ANN BASED POWER ALLOCATION FOR MASSIVE MIMO USING C NETWORKS

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ABSTRACT

Resource allocation is of great importance in the next generation wireless communication systems, especially for cognitive radio networks (CRNs). In this project a resource allocation strategy based on artificial neural networks (ANN) is proposed and the training method is presented to train the neural networks.

Keywords - Artificial Neural Network, Cognitive Radio

1. INTRODUCTION

In efforts to improve the bandwidth utilization, the concept of cognitive radio networks (CRNs) has been proposed as a key enabling solution for next generations of wireless networks. The basic idea behind CRNs is to efficiently utilize the temporary unused licensed spectrum at a specific time or a specific geographic area for communications. A CRN can overcome the shortage of radio spectrum. users in a CRN are classified into primary users (PUs) and secondary users (SUs). A PU, also called licensed user, has the highest priority to access the spectrum and should not be subject to harmful interference from other users. Moreover, the SU can operate in crowded areas where the number of spectrum holes are small. However, the SU must be subject to the interference constraints to not degrade the PU performance, which results in short-range communication and low transmission rate for the SU. To overcome this drawback, optimal power allocation policies and cognitive cooperative radio networks (CCRNs) have been proposed to enhance transmission rate, spectrum utilization, and to expand the SU coverage range.

2. SYSTEM MODEL

Consider cellular networks coexist with ad hoc networks sharing the same spectrum, as shown in Fig. 1. The spectrum belongs to the cellular network and it is reused by different cells. The locations of BSs and MUs are modeled as two independent homogenous PPPs Πb = {xi, i ∈ Z} and Πm = {yi, i ∈ Z} with intensities λb and λm, respectively. Each MU is served by its nearest BS.

Fig: 2.1. Cellular Networks coexist with ad hoc networks

Fig: 2.2. Cooperation model

The locations of SUs follow another PPP with intensity λs, i.e., Πs = {zi, i ∈ Z}. Each SU has a receiver departed d meters away. The Aloha-type protocol is adopted in the ad-hoc network to control the channel access of SUs. Whether a
SU could access the channel or not is determined by the media access probability (MAP) $\xi \in (0, 1)$.

- **Spectrum Sharing Model**
  We consider the overlay spectrum sharing, where a fraction of spectrum is released to the ad-hoc network in exchange for its cooperation for the cell-edge communication.

- **Cooperation Model**
  The truncated automatic repeat request (ARQ) scheme with one-time retransmission is adopted for the communication between BS and its cell-interior MU. If the original transmission is successful, the acknowledgement (ACK) frame is fed back and the BS continues to transmit a new data packet.

3. PROPOSED SYSTEM

Modern vehicles are making inroads in the market. These vehicles are not only equipped with global positioning system (GPS) and navigation systems, but also more advanced features such as environmental awareness to prevent vehicle collisions, multimedia systems, and integrated wireless access systems to improve vehicle performance and user experience. In addition, there is much interest in improving the efficiency of vehicular communications. A vehicular ad hoc network (VANET) is formed among vehicles for exchanging information e.g., safety information. Cellular (2G/3G/4G) technology provides good coverage and sufficient security, but it is relatively costly. Several portions of the radio spectrum are regulated by the governments or regulatory bodies for an efficient use of the limited radio spectrum. Here we describe the unique characteristics of VANETs and identify some major issues. Deploying a vehicular networking system requires addressing several challenges posed by the unique characteristics and requirements of vehicular communications. Security protocols for vehicular networks should take into account their specific characteristics such as high mobility and requirements such as trust (vehicles should be able to trust the received messages), resiliency (for interference), and efficiency (e.g., ability to authenticate message in real time).

CR systems involve PU and SU of the spectrum; primary users are license holders, while secondary users seek to opportunistically use the spectrum through CR when the primary users are idle. The cognition cycle of CR consists of multiple phases: Observe, Analyze, Reason, and Act. The goal is to detect available spectrum, select the best spectrum, select the best operational parameters, coordinate the spectrum access with other users, reconfigure the operational parameters, and vacate the frequency when a primary user appears. A spectrum hole refers to a portion of spectrum not being used by the primary/licensed user at a particular place and time. It is detected through spectrum sensing and signal detection techniques. One initial protocol called Search is proposed for cognitive radio ad hoc networks that is interesting for CR-VANETs scenario also. It selects a route and the channel that avoid the regions of PU activities. It sends route request packets (RREQs) and they reach the destination via different paths. Mobility management is important for ensuring connectivity even when the vehicles move. The Internet Engineering Task Force (IETF) has defined some IP mobility support protocols that will be used for vehicular networks.

4. SIMULATION RESULTS

![Communications between various nodes](image1)

Fig.4.1: communications between various nodes

![Anchor node formations](image2)

Fig.4.2: Anchor node formations
In this project created rectangular node using 50 sensor nodes and one anchor node. The ANN algorithm is used to find the shortest path between source and destination node. This figure shows the anchor node formation between source node and anchor node. In this project main objective is to minimize the energy consumption. The overlaid wireless network with PPP modeling for both systems. Each mobile user (MU) is associated with its nearest base station (BS), so the Voronoi cell is formed in the cellular network. The circular area around each BS represents the cell-interior area, with radius c0. In each Voronoi cell, the outside of the circular area represents the cell-edge area. The potential secondary users (SUs) in each cell can actively help the cell-edge downlink communications in exchange for a fraction of disjoint spectrum band. Each SU has a fixed receiver departed d meters away, and they are paired together by the ellipse. The Aloha type protocol is implemented in the ad-hoc network to activate the SUs to access the released disjoint spectrum band.

5. CONCLUSION AND FUTURE WORKS
In this project, we analyzed the performance of the PN and SN when the number of PBS or SBS antennas was assumed huge. The results show that the SN can obtain higher sum rate with SINR constraint than that with traditional interference power constraint. The results verify that more SBS antennas do not bring higher rate of the SN because the SBS’s transmit power has to be decreased to protect PUs. In addition, we only focus on the SU’s power allocation problem in this project, while the joint optimization of pilot/power allocation and the number of antennas is left as interesting future works.

6. REFERENCES


