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HISTORICAL SPECTRUM SENSING DATA MINING FOR COGNITIVE RADIO ENABLED VEHICULAR AD-HOC NETWORKS

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Abstract:

Cognitive radio for Vehicular Ad hoc Networks is an emerging technology that offer functionalities for the transmission of intra-vehicular commands and dynamic access to wireless services, while the vehicle is in transit. The spatiotemporal correlations among historical spectrum sensing data are exploited to form prior knowledge of channel availability probability, and Bayesian inference is used to derive posterior probability of channel availability. The sensing process is initiated with the channel probe and channel aware sensing. Historical sensing lacks channel detection and overhearing of channel probe which results in higher channel access time and higher transfer rate. To overcome the drawbacks of the spatio-temporal sensing, we propose Dynamic Channel State Information (CSI) based channel allocation using dual consideration of Lateration technique. In dynamic CSI, the status of the last used channel is updated forehand to the requesting users and Lateration based neighbor detection implies for the number of available vehicles. The integrated approach minimizes channel access delay and improves the transmission rate of the CR-VANET improving the optimal performance of the network.

Keywords: Vehicular ad-hoc networks, Cognitive radio, Channel availability prediction, Spectrum sensing, Data mining.

1. INTRODUCTION

The current wireless networking paradigm consists of the connectivity of many heterogeneous devices through links operating under dynamic environments. These devices will demand an increasing usage of communication resources such as spectrum, and it will not be possible to Moreover, with the new trends in wireless devices and services, the spectrum scarcity problem has become one of the main research focuses. Therefore, today's wireless communication networks encounter difficulties on the efficient management of this increasing complexity. The answer for an efficient use of scarce communication resources is the use of multiple access protocols that maximize the number of users and throughput. Although protocols at the MAC layer have been studied for many years, their use in new communication paradigms, e.g., Cognitive Radio (CR), requires modifications that need to be identified. This paper provides a survey in detail of the state-of-the-art in MAC protocols especially for CR networks. As can be observed from existing surveys, most of the concentration is given to spectrum management functionalities, and less attention is given to the MAC protocols, especially for decentralized networks, concluding that there is no comprehensive survey paper on MAC protocols for CRAHN. Thus, this paper anticipates to provide a comprehensive and intensive study by giving a detailed summary of the state-of-the-art in MAC layer protocols with a concentration on CRAHN. Before surveying MAC protocols, we present a brief description of CR fundamentals and explain each cognitive radio function. Later, the MAC protocols are divided into three groups based on their access scheme where the salient features of MAC protocols are presented, and the pros and cons of each protocol are discussed and highlighted. Based on the analytical study of the existing MAC protocols, we have provided a discussion on the open research topics to be investigated more deeply in the future. Moreover, the comparison between protocols is introduced in a table to give the reader a broader view of all of the protocols. A CR device must be able to collect information on the spectrum usage in its surroundings to know the set of available channels to be used for communications in an opportunistic way. A cognitive user can only access the idle frequency band, and when a signal from a PU is detected, the cognitive user must vacate the allocated spectrum in order to avoid the generation of interference to PUs, this is called spectrum mobility. As the control and management of communication over wireless channels occur at the MAC layer, other relevant tasks for CRs as sensing the channel, spectrum sharing, resource allocation and spectrum handoffs become essential for connectivity.

2. RELATED WORK

Since there is no central entity for the operation of ad hoc networks, the previously-mentioned MAC functionalities impose an extra challenge on ad hoc networks. For example, spectrum sensing in CRAHNs is not controlled and synchronized by the focal network element, but by each user, i.e., in a distributed way. Thus, in CRAHNs, the need for cooperation with neighboring nodes for distributed functionality (e.g., spectrum sensing, sharing and access) is increased.

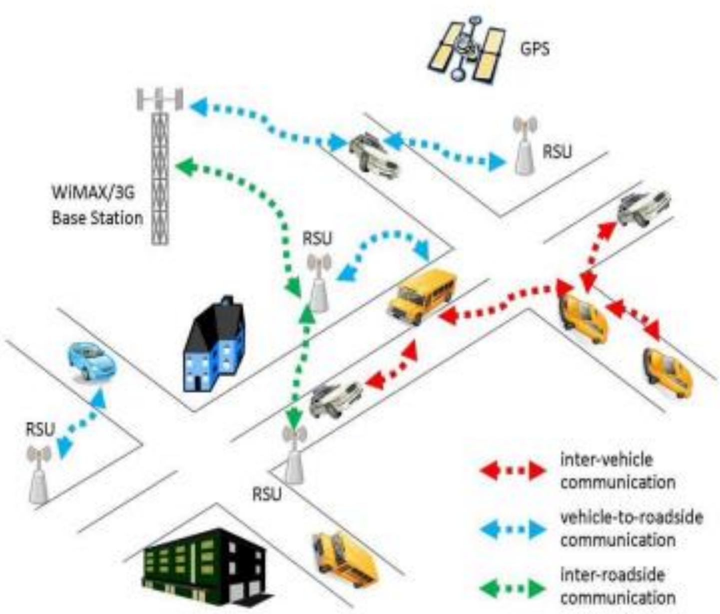

Fig.1.Structure

Therefore, channel estimations must be obtained when other CR devices are not transferring, which requires coordination between CR users. Achieving this coordination is a difficult task due to the lack of synchronization in the network and the relative positions and separation distances among CR devices. In addition to the coordination, the definition of the times for sensing and transmission is an essential tradeoff between guaranteeing protections to the PUs and expanding the information throughput at the MAC layer. Spectrum sensing is firmly identified with other range administration capacities and additional layering protocols (PHY and MAC) to give data on spectrum accessibility In cooperative spectrum sensing, each node needs to sense the channel and later report the information to a central entity or share it with its neighbors. Considering the multipath propagation environment between the PU and CRs, fading in sensing channels is usually Rayleigh distributed with AWGN. Since there might be different CR nodes attempting to get to the spectrum, the spectrum sharing functionality coordinates CR users' transmissions to keep different users from crashing in covering parts of the spectrum In cooperative allocation, interference measurement of each node is considered, whereas in the non-cooperative method, only a single node measurement is considered. Based on the access technology, spectrum sharing can be categorized into overlay and underlay spectrum sharing. In the overlay scenario, the unused part of the spectrum is considered for SUs' transmission, whereas in underlay, SUs transmission is considered as noise for the PUs' signal.

3. PROPOSED SYSTEM

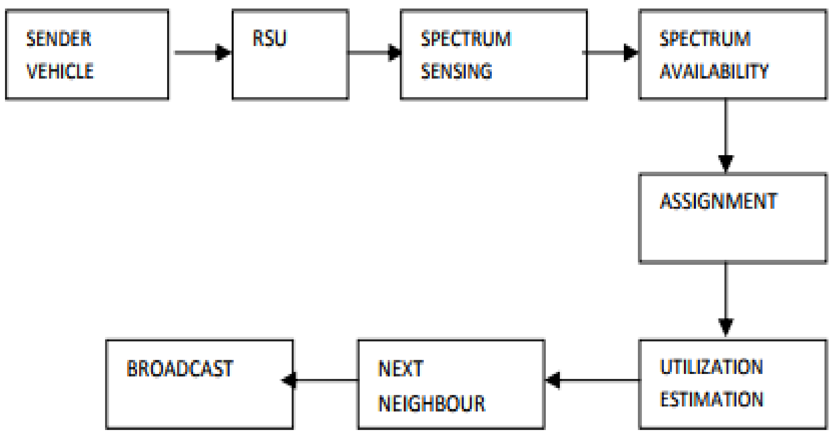

Fig.2.Proposed Architecture

Traditionally, the MAC sub-layer is at the link layer, where the link layer is in charge of the communication between adjacent nodes. Therefore, the purposes of the CRAHN MAC protocol not only include the enhancement of channel use and throughput, but also include the mechanism of spectrum controlling modules Random access protocols arise from protocols such as Carrier Sense Multiple Access (CSMA) where the use of the communication channel is permitted to a random number of nodes without central coordination. This group of protocols is also known as Carrier Sense Multiple Access/Collision Avoidance (CSMA/CA). The advantage of CSMA-based protocols is that resources are allocated on demand, making it easily adaptable to traffic fluctuations and protocol changes. We propose a manifold process of Dynamic Channel State Information (DCSI) based channel allocation for available neighbors that are updated using dual consideration of Lateration technique. In DCSI, the status of the last used channel is updated fore-hand to the requesting users and the users are prevented from waiting for a longer time intervals till the availability of the channel. Lateration based neighbor detection implies for the number of available vehicles in the range and the number of channels that are to be allocated. It updates the current traffic information and vehicle density to prevent overlapping channel access. The integrated approach minimizes channel access delay and -improves the transmission rate of the CR-VANET improving the optimal performance of the network.

4. ANALYSIS

In our proposed method we consider the vehicles and the anchors i.e the reference vehicles as static, we should find the lateration of the vehicle. The distance is estimated estimated with various geometric techniques namely trilateration or multilateration The total RSSI that occurs in estimating the distance and positioning is calculated i.e at the transmitter and the receiver.

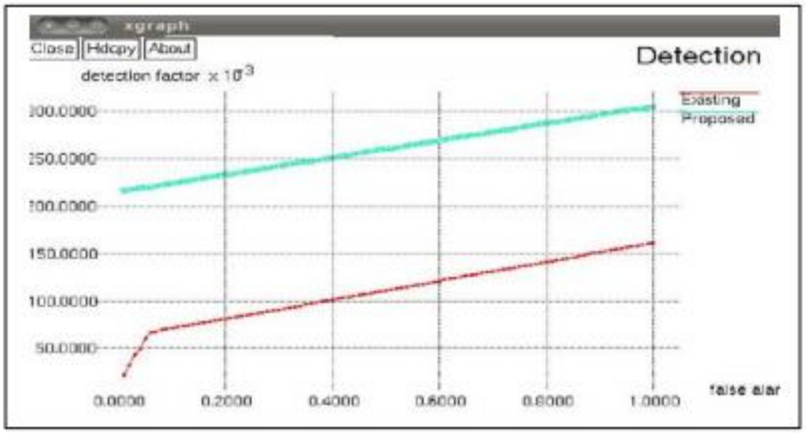

Fig.3.Output

Here the transmitter is the anchor vehicles and the receiver is the unknown vehicle. Each node in the cognitive mesh network has an infinite buffer for storing packets of fixed length. The finite buffers case could also be accommodated into our model with slight modifications to the optimization problem formulated in the next section. The duration of a time slot is enough for the transmission of a single packet (in addition to the sensing time and ACK/NACK feedback). Multiple data connections or streams are present in the network. The state (idle or busy) of any of the N primary channels is modeled using a two state Markov chain. Using the stationary distribution of the Markov chain, at any given time slot channel will be idle (Markov chain in the off state) with probability.

CONCLUSION

To mitigate the problem of channel allocation and sensing in CR-VANETs, we propose opportunistic channel allocation scheme with neighbor information. The two-fold approach improves vehicle independency in communication with minimal day for allocation. Besides Lateration provides neighbor specific information for allocating limited channels at the time of vehicle request. The overall process improves CR-VANET performance by increasing reception rate by 15.47%, detection by 66.1% and decreasing delay by 42.1%.

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