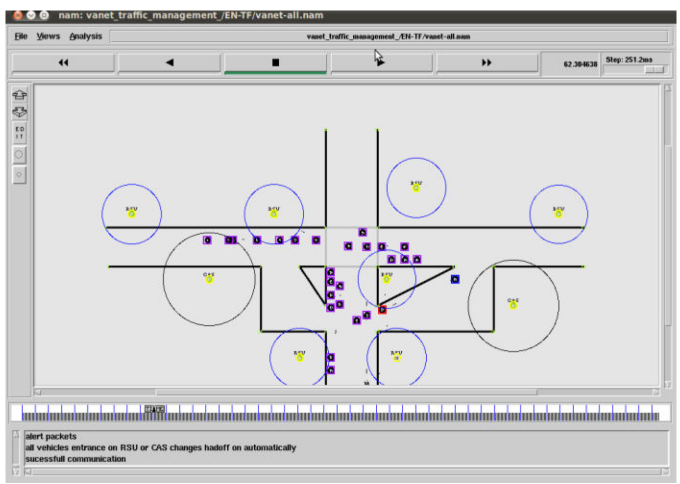

Fig 6: Highway Model Representation 3

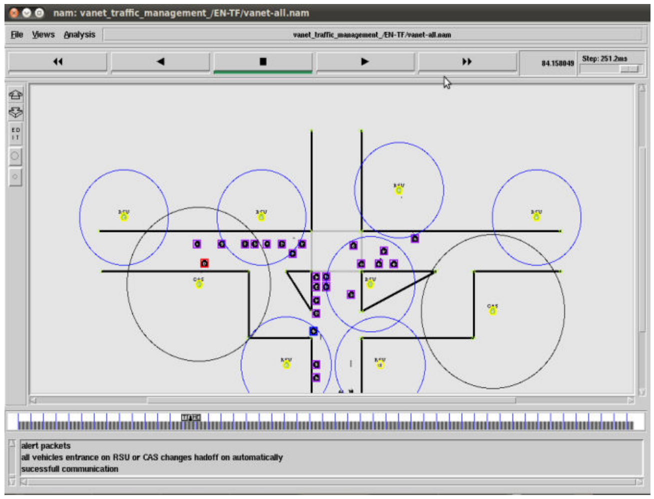

Fig 7: Highway Model Representation 4

CONCLUSION AND FUTURE WORK

We have studied the problem of interference minimization for safety applications in VANETs using the highway model. We have created a new multihop clustering approach, which is fully distributed, uses local decisions, and does not require a cluster-head selection. Our GIM scheme allows contention less channel access for both collision avoidance and broadcasting applications. The interference measurements in our work use the Neighbourhood Interference Model, which is more demanding (interference wise) than the Receiver Centric Model used in many other works, similarly to those same works, we assumed a simple transmission-range-based model to determine if nodes correctly receive each other. A direction for future work could be extending our scheme with more advanced RF models, which take signal-to-interference-plus-noise ratio into account.

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