IJIREEICE

ISSN (Online) 2321 – 2004
ISSN (Print) 2321 – 5526

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN ELECTRICAL, ELECTRONICS, INSTRUMENTATION AND CONTROL ENGINEERING
Vol. 4, Issue 4, April 2016

Advanced Highway

Marvel Devasia[1], Michael Mathew[2], Sajana Varghese[3], Sijin Raj[4], Silpa Philomina Varghese[5]

UG Scholars, Electronics and Electrical Department, Amal Jyothi College of Engineering, Kanjirappally, India[1, 2,3,4,5]

Abstract: In this paper we are designing a highway system which contains hi-tech qualities. This project helps to reduce road accidents to some extent. Here the driver receives information regarding the road conditions beforehand itself to avoid accidents. Information given can be regarding the conditions like constructions going on road directions, warnings like steep slopes, hair pin bends, sharp corners, narrow paths etc. Driver also receives signals that indicates arrival of ambulance, fire engines etc. The project is based on various transmitter modules connected to local computers capable of sending various messages regarding road conditions. The compatible receiver can be placed inside the vehicle to accept the messages from transmitters. The warning messages will alert the driver so that he can drive the vehicle safely. The major hardware components used are PIC 16F877A, RF transmitter and receiver modules, GSM module and LCD. This technique helps to provide an easy and safe journey. In future we can extend this work not only to highways but also to every road.

Keywords: Hitech highway, PIC, GSM, RF module, emergency vehicles.

I. INTRODUCTION

As a nation's economy grows, the number of motor vehicles increases. This means death and injury from traffic accidents are likely to increase, since motorized traffic competes with slower moving non-motorized traffic for road space, especially if measures are not taken to mitigate the problem. Road accidents disproportionately affect the poor, making road safety an economic development imperative. Most of the victims of road accidents aren't even in a motor vehicle. A shortage of safe, affordable travel options makes things even worse for the poor. Pedestrians, cyclists and motorcycle riders are the most vulnerable road users and account for the majority of traffic deaths in low and middle income countries. The human and economic damage caused by road crashes is largely preventable. Important design and traffic calming measures such as median drivers, speed bumps, rumble strips, road markings, traffic signs, and roundabouts are usually not present in most of the countries. Flaws in road design and engineering, coupled with driver behavior, can help to overcome this with concerned effort.

In this project, we are designing the system such that the driver receives information regarding the road conditions beforehand itself to avoid accidents. Information given can be regarding the conditions like constructions going on road directions, warnings like steep slopes, hair pin bends etc. Driver also receives signals that indicates arrival of ambulance, fire engines etc.

II. LITERATURE REVIEW

From earlier days onwards road markings and traffic signs where used to give information regarding the road conditions to drivers. Now to make drivers notice these signs during night time also the traffic department has placed reflectors along with the traffic signs. But these methods do not completely help the drivers. So here we are using a system that will show the information inside the vehicle. This will make the driver to notice it. The smart highway application is to create a wireless communication between vehicle and roadside infrastructure [1].There is a new approach to design a Vehicle-to-Vehicle Data Transmission (VVDT) system within the DSRC concept capable of data transmitting in real-time scale between all cars within a highway area of 2 km radius [4]. The operation and transit of emergency vehicles on an automated highway system (AHS) designed under the control architecture proposed in the California Partners for Advanced Transit and Highways (PATH) program is described in [3]. The term emergency vehicles are used in a general sense to describe vehicles, such as police cars, ambulances, and tow trucks, that may service faults inside or outside the AHS. In [2] they have proposed Vehicle-to-Vehicle 2-Way Communication & Ranging System using Spread Spectrum Technique called Double Boomerang Transmission System. This proposed system is based on Boomerang Transmission System and uses the principle of CDMA. This proposed system is an efficient system for active safety and smooth driving without traffic jam from view of effective use of money and transmission medium.

III.WORKING

Figure 1 show the basic block diagram of the project work. The major hardware components used are PIC 16F877A, RF module, GSM module and LCD (16x2 display). Embedded C using micro C and hi-tech PIC C is used as the software requirement. The local computer is a digital system based on PIC 16F877A. RF modules are used for communication between vehicle and the local computer. GSM module may be used for communication between local computer and the central computer under the operation of road safety office.

The working of the project is explained as follows. Road directions and warnings regarding road conditions are encoded in PIC microcontroller. Codes corresponding to particular road condition are sent by an authorized officer to PIC. GSM is used to receive signals sent by the officer. GSM sends this code to PIC and from there it is send to

IJIREEICE
ISSN (Online) 2321 – 2004
ISSN (Print) 2321 – 5526
INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN ELECTRICAL, ELECTRONICS, INSTRUMENTATION AND CONTROL ENGINEERING
Vol. 4, Issue 4, April 2016

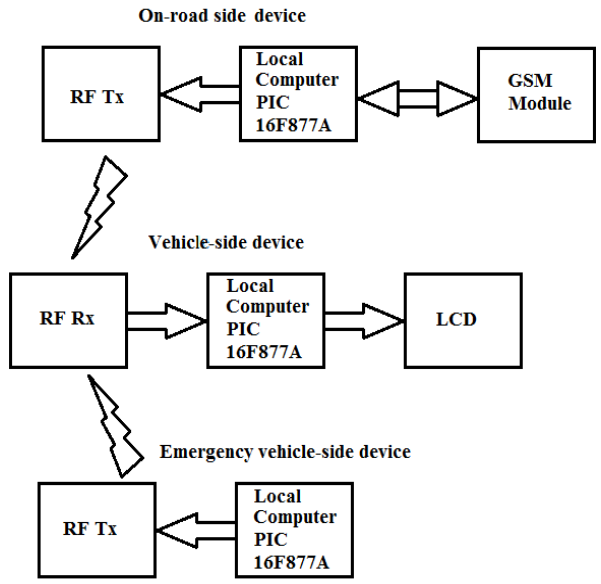

Fig. 1 Basic Block Diagram

RF module. RF transmitter always sends the code to all matching RF receiver placed in the vehicles. RF receiver then sends it to PIC in the vehicle where it is decoded and particular information is given to driver through the display screen and buzzer. Here an LCD is used as the display screen. By making use of the receiver in the vehicle another advantage is added that it receives information regarding the approach of emergency vehicles. This helps them to clear the way earlier itself so that emergency vehicles can go smoothly and without getting into traffic. For that RF transmitter is kept in the emergency vehicle. Signal regarding its approach is send to vehicles within a particular range.

A. Different Cases

Figure 2 shows the case when a vehicle is traveling through a road which is under construction. Here the vehicles receive information that the road is under construction beforehand itself. Figure 3 shows the case when vehicles come at a turning point. Here the vehicles which need to turn right receive information to turn right earlier itself and the vehicles going opposite receive turn left information. Both these signals are sent by the same transmitter. By considering the direction also as a parameter, using the same transmitter these two information can be sent. Figure 4 shows the case when an emergency vehicle approaches in the vicinity of other vehicles. Here the vehicles on the road receive information regarding the approach of emergency vehicles like ambulance, fire engines etc. earlier itself so that it can make way for these vehicles to travel. This project provides navigation and as it is not a mobile based technology, there no need to access mobiles for it. This also helps to avoid accidents as warnings regarding the road conditions are informed to the driver. Also it provides a traffic free passage for the emergency vehicles. So finally we can say that this helps to provide an easy and safe journey. In future we can extend this work not only to highways but also to each and every local road to provide maximum safety to travellers.

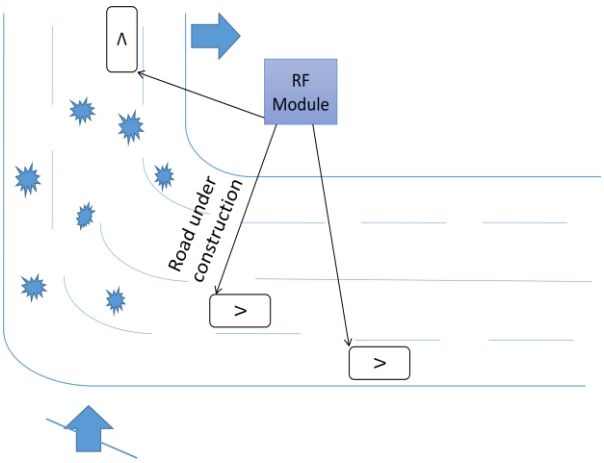

Fig. 2 Case when the road is under construction

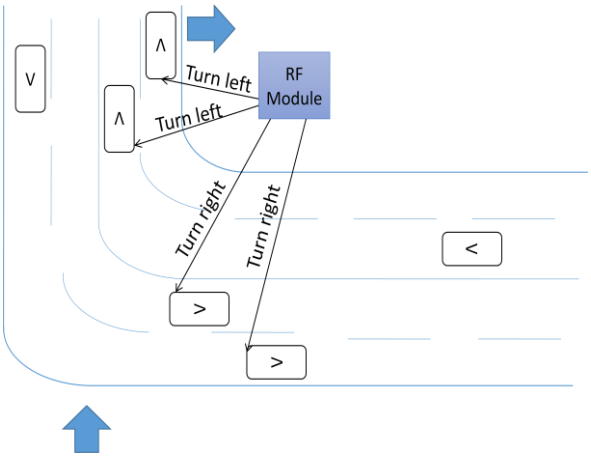

Fig. 3 Case when the vehicle approaches a turning

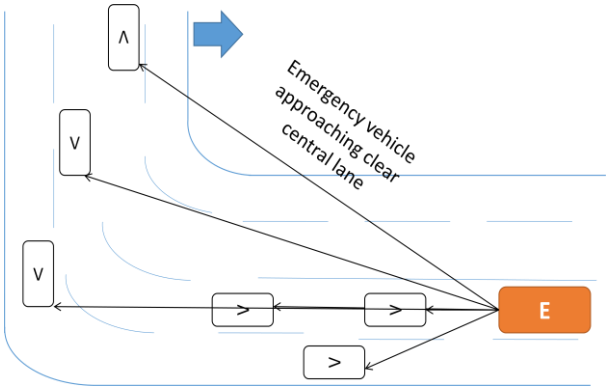

Fig. 4 Case when an emergency vehicle approaches

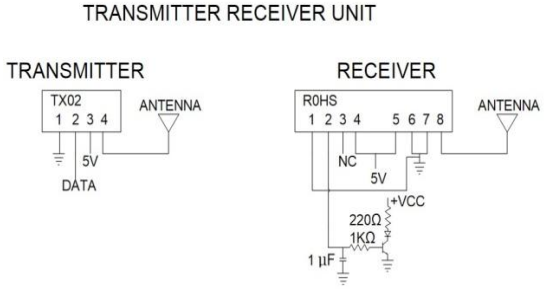

Fig. 5 Circuit diagram of transmitter and receiver unit

IJIREEICE
ISSN (Online) 2321 – 2004
ISSN (Print) 2321 – 5526
INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN ELECTRICAL, ELECTRONICS, INSTRUMENTATION AND CONTROL ENGINEERING
Vol. 4, Issue 4, April 2016

As a starting towards the project work we have taken RF 455 kHz transmitter receiver set and designed a circuit shown in Fig. 5 which could help to know practically the range of the transmitter and receiver set. This circuit is drawn in AutoCAD and then its print has been taken as the figure. 5V power supply was given to transmitter and it was held stationary and another 5V power supply was given to the receiver with the help of 9V battery and then using 7805 to convert 9V to 5V. An LED was connected in the circuit having receiver so that the LED glows when it receives signal from the RF transmitter. A square pulse was given to transmitter to transmit. So when the receiver receives the signal, the LED will blink. Now the receiver was moved away from the transmitter and the distance was noted till the LED stops blinking. The range of distance was noted to be 150m. After 150m the intensity of brightness was becoming lesser and lesser. Hence 150m was taken as the range of distance which can be transmitted by the transmitter. The experiment says that before 150 m itself, the vehicle will receive the information regarding road conditions or emergency vehicles from the road side or emergency vehicle side local computer respectively. If a vehicle is moving on an average speed of 70KMPH, then the vehicle will get the information regarding road conditions prior before 8 seconds itself. This is enough for a driver to reduce the speed of the vehicle safely if the vehicle is maintained in a good condition. The main aim is to reduce the cost on road side, vehicle side and emergency side. If we select a transmitter of higher range, then we can improve the performance but obviously it will increase the cost. Figure 6 shows the proposed circuit diagram of road-side computer unit. The central unit is PIC 16F877A. A keypad unit is attached to input configuration settings. Two wireless modules are attached to the computer. RF transmitter is used for vehicular communication. GSM module is used to communicate between local and central unit. Status LEDs are also attached for easy debugging. The proposed clock frequency is 11.0592 MHz for accurate RS 232 communication. Figure 6 shows the simulation done in proteus.

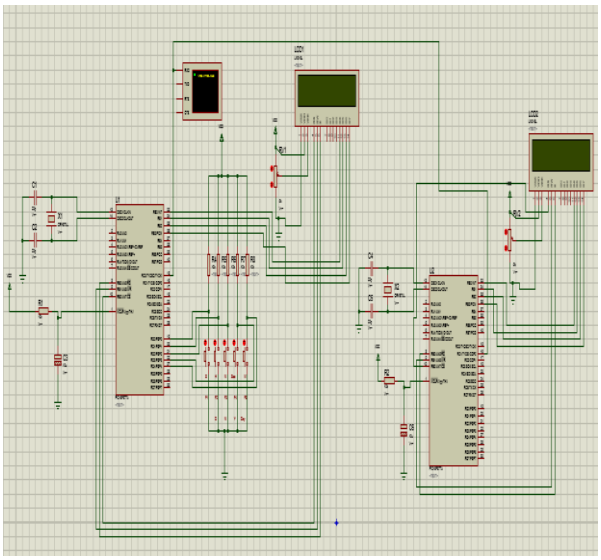

Fig.6 Main circuit diagram

B. Results

RF 455 kHz transmitter receiver circuit is designed and set to know the range of the transmitter and receiver set. The range of distance was noted to be 150m. Transmitter unit is designed and hardware connection is done. Receiver unit is designed and hardware connection is done. Simulation in proteus is done. Algorithm for receiving message by GSM is done.

IV. CONCLUSION

Highway system which contains hi-tech qualities is constructing here. The driver receives information regarding the road conditions beforehand itself to avoid accidents. Information given can be regarding the road conditions. This gives a number of benefits such as it gives local navigation, avoids accidents and provides traffic free passage for emergency vehicles as the information regarding its approach is send earlier itself. Since it is not a mobile based technology, accessing mobiles is not necessary during driving. Warning regarding road conditions is also provided. So in overall we can say that this helps in providing an easy and safer journey. The circuit diagram for road side and vehicle is also built. As the testing of RF transmitter and receiver is done now program need to be written and it has to checked and corrected till the output is obtained. In future, the roadside equipment can be used to do many functions that could provide a local optimal decision, real-time processing and distributed processing to collect and provide traffic information. Through these, it could give information for avoiding collisions.

ACKNOWLEDGMENT

Sijin Raj thanks Electrical and Electronics Department of Amal Jyothi College of Engineering for conducting the tests. Special thanks goes to Mr. Anish Benny and Mr. Sreenath B. for assisting the project work.

REFERENCES

[1] K. Yeon, H. Lee, D. Lee, J. Hwang “Prototype Developments of vehicle antenna for SMART Highway WAVE Communication system ,“IEEE Vehicle Power and Propulsion Conference, Oct. 9-12,2012

[2] K. Mizui, M. Uchida, M. Nakagawa “Vehicle-to-vehicle 2-way communication & ranging system using spread spectrum technique,” Vehicle Navigation & Information Systems Conference Proceedings,1994

[3] C. Toy, K. Leung, L. Alvarez, and R. Horowitz, Senior Member, IEEE “Emergency Vehicle Maneuvers and Control Laws for Automated Highway Systems, “ IEEE Transactions On Intelligent Transportation Systems, Vol. 3, No. 2, June 2002

[4] K. Lukin', V. Konovalov, V. Scherbakov and R. Breed “Dedicated Short-Range Communication System For Vehicle-To-Vehicle Data Transmission On The Basis Of Chaotic Waveform Codes (DSRC-VVDT),” Usikov's Institute of Radiophysics and Electronics National Academy of Sciences of Ukraine