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Research paper

A versatile communication approach between autonomous vehicles in dynamic environment

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Abstract

The current state-of-the-art in wireless communication technology is within vehicles as well as between vehicles.Different concepts associated with radio frequency bands and wave propagation simulations are applied to inter-vehicle communication analysis. The Medium Access Control (MAC) layer protocols used for routing in inter-vehicle communication. Security issues associated with inter-vehicle communication are reviewed.In Proposed communication techniques The push buttons switches are arranged inside the car where the driver presses the buttons, which notify whether the route is busy or not. This data is broadcasted over the internet using node MCU to the other available driver in the next route whether to choose this road are not. In this system ambulance can directly communicate with other vehicles on its route. Within the range of ten meter, ambulance sends the signal to nearest vehicles make drivers to be alert and give the possible way to the ambulance. Communication between the ambulance and vehicles takes place using RF with Microcontroller which is helpful to driver to check the best route, and avoids the Accidental Area.The proposed technique is simulated in keil Micro vision software and implemented on ATMEGA 328.

Keywords: *AVR; Node MCU; Push Buttons; RF Transmitter; RF Receiver*

1. Introduction

In Present technology every ones using internet which is used for data transmission people would like to transmit data with high speed, for efficient and fast data transmission, wireless communication technique is used between the devices and transmitted by the electromagnetic waves. Vehicle to vehicle communication technology is essential to avoid the traffic and accident. It is an Automobile technology intended to permit automobile to communicate with each other. It is worked on base of dedicated short range communication (DSRC) technology.

According to WHO Reports Road Accident Causes nearly 1.2 million death in worldwide, 50 million people got injured [1]. In conventional method Laser, Radar and Ultrasonic sensor is used for enormous communication but certain restriction such as vehicle at a junction it is impossible to communicate, so technology approached GPRS and WIFI technique to communicate in all condition.

Generally sensors collect large amount of data but, a reporting of collected data becomes difficult, to overcome this several car manufacturer are planned to install wireless connectivity(internet or mobile) in their vehicle to enable communication both with road side base station and between vehicle for the purpose of safety driving.[2].

2. Literature survey

Vehicular sensor networks are developing as advance network relevance, particularly for collecting and monitoring information in urban environments. Generally, vehicles have no constraints on processing power and storage capabilities. They can sense images from streets, process sensed data, and send messages to other vehicles connected to them. Vehicle applications consume a huge amount of sensor data. Multiple sensors, installed on multiple vehicles, to record information. to give value-added services.

U. Lee, E. Magistrate[3] introduced Mob Eyes communication, it is one type of vehicular sensor network to collecting and monitoring information in urban areas, it consist of few sensors (including a video camera) to record all surrounding actions such as road conditions, traffic information and congestion including car accidents while driving. It supports forensic data management and also measure pollution of the environment. Usually Vehicle to infrastructure [4] (V2I) communication is also used to communicate between vehicles, due to high cost of V2I. Many people cannot afford to install in their vehicle hence L. Wang [5] builds a vehicular network by using TCP/IP protocol to communicate with centralized server via cellular network. Constant connectivity alters in vehicular environment and also insists that particular routes to be recalculated and session to be reconnected. [6] If connectivity alters they need send request to Request/Reply model by entering data name, it does not require any information like allocation of address, data delivery path and session establishment, before data transmission.

Generally vehicular sensor network consist less memory processing, storage and energy so E.-K. Lee,[7] Y. M. Yoo designed Ad Hoc Vehicular network(VANET) in this design if connectivity is alter (user route changes) than also communication takes place with high speed and mobility pattern is also becomes easy to predict. Especially it is an onboard sensing device. Therefore, it can support only short range communication. Y.-T. Yu, T. Punihaole, [8] M. Gerla he explained about data routing in cloud network it facilitates different services like, storage, communication and computing application, it is helpful for safety navigation ,live video streaming and they used Hybrid content based routing pro-

tocol. Again this protocol is divided into Proactive content and Reactive content, in Proactive content protocol required more storage location. In Reactive content Network, Congestion Problem to reduce the content cost bloom filter based routing algorithm. B. Algren, C. Dannewitz [9] [10] he explanation about 4 approaches for efficient communication Data oriented Network Architecture, Content Centric network, Public-subscribe internet routing and Network of Information from the design for future internet in this content centric network provides more efficient content distribution but it cannot provide privacy.

Mario Gerla [11] explains about autonomous vehicles and updating vehicles data like video information and sensors information to could. Tracking vehicles data and sending it to cloud. Means if anyone comes in front of the autonomous car it just stops the vehicle without knowing the reason which is the drawback of it. And the autonomous cars cannot takes sudden decisions like human brain.

The proposed paper describes about how vehicles intercommunicate between them by using IOT and helps to avoid the traffic jams and give emergency notification in life rescuing situations.

3. Proposed technique

The proposed system consists of two sections, one is transmitter and the other is receiver section. The communications in between these modules is done with RF module, which consists of RF Transmitter and RF Reciever; these are interfaced with encoder and decoder IC.

a) Transmitter Segment:

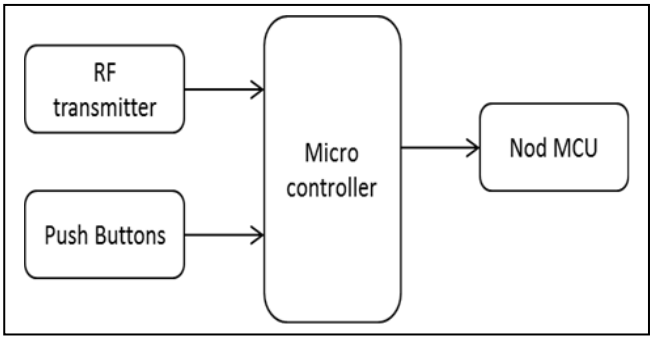

Fig. 3.1: Block Diagram of Transmitter.

a) Transmitter section consists

Of RF Transmitter, Push buttons, AVR Microcontroller and Node MCU as shown in figure3.1. The RF transmitter uses for the navigation purpose of the vehicle. 4 Push buttons are used and each has unique response like Traffic, Road repair, Road strike, Accident etc. Depends on the situation user can select the switch. When this switch is pressed, the input (low logic level)is passed to the controller. It process the data immediately generate output (High logic level) and that output is connected encoder i.e. HT12E IC, which encodes from 12 bit parallel data into 12 bit serial data where first eight bits are called address bits and next 4 bits is data bits.This encoding process helps in securing the data it should be encoded before the transmission and these data is updated on Webpage through MCU. Transmitter of node MCU is connected to Receiver of the controller and Rx of node MCU to Transmitter of controller.

b) Receiver Segment

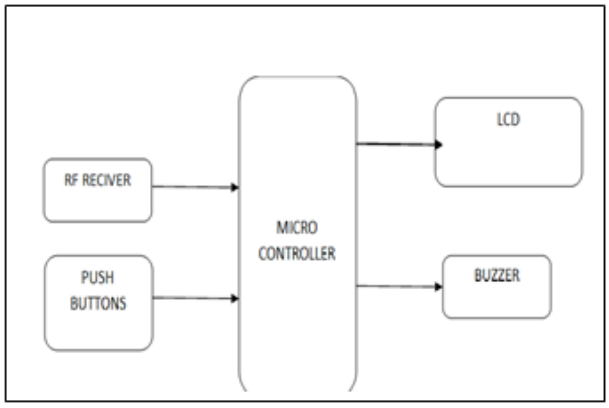

Fig. 3.2: Receiver Block Diagram.

Receiver consists of of HT12D which is a decoder, it generates 4 bit data by decoding 12bit serial data into parallel data and makes sure the address of the transmitter and receiver should be same. This 4 bit data is given to the controller and the controller checks logic according to stored responses and generates respective response on the LCD. By looking response on the LCD user 2 decides whether he would choose the rout 2 or not.

c) Process Flow`

The process flow of the proposed technique as in the Figure

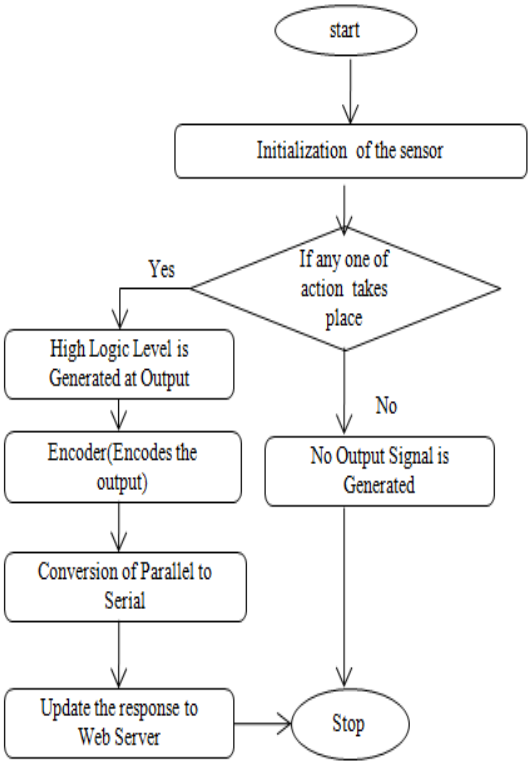

Fig. 3.3: Flowchart of Transmitter.

When the vehicle is started, RF modules, Node MCU and AVR (ATMega 328) controller are initialized at a time. When heavy traffic/low traffic is discovered by the user, he/she presses the button. This data is broadcasted over the internet using node MCU to the other available Driver in the next route whether to choose this route or not.

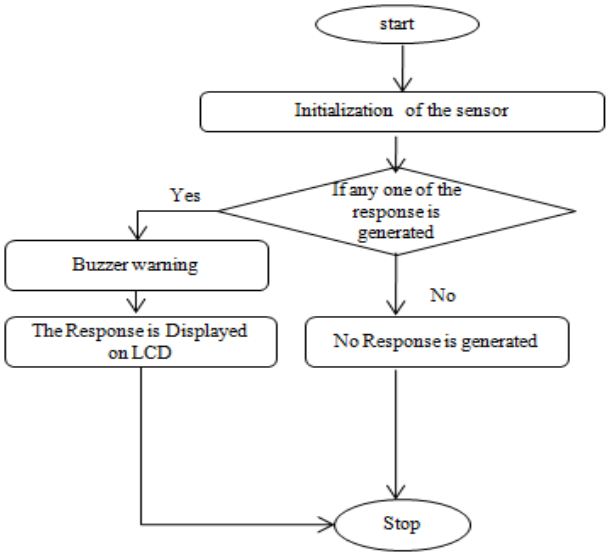

Fig. 3.4: Receiver Flow Chart.

The receiver Flow diagram as shown in figure 3.4, after initialization of sensor if any response is generated it gives Buzzer warning else it remains same as No response is generated That response should be displayed on LCD and later it's going to be stop.

d) Hardware Components

1) Push Buttons: There are 4 push buttons are used in this technique, as shown in Figure3.5 if user finds any Accident on that way than he can press button B1similarly if Traffic is High than He can Press B2, else if he finds any Road Strike than B3 else road Repair than he can press B4.this information is passed to microcontroller.

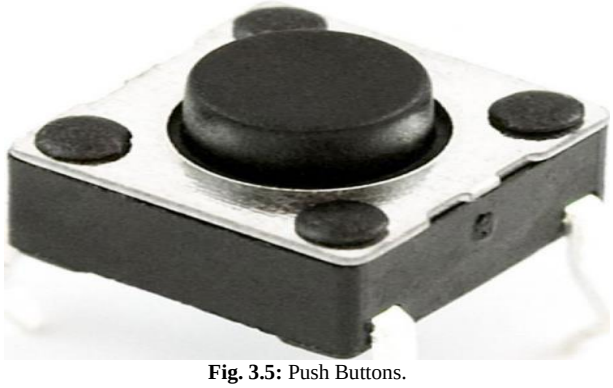

Fig. 3.5: Push Buttons.

2) ATMega 328: This Microcontroller as shown in figure 3.6 it collects the information from Push buttons .which connected to pin2,pin3,pin4,pin5 of the microcontroller The output of pin4 of the controller is given to the D0 pin of encoder ic named ht12e which converts parallel to serial data before to send transmission.

Fig. 3.6: Atmega 328.

3) Nod MCU:

It is platform of IOT which is a web server whatever collected information is stored and transferred through the NODMCU

Fig. 3.7: Nod MCU.

4) Buzzer: Buzzer is used to give warnings if any action like accident is happened than it will give in the form of sound.

Fig. 3.8: Buzzer.

5) Display: LCD 16X2 is used to display the Responses generated from the push buttons which is stored in th NOD Mcu Web Server

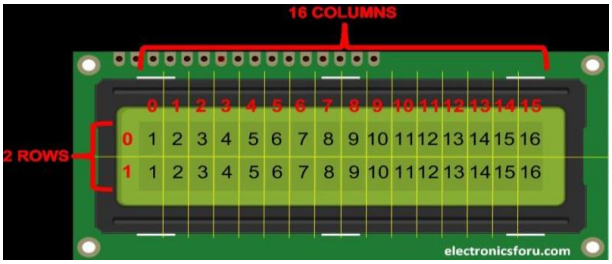

Fig. 3.9: 16X [2] LCD.

4. Result and analysis

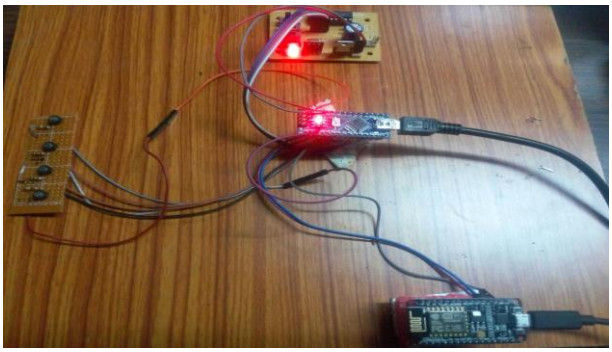

Fig. 4.1: Implementation of Transmitter.

Here we are using RF transmitter, AVR microcontroller, Push buttons and Node MCU. The push buttons switches are arranged inside the car where the driver presses the buttons, which notify whether the route is busy or not. This data is broadcasted over internet using Node MCU to the other available driver in the next route whether to choose this road or not. Within the range of ten meters ambulance sends the signal to the nearest vehicles make drivers to be alert and give possible way to the ambulance.

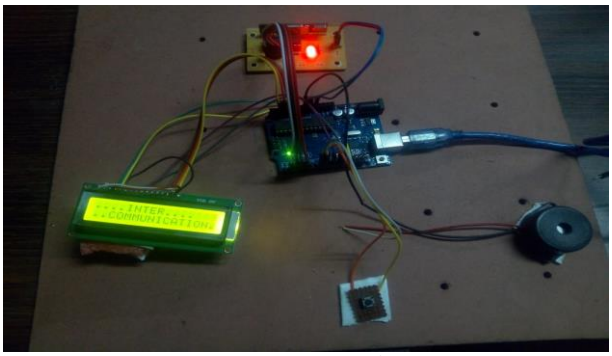

Fig. 4.2: Implementation of Receiver.

In the Receiver section we will be having RF Receiver, Push buttons, LCD and a buzzer. The data which is uploaded in the web server that information can be received by the Receiver in the vehicle. The communication between the vehicles, between vehicle and ambulance takes place using RF. In the Receiver section when the button is pressed it will be connected to web server and the data will be uploaded using internet. And the data will be uploaded to the Node MCU and the buzzer will be ON to intimate the driver to choose another route.

5. Conclusion and future work

This paper describes the Inter-Vehicular Communication, using Internet of things. Here the communication between vehicles is done by uploading the sensor information to the web server. That information can be accessed by the driver in the next route whether to choose that road or not. We can improve this by the Artificial Intelligence where we can predict the future of upcoming vehicles.

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