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Implementation of Connected Vehicle Technology by using Raspberry Pi to Reduce the Accidents

Gontu Gopika[1], Basavoju Harish[2]
[1]*M. Tech Student, ECE Dept, Vignan's Lara Institute of Technology & Science, Vadlamudi, Guntur, India*
[2]*Assistant Professor, ECE Dept, Vignan's Lara Institute of Technology & Science, Vadlamudi, Guntur, India*

Abstract: In India, road transport is popular for various reasons, but the conditions of the Indian roads are very poor and bad. The rate of road-accidents and fatality in the country is very high. According to WHO report, India has highest number of road accident deaths in the world. Drug-abuse and addiction by drivers is a major cause of accidents. Hence we can reduce the accidents using connected vehicle technology (CVT) with artificial intelligence (AI) paradigm forming a CVT-AI method. In the proposed system two vehicles are needed for the operation. The primary vehicle is interfaced to the raspberry pi. The secondary vehicle is interfaced with Arduino Uno. With this technology the parameters like blind spots, crash alerts, emergency vehicle and weather monitoring can be informed and updated to the users. These parameters can help for reducing the rate of accidents.
Keywords: Connected Vehicle Technology (CVT), Artificial Intelligence (AI), RF Transmitter and Receiver, Raspberry pi, Arduino Uno.

I. INTRODUCTION

In recent year connected vehicle technology (cvt) has been considered as the next big innovation platform for ITS .The connected vehicle technology means wireless communication between the motor vehicles. In the proposed system RF transmitter and RF receiver are used for wireless communication between two vehicles. . The secondary vehicle RF transmitter transmits the signals to the primary vehicle of the RF receiver .whenever it receives the signals from the RF transmitter the primary vehicle automatically stops by selecting operation on the mode switch *i.e.* blind spots, crash alerts, emergency vehicle and weather monitoring. Whenever an option is selected, that particular objective gets activated and it is useful for reducing the rate of accidents occurring in our day to day life. Statistics show that the leading cause of death by injury is road traffic accidents. A survey report by World Health Organization highlights that every year more than 50,000 people in India are died due to road traffic accidents [3]. There are number of causes for which an accident can occur, some of them are lack of training institutes, use of mobile phone while driving, unskilled drivers, driving while intoxicated, bad road condition, overloading, and poor traffic management [4].

As the name implies it is a collision between an animal and a vehicle. Statistics shows that mortality of animals is increasing in North-East China due to accidents as compared to hunting [5]. Statistics shows that 67% drivers at Northern Tanzania felt that animal vehicle accidents were due to over speeding and night-time low visibility [6].

Hitting a pedestrian while driving a car is very common. A study highlighted that Islamabad Police Department reported 53.3% fatalities for pedestrian cases that are 56% of reported fatal traffic accidents [7]. The basic reasons of car accidents are over-speeding, casual behavior, reckless and unsafe driving [8].

Due to slow movement of pedal cyclists, they are not seen by vehicles which over takes another car and suddenly hit the pedal cyclists. As motor cycle moves much faster than cycle so motor cyclists are less vulnerable than pedal cyclists [9].

II. EXISTING SYSTEM

In this existing system connected vehicle technology is introduced only on the real time traffic state estimation. Connected vehicles (CVs) will reliably share the traffic condition data with surrounding vehicles through vehicle-to-vehicle (V2V) communication and with transportation infrastructures through the vehicle-to- infrastructure (V2I) communication. Once the connected vehicle on-board units collect traffic data (e.g. vehicle positions, headway distances from leading vehicle front bumper to following vehicle front bumper etc.)[1][2] In an autonomous way at predetermined intervals, they transmit the data to roadside units (RSUs). Later, these data are further processed to traffic management center; RSUs are controlled by the TMC, where TMC assigns the parameters to

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control the information flow from the RSUs. Finally the information is forwarded to the other centers (i.e. maintenance and construction center, transportation information center, and emergency management center) to take necessary actions.

III. PROPOSED SYSTEM

The main aim of this paper is to provide connected vehicles technology (cvt) and the extension is to reduce accidents by indicating crash alerts, avoid blind spots and also allow the emergency vehicles to pass. In the proposed system, two vehicles are needed for the operation. For the primary vehicle the modules such as IR sensor, buzzer, flash light, RF receiver and the display are interfaced to the raspberry pi development board. The secondary vehicle implemented by using arduino board. The modules interfaced to the secondary vehicle are LCD, buzzer, RF transmitter and rain sensor.

A. Working of Cvt

The proposed system mainly contain two vehicles operate by IR sensor, RF transmitter and receiver.IR sensor and RF receiver connected to Raspberry pi board through GPIO (general purpose input) pins as primary vehicle. An SD (secure digital) is inserted into raspberry pi board card slot. The SD card having raspbian Jessie the source code file according to application. RF transmitter connected to ardunio board through GPIO as secondary vehicle. Power on the two vehicles. If any obstacle occurs infront of the four IR sensors the primary vehicle will be stop, if there is no obstacle the primary will movie. If the secondary vehicle transmits the emergency single, it receives the signal the primary vehicle then the vehicle automatically stops. If the secondary vehicle transmits the crash alert signal, primary vehicle receiver the signal and automatically stops. If the secondary vehicle transmits the blind spot signal, primary vehicle receives the signal and automatically stops.If it is rainy at one place, secondary vehicle passes the information to the primary vehicle. So that the vehicle can change the route. the vehicle can change the route.
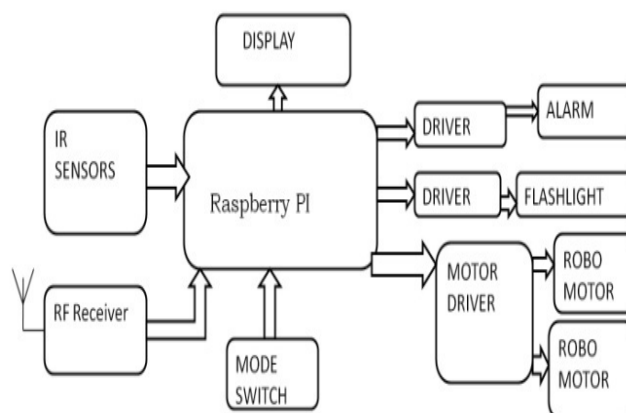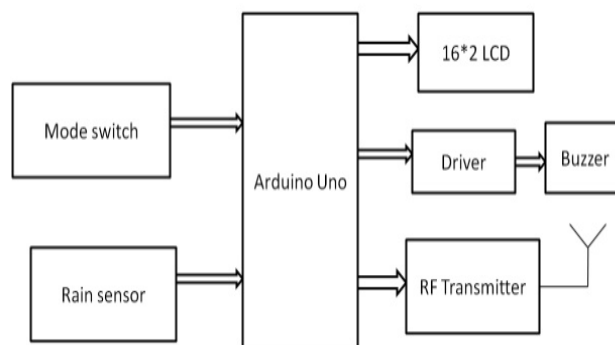

Fig.1. Block scheme of Primary Vehicle

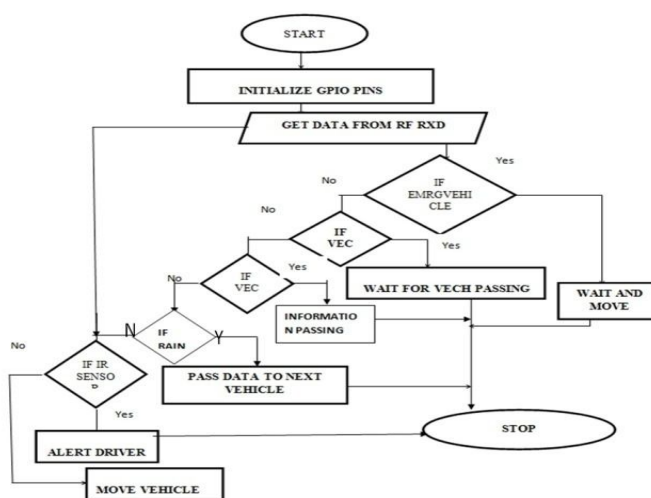Fig.2. Block scheme of Secondary Vehicle

Fig no: 3 flow chart of the system

B. Software

In raspberry pi default language is "python". OS used in this is Jessie version. It is introduced on Jan 2017. Jessie is the name of the character in cow boy. Connect memory card to the computer to copy the software. Open win 32 disk manager. Copy Jessie image. Remove memory card and insert in raspberry pi. And update the library.

Python could be a widely used high-level programming language for general programming, created by Guido van Rossum and initial discharged in 1991. Associate degree taken language, Python encompasses a style philosophy that emphasizes code readability (notably exploitation whitespace indentation to delimit code blocks instead of premed brackets or keywords) and a syntax that permits programmers to specific ideas in fewer lines of code that may well be utilized in languages like C++ or Java. The language provides constructs supposed to alter writing clear programs on each a little and huge scale. Python interpreter's square measure offered for several operating systems, permitting Python code to run on a large kind of systems.

In ardunio Uno default language is "embedded c". The ardunio Uno is microcontroller board based on the AT mega328 p.
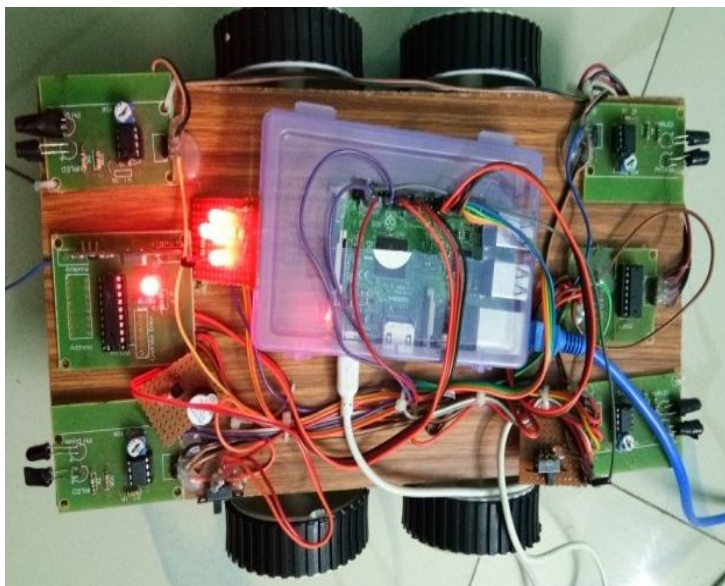
C. Hardware

Fig: 4 primary vehicle hardware

Fig: 5 secondary vehicle hardware

IV. RESULTS

In the fig no 6 If emergency vehicle which is a objective in secondary vehicle passes on the road it sends message to the primary vehicle ,the fig no 7 receiving the emergency vehicle signal from the secondary vehicle and automatically primary vehicle stops .In the fig no 8 If a vehicle coming out of the parking place, it indicates crash alert, this message can be sent to the primary vehicle ,the fig no 9 receiving the crash alert signal from the secondary vehicle and automatically primary vehicle stops .In the fig no 10 If a vehicle passes on a 'L' shaped route, it indicates blind spots that message can be sent to the primary vehicle so that the driver gets alert ,the fig 11 receiving the blind spot signal from the secondary vehicle. In the fig no 12 if it is rainy and fogy at some place that message can be sent to the primary vehicle, fig no 13 receiving the rainy and fogy at that place to change the route.fig no 14 if there is an obstacle at any side of the vehicle that message will be displayed and automatically the vehicle stops.
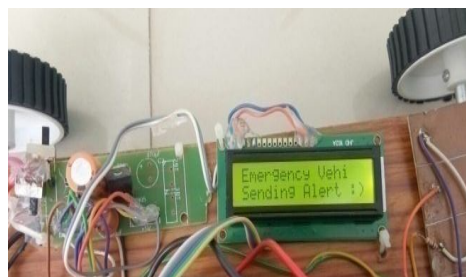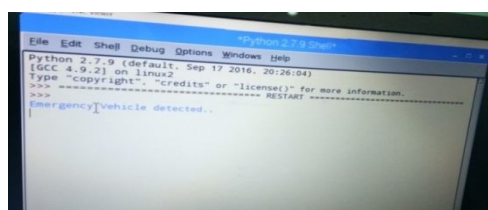

Fig: 6 emergency vehicles sending

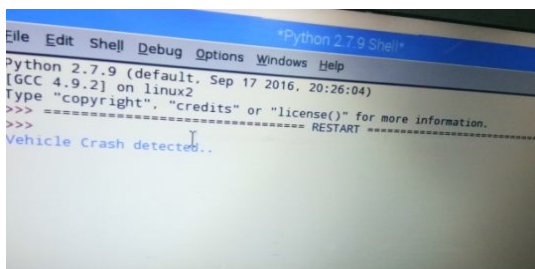Fig: 7 emergency vehicles receiving

Fig: 8 crash alert sending

Fig: 9 crash alert receivng

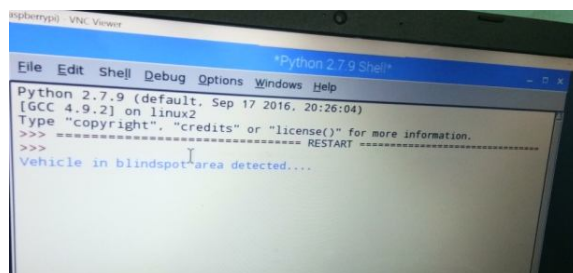Fig: 10 blind spot sending

Fig: 11 blind spot receiver
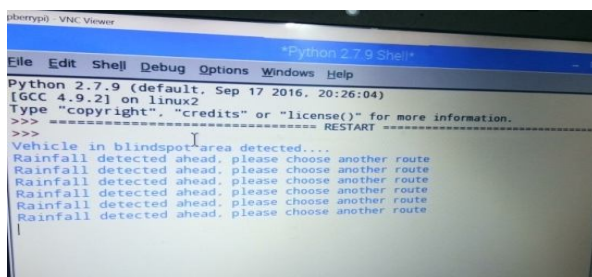

Fig no: 12 rain sensor sending
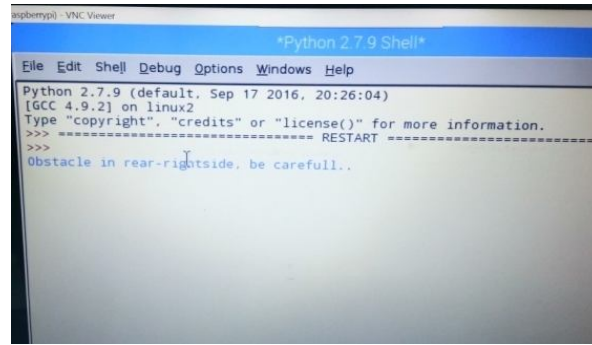

Fig : 13 rain signal receiving

Fig: 14 obstacles near

V. CONCLUSION

Connected vehicle technology enables the communication between two or more vehicles. Connected vehicles will provide benefits that extend beyond drivers to include pedestrians as well as travelers using public transportation and it also promises to provide benefits in improved mobility and efficiency of our nation's transportation system. This System provides safety by avoiding crashes through notifications sent to the driver. In addition to above advantage the system also provides benefits like blind spots, crash alerts, emergency vehicle and weather monitoring.

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