VEHICLE TO VEHICLE COMMUNICATION USING COGNITIVE RADIO TECHNIQUE

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Abstract— Vehicle to vehicle communication systems are the emerging type of networks in which vehicles use a dynamic wireless exchange of data between nearby vehicles providing each other with information, such as safety warnings and traffic information. V to V communication is the part of the growing towards pervasive computing; the goal of V to V communication is to prevent accidents by allowing vehicles in transit to send positioning trend and speed data to one another over a cognitive network. Depending on how the technology is implemented the vehicle's driver may simply receive a warning should there be a risk of an accident or the vehicle itself may take pre-emptive actions such as braking down or stop right away. The project gives us the thorough sense of how the communication between vehicles takes place and how the safety protocol is considered. Equipment which uses moving cars as nodes in a network to create a mobile network is called as a Vehicular Ad-Hoc Network. V2V turns every contributing car into a wireless router, letting cars roughly 100 to 300 meters with one another to connect the nodes and, this produce a network with an extensive range.

I. INTRODUCTION

Each day the world embraces more devices to connect everything, everywhere and everyone. This kind of interconnecting concedes a huge volume of data traffic among the connected devices. The newly hyped paradigm is anticipated to provide the necessary impetus to carry the burden of achieving massive system capacity, reducing latency, and enormously increasing energy saving for the devices. In addition to the above mentioned expectations, wireless devices in networks are also expected to be constantly interacting with each other as well as with their environment (e.g. data communications from wireless sensors to devices or vice versa). In addition to human-centric vehicle-to-vehicle (V2V) communications, one very important use case is V2V communications. Recently it has been shown that the integration of information and communication technologies with transportation infrastructure and vehicles will revolutionize the way it travels. Moreover, vehicles are indeed the third place, after homes and offices, where citizens spend the most time daily. V2V communications have already been of the focus of the wireless communications community for many years. For example, IEEE has already developed the 802.11p standard for V2V communication which is based on dedicated short-range communication (DSRC) technology. DSRC technology is mainly used to support intelligent transportation system (ITS) applications in V2V scenarios, but due to the lack of pervasive infrastructure deployment and sufficient transmission range, the IEEE 802.11p standard is normally considered to offer intermittent and short-lived connectivity between vehicles and roadside infrastructure (V2I). Using technology that provides V2V communication in a pure distributed fashion always guarantees reliability and efficiency in practical applications. However, natively it sustains V2V communications. For instance, when vehicle density is high, the signals of vehicular safety applications may easily

substitute the serving spectrum. It can change its frequency and bandwidth according to its usage. The main approach of this system is to transmit speed, temperature, vehicle ranking etc to other vehicle.

II. UNITS

1. IDEALOGY:

In this project, the wireless V2V communication is achieved using Radio Frequency technology. The wireless V2V communication continuously monitors the speed, engine data and other nearby status of the vehicle. In order to avoid data collision and channel destruction, Radio Frequency technology is used. Individual vehicle detects the most nearby vehicle in all the directions to get the vehicle data. The radio Frequency transmits each vehicles parameter to other vehicle.

2. RADIO FREQUENCY:

Radio Frequency is an adaptive, intelligent network technology that can automatically detect available channels in a wireless spectrum and change transmission parameters enabling more communications to run concurrently and also improve Radio Frequency operating behavior. This uses number of technologies including adaptive radio Frequency (where the communications system monitors and modifies its own performance) and Software Defined radio Frequency (SDR) where traditional hardware components including mixers, modulators and amplifiers have been replaced with intelligent software.

3. VEHICLE TO VEHICLE COMMUNICATION:

V2V (short for vehicle to vehicle) is an automobile technology designed to allow automobiles to "talk" to each other using air as a medium. Vehicular communication systems are computer networks in which vehicles and roadside units are the communicating nodes, providing each other withinformation, such as safety warnings and traffic information. They can be effective in avoiding accidents and traffic congestion. Both types of nodes are dedicated short-range communications devices.

4. D2D DESIGN ASPECTS FOR VEHICULAR COMMUNICATION:

Most of the D2D design aspects described directly applies to V2V communication in addition to the following enhancements. The communication environment in V2V is quite different than in D2Ddue to the high mobility of the vehicles. Thus, network connectivity may play a more important role in vehicular communications, compared with system throughput. These characteristics can significantly affect D2D resource allocation strategies and system performance, and thus should be reexamined for V2V.

5. V2V STANDARDIZATION:

To achieve V2V safety communications, many consortia involved in industrial, governmental, and university research have created significant opportunities in many projects such as US IntelliDrive, CAMP/VSC-2, CICAS, SafeTrip21, and California PATH [8]. In these projects a category of protocol standards for a special mode of operations in IEEE 802.11 for vehicular networks is designed, called wireless access in vehicular environments (WAVE). These protocols are standardized by IEEE in the IEEE 802.11p and IEEE 1609 protocol set.

6. V2V COMMUNICATION USING SPECTRUM OVERLAY MODEL:

V2V communication is getting popular day by day and researchers are trying to make this dream a reality. In V2V communication, vehicles exchange critical information like their speed, and direction with each other using some radio. Different types of solutions have been proposed for this purpose. Cognitive radio has proven itself the best among them. Opportunistic spectrum access is one of the flexible spectrum access models to initiate secondary user (SU) communication in the absence of primary user (PU).It is also known as overlay spectrum access. Dozens of research papers are available in this regard, but only covering technical aspects and are silent about its business aspects. Currently different telecommunication companies are in operation in Pakistan for wireless communication.

7. EXISTING SYSTEM:

The wireless vehicle to vehicle communication is achieved using radio Frequency technology. In order to avoid data collision and channel destruction radio Frequency technology is used. Individual vehicle detects the most nearby vehicle in all the directions to get the vehicle data. Vehicle to Vehicle Communication using radio Frequency Technology by assigning unique address detection method is proposed to differentiate each vehicle to avoid interruption, so that the accurate information is transmitted between vehicles without noise and false data. Data transmission between devices to device is done in MATLAB software and simulation results are analyzed. The working of channel with spectrum sensing is simulated in MATLAB and results are analyzed.

8. PROPOSED SYSTEM:

In this proposed system, a development of a working model in communication system between nearby vehicles can be implemented using radio Frequency Technique. By using this technique, a clear view of the vehicles speeding nearby and other necessary data can be achieved. The information like speed, temperature, distance, condition of road and vehicles ability is shared between each other vehicles. V2V communications is a system designed to transmit information between vehicles and other objects on the road in real-time. This is a form of wireless communication where a transceiver.

9. VEHICLE TO VEHICLE COMMUNICATION:

V2V communication enables vehicles to wirelessly exchange information about their speed, location, and heading. The technology behind V2V communication allows vehicles to broadcast and receive Omni-directional messages (up to 10 times per second), having a 360-degree “awareness” of other vehicles in proximity. Vehicles equipped with appropriate software (or safety applications) can use the messages from surrounding vehicles to determine potential ash threats as they develop.

10. COGNITIVE CHANNEL:

Cognitive radio is a form of wireless communication where a transceiver can intelligently detect the channels for communication which are in use and which are not in use, and move into unused channels while avoiding occupied ones. This optimizes the use of available radio-frequency spectra while interference is minimized to other users. In order to perform this advanced numerical calculation MATLAB is used. MATLAB supports developing applications with graphical user interface features. It includes GUIDE (GUI development environment) for graphically designing GUIs. It also has tightly integrated graph-plotting features.

A. Block diagram and flowchart

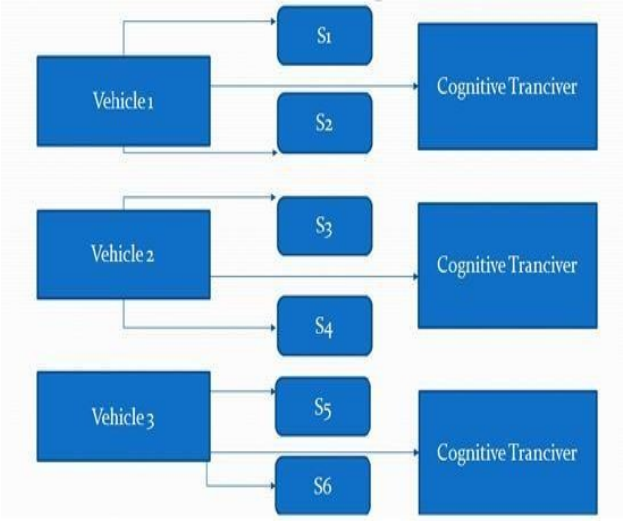

Fig 1 VEHICLE TO VEHICLE COMMUNICATION

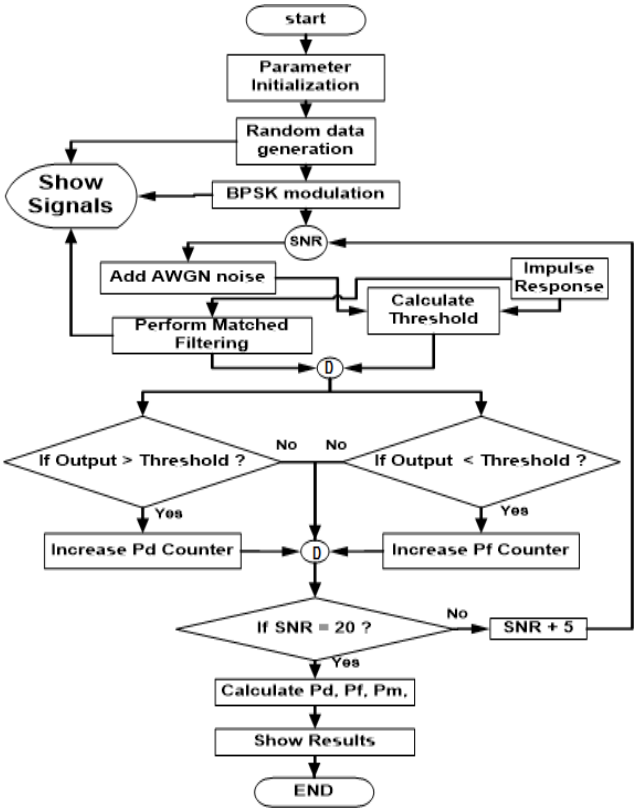

Fig 2 FLOWCHART

B. ALGORITHM:

- Step 1: Sensor from the device in the vehicle gets started and collects all the information ofvehicle
- Step2: Each device from the individual vehicle is assigned with the unique address.
- Step3: Radio Frequency transceiver from the device starts to scan the channels.
- Step4: The used channels from the particular area is said to be primary user and unused channels are authorized to use for secondary user.
- Step5: The secondary user selects the unused channel from the available channels by analyzing noise and threshold level of all channels.
- Step6: Device data is manipulated as packets and transferred to another vehicle using channel.
- Step7: Similarly the information is received from all direction of vehicles simultaneously by differentiating unique address detection method.
- Step8: The packet is decoded in the form of information and available to the user.

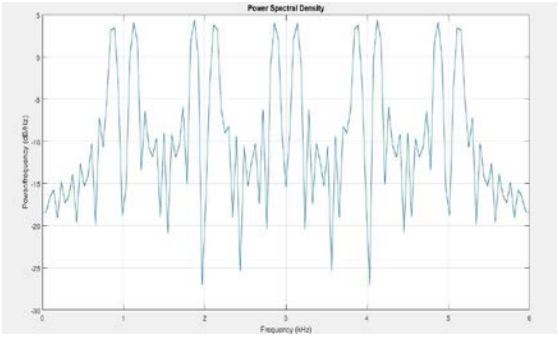

Fig 3 Channels for Used Spectrum

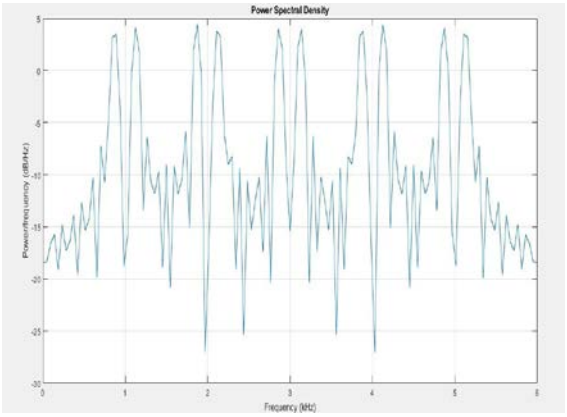

Fig 4 Used and Unused Spectrum for Channels

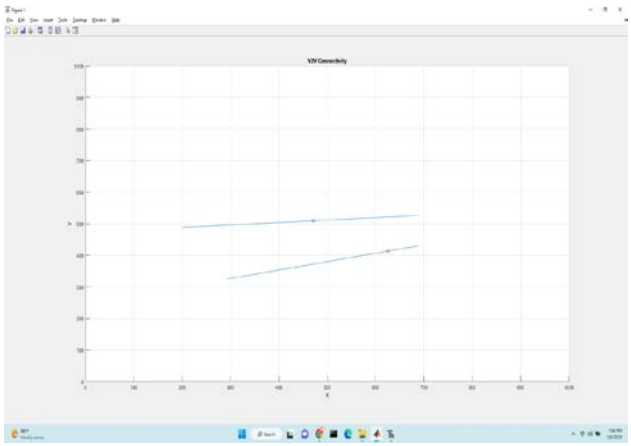

Fig 5 Simulation waveform for BPSK data transmission

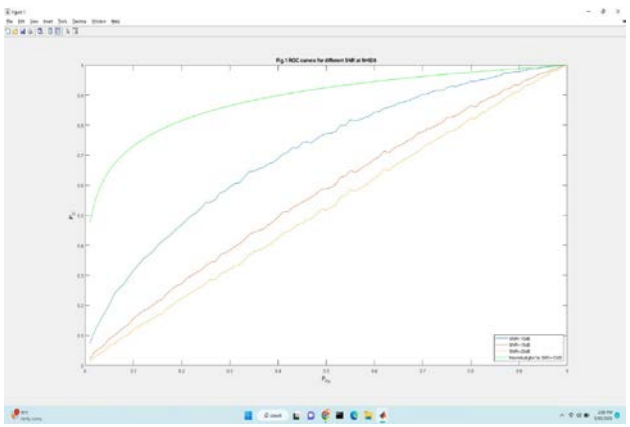

Fig 6 ROC Curve for different SNR values

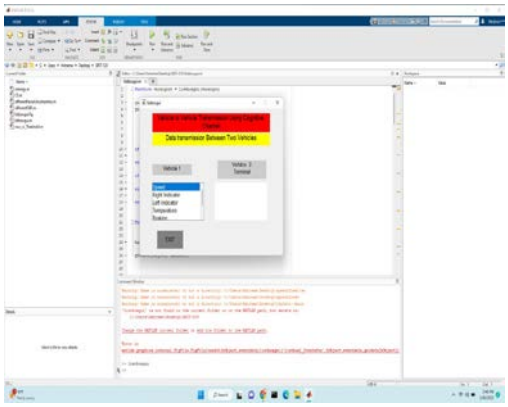

Fig 7 GUI for multiparameter transmission

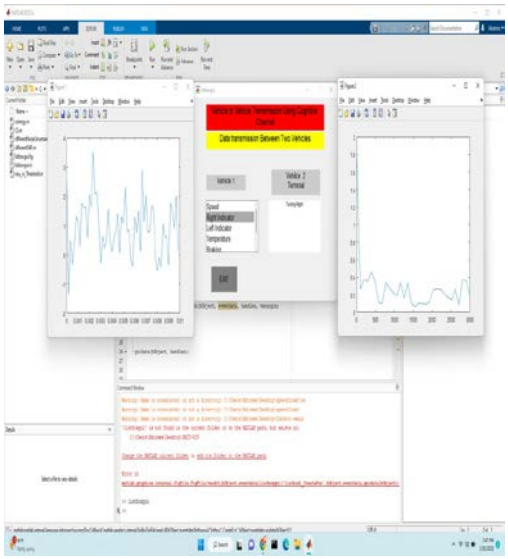

Fig 8 GUI with signal transmission which indicates signal wave form

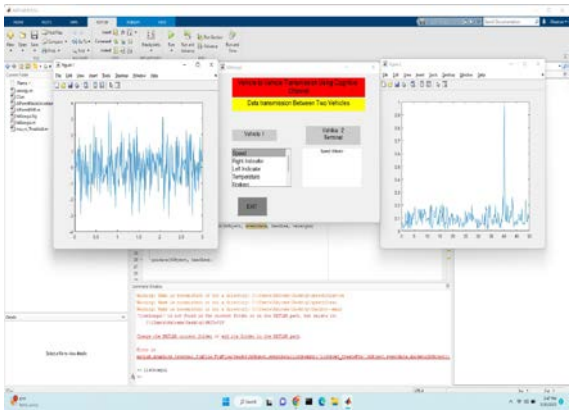

Fig 9 Different wave forms with respective to different data

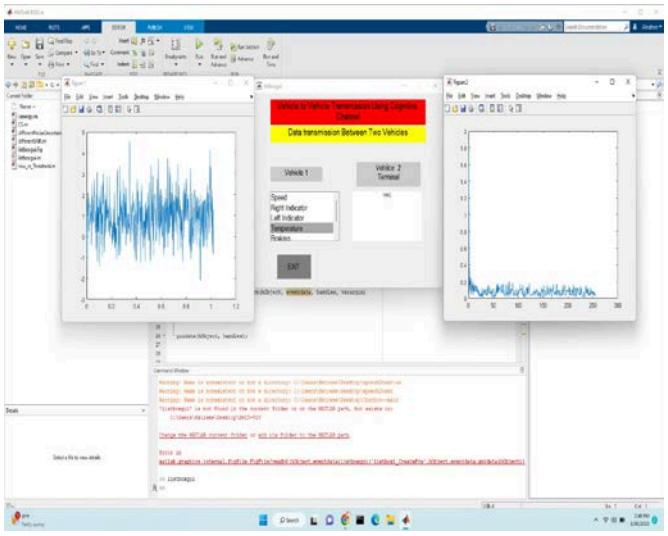

Fig 10 Wave forms with respective to different data while transferring temperature data

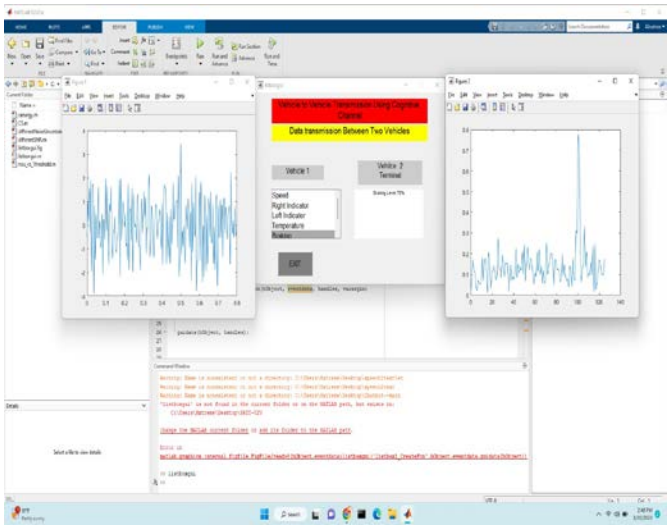

Fig 11 Wave forms with respective to different data while transferring Break status

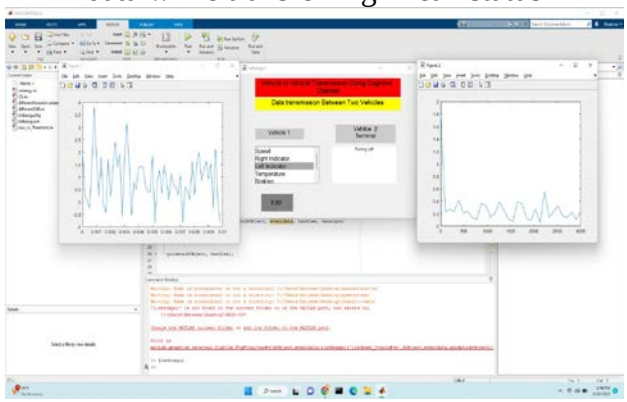

Fig 12 Wave forms with respective to different data while transferring vehicle indicator status

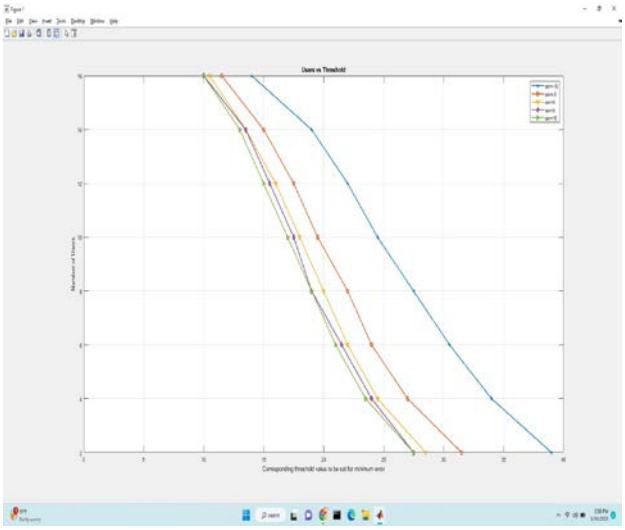

Fig 13 Threshold Graph with respective to different number of users

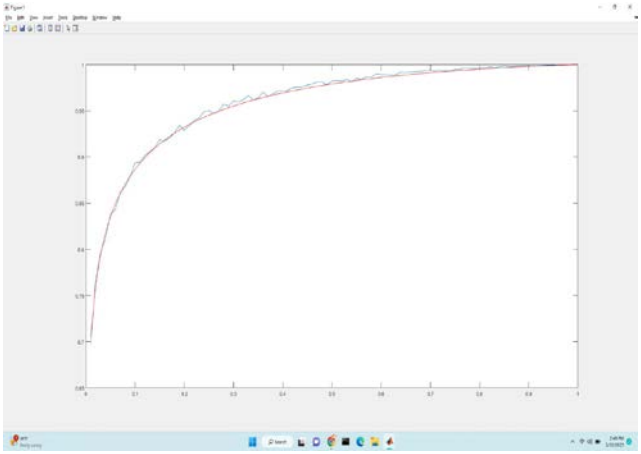

Fig 14 Error correction graph of V2V communication

11. SOFTWARE TOOLS

MATLAB-SOFTWARE DESCRIPTION: MATLAB, software is a technical matrix manipulating based computation software manipulating matrices leads to big data analysis. The things to learn in MATLAB are entering matrices, usage of the: (colon) operator, invoking functions. At the heart of MATLAB is a new high level language due to its Multilanguage inheritance fully exploits its power. Matrix manipulation and function working will be the basics of MATLAB. Users will be rewarded with high productivity, high- creativity, and strong computing power that will change the way it works.

Introduction - describes the basic commands and components of the MATLAB system.

Development Environment - introduces the MATLAB development environment which is based on script making based on the needs, including information about toolboxes and the MATLAB desktop window environment.

Manipulating Matrices - introduces how to use MATLAB to generate matrices and perform mathematical operations on matrices such as addition and various mathematical operations. Graphics - introduces MATLAB graphic capabilities, including information about plotting data, annotating graphs, working with large data base and working with images.

Programming with MATLAB - describes how to use the MATLAB language to create scripts and functions based on external calculations, and manipulate data structures, such as cell arrays and multidimensional arrays

12. CONCLUSION

This project work has approaches and discussed research challenges related to the use of radio Frequency technology for V2V. Though deployment in vehicular networks is still in the preliminary stage, it has the potential of becoming a killer product in the future due to a huge consumer market for vehicular communications. The alarming increased numbers of fatal accidents resulting from collisions between emergency vehicles and normal vehicles, especially at intersections in urban scenarios, have caused governments and car manufacturers to focus their attention on the research and development. Thus, in order to avoid data collision and channel destruction radio Frequency technology is used. Individual vehicle detects the most nearby vehicle in all the directions to get the vehicle data. The device communicates other vehicle by assigning unique address detection method to differentiate each vehicle to avoid interruption so that the accurate information is transmitted between vehicles without noise and false data. In future, this device is made as a product and the system can be applied in Real time for Automobiles and response is tested.

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