International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 2 Issue 8, August - 2013

RF and GPS Based Intelligent Vehicular Anticollision System

J. Raga Priya[#1], Dr.G.N. Kodanda Ramaiah[*2]

[#] *Department of ECE, KEC & JNT University, Ananthapur*
India

Abstract**—**Traffic accidents have been taking thousands of lives every year. According to World Health Organization (WHO) road accidents annually cause approximately .2 million death world wide and 50 million people being injured. So, road accidents are major threat to the human beings lives. Road accidents are mainly caused due to two reasons, line of sight limitation and Delay in propagating the emergency warning.

The proposed system is protocol for communication of vehicles to avoid accidents. Emerging wireless technologies for vehicle to vehicle communications such as DSRC (Dedicated short range communications) are promising to dramatically reduce the number of fatal roadway accidents by providing early warnings. One major technical challenge addressed in this project is to achieve low latency in delivering emergency warnings in various road situations.

The protocol comprises of following things. Technology that will enable cars to talk to each other, helping to reduce crashes as well as potentially fuel consumption. The idea is that the wireless network and GPS chip in the cars can see the other cars connected to the network. If the driver can't actually see the other cars for one reason or another they are blocked at intersection or blind spot.

Keywords— ARM Microcontroller, GPS, RF Transceiver, IR Sensor

I. INTRODUCTION

The main aim of the paper is to design a intelligent vehicle communication system in order to avoid collision with the help of Embedded technology, which use ARM Microcontroller, GPS and RFtransceiver . With the help of GPS the car information is gathered and is sent to other car through RFtansceiver and Microcontroller. The other car which receives the information reads the information and replies back its own information. With this information the car can know the position of cars surrounding it. With the help of IR sensor it is easy to detect any obstacle in front of the car, which is connected to a buzzer. The buzzer warns the driver if any obstacle comes in front of the car.

The Project proposes a protocol for communication of vehicles to avoid road accidents to improve road safety. In particular, it defines congestion control policies for emergency warning messages so that a low emergency warning message delivery delay can be achieved and a large number of co-existing abnormal vehicles can be supported. It also introduces a method to eliminate redundant emergency warning messages, exploiting the natural chain effect of emergency events.

An Embedded system is a Computer (Programmable part) surrounded by other subsystems, sensors and actuators. The computer is called a micro-controller.

Embedded Systems or Electronics systems that include an application Specific Integrated Circuit or a Microcontroller to perform a specific dedicated application. Embedded System is pre-programmed to do a specific function while a general purpose system could be used to run any program of your choice. Further, the Embedded Processor Is only one component of the electronic system of which it is the part. It is cooperating with the rest of the components to achieve the overall function.

What goes into an Embedded System?

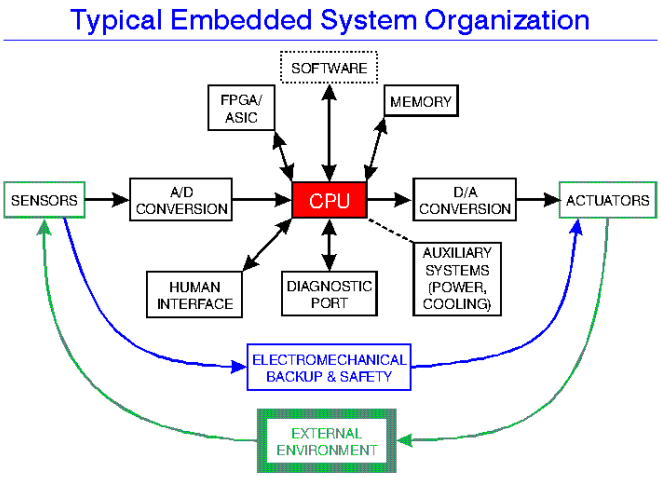
An Embedded system is a device controlled by instructions stored on a chip. These devices are usually controlled by a microprocessor that executes the instructions stored on a Read Only Memory (ROM) chip. One of the most popular Real Time Operating Systems (RTOS) is in use today is QNX (pronounced `queue nicks'). It is used for everything from medical instrumentation and monitoring nuclear reactors, to traffic lights and industrial process control. In fact, it is so widely used that we use devices having QNX several times a day without being aware of it.

QNX makes use of a micro kernel as opposed to OSssuch as Windows and UNIX, so system level functions such as device drivers are not part of the system. The kernel contains a minimum number of features for implementing basic system calls. These include message passing along with other interprocesscommunication,

An embedded system has:

- A digital signal processor,
- A variety of I/O devices connected to
- Sensors and actuators, Controllers and DSP are programmable parts,

–customizable for different application by writing software.



A Microcontroller is a device where CPU and limited associated resources such as memory, I/O are integration on the same single chip. Because of this integrated on a single chip, the reliability of a micro-controller is far superior to an equivalent system designed using CPU, memory, I/O interface chip on a PCB. But it has limitation in terms of program memory, data memory and I/O interfaces. Manufacturers of I/O controllers (Intel, Motorola, Atmel, Scenix, SGS Thomson, Hitachi, Zilogetc). Provide facilities for expansion of resource requirement for memory. But it is always advisable to use the Microcontroller in its single chip mode of operation rather than in the expanded mode. These Microcontrollers are available in sizes of 4 bit, 8 bit, 16 bit and 32 bit from various manufacturers.

II. SYSTEM ANALYSIS

Traffic accidents have been taking thousands of lives each year, outnumbering any deadly diseases or natural disasters. Studies show that about *60%* roadway collisions could be avoided if the operator of the vehicle was provided warning at least one-half second prior to a collision. Human drivers suffer from perception limitations on roadway emergency events, resulting in large delay in propagating emergency warnings, as the following simplified example illustrates. In Figure 1, three vehicles, namely A, B and C, travel in the same lane. When A suddenly brakes abruptly, both vehicles B and C are endangered, and being further away from A does not make vehicle C any safer than B due to the following two reasons:

- Line-of-sight limitation of brake light: Typically, a driver can only see the brake light from the vehicle directly in front1. Thus, very likely vehicle C will not know the emergency at A until B brakes.
- Large processing/forwarding delay for emergency events: Driver reaction time, i.e., from seeing the brake light of A to stepping on the brake for the driver of vehicle B, typically ranges from 0.7 seconds to 1.5 seconds, which results in large delay in propagating the emergency warning.

Emerging wireless communication technologies are promising to significantly reduce the delay in propagating emergency warnings. The Dedicated Short Range Communications (DSRC) consortium2 is defining short to medium range communication services that support public safety in vehicle-to-vehicle (V2V) communication environment.

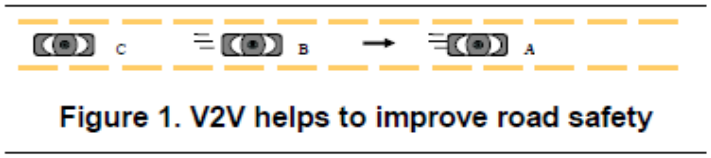


Figure 1. V2V helps to improve road safety

Using V2V communication, in our previous example, vehicle A can send warning messages once an emergency event happens. If vehicles B and C can receive these messages with little delay, the drivers can be alerted immediately. In such cases, C has a good chance of avoiding the accident via prompt reactions and B benefits from such warnings when visibility is poor or when the driver is not paying enough attention to the surroundings. Thus, the vehicle to- vehicle communication enables the cooperative collision warning among vehicles A, B and C.

Even though V2V communication may be beneficial, wireless communication is typically unreliable. Many factors, for example, channel fading, packet collisions, and communication obstacles, can prevent messages from being correctly delivered in time. In addition, ad hoc networks formed by nearby vehicles are quite different from traditional ad hoc networks due to high mobility of vehicles.

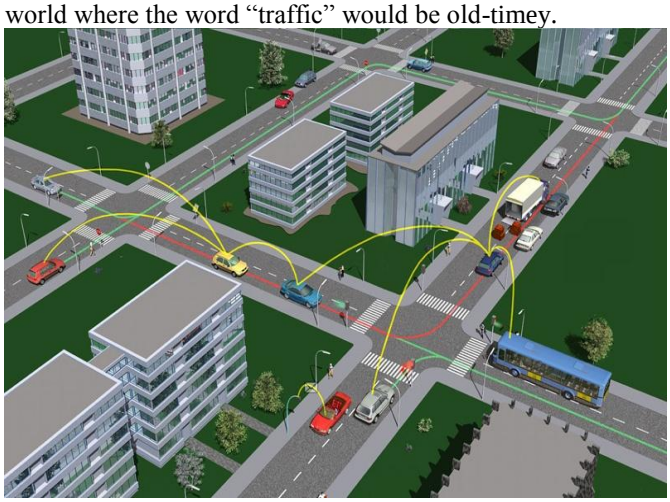
A Vehicular Collision Warning Communication (VCWC) protocol is discussed in this project. Major contributions of this Project include:

- Identifying application requirements for vehicular cooperative collision warning.
- Achieving congestion control for emergency warning messages based on the application requirements.

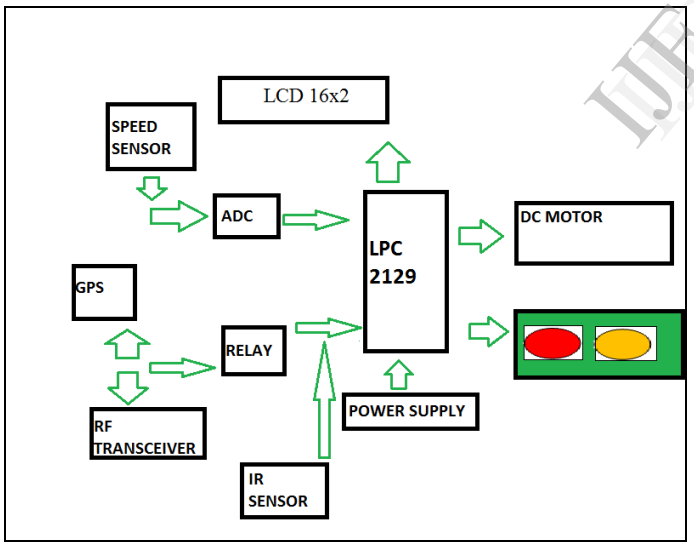
III. PROPOSED SYSTEM

Wireless communication could also lead to a more sustainable transportation system. Think of it like this: When there's an accident, it creates congestion. That results in billions of gallons of fuel wasted each year, not to mention the time you're wasting while sitting in traffic. Unlike radar-based safety features, which spot hazards in the driver's line of sight, an advanced Wi-Fi–based radio system allows a full-range, 360-degree detection of potentially dangerous situations, particularly useful when the driver's vision is obstructed. Intelligent vehicles would talk wirelessly through the Wi-Fi signals, or dedicated short-range communications like RF on a secured channel allocated by the Federal Communications Commission.

For example, you could be alerted if your vehicle is headed for a collision at an intersection, when a vehicle ahead stops or slows suddenly or when a traffic pattern changes on a busy highway. The system also could warn you of a risk of collision when changing lanes, approaching a stationary or parked vehicle or if another driver loses control. And traffic could be avoided through a network of intelligent vehicles and infrastructure that would process real-time traffic and road information to allow drivers to opt for a less congested route. You know how kids these days don't really grasp how people used typewriters before the advent of computers? Imagine a world where the word "traffic" would be old-timey.



IV. Architecture of Thesis



Design implementation focuses on how the solutions were implemented. This section also describes any problems encountered, changes to the original solutions, and discusses alternative designs. Each car side, GPS & RF is connected to UART through a relay circuit. LCD is interfaced to **LPC2129** P1.2, 3, 4, 5 are connected for the data pins of 16x2 LCD. Register select and Enable pins of LCD are connected for the ports P1.0, 1. 9v is given to the **LPC2129** board along with RF Transceiver & GPS.

(a) LPC2129 Microcontroller :-The LPC2129 is an 32 bit microcontroller with 256KB ROM and 16k bytes of data RAM. It is of 64 pin IC which supports serial Communication.

(b) GPS :- The Global Positioning System (GPS) is a space-based global navigation satellite system (GNSS) that provides reliable location and time information in all weather and at all times and anywhere on or near the Earth.

(c) IR Sensor :- This sensor has a definite range. If there is no obstruction in line of sight then active low signal is sent by the sensor & if there is any obstruction in line of sight then active high signal is sent by the sensor. This sensor works on the principle of reflection of IR rays.

(d) RF Transceiver:- In this technology the communication between devices is done through radio frequency, transmission & reception. Hence name given RF Transceiver. The RF has a definite range of its operation. Through this we can send string of symbols.

Working Design

- Two cars are communicating to each other through RF i.e. Radio Frequency.
- Each car would be receiving its location through GPS & will send the Driver vehicle information to nearby cars.
- Driver vehicle information consists of car's location, car speed & where it is going i.e. its Line of sight.
- On the basis of received data from other car through RF, it will manipulate with its own location.
- According to the result of manipulation it will warn the driver and apply automatic brakes.

V. Application

- Vehicle collision avoidance to prevent threat to life
- Blind Spot Information System (BLIS®) with cross-traffic alert rely on radar Sensors to detect vehicles or objects close to the vehicle.

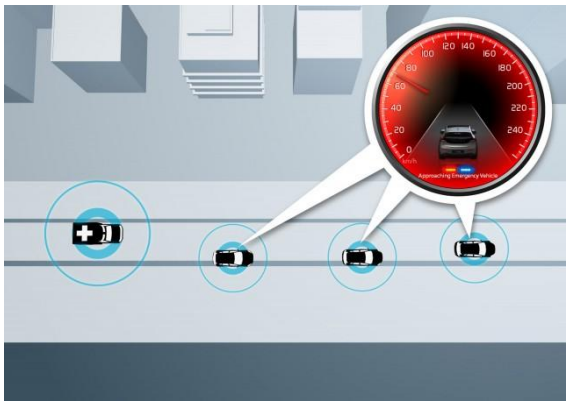
VI. FUTURE ENHANCEMENTS

- Wi-Fi is more efficient than RF which will reduce the transmission time of Emergency warning messages.
- Wi-Fi & GPS can be replaced with smart phones.

VII. CONCLUSION

This Project proposes a Vehicular Collision Warning Communication (VCWC) protocol to improve road safety. In particular, it defines congestion control policies for emergency warning messages so that a low emergency warning message delivery delay can be achieved and a large number of co-existing abnormal vehicles can be supported. It also introduces a method to eliminate redundant emergency warning messages, exploiting the natural chain effect of emergency events.

➢ VEHICLE WARNING SYSTEM



VIII. ACKNOWLEDGEMENT

We sincerely thank Prof. G.N. Kodanda Ramaiah, HOD ECE, KEC, Mr T.V.S. Gowtham Prasad, Associate Professor, KEC, Mr. Venkata Ramana, Associate Professor, KEC, and the Staff members of ECE Dept.KEC, family members, and friends, one and all who helped us to make this paper successful.

REFERENCES

[1] Dedicated Short Range Communications (DSRC) Home. http://www.leearmstrong.com/DSRC/DSRCHomeset.html.
[2] L. B. Michael and M. Nakagawa. Non-Platoon Inter-Vehicle
[3] Communication Using Multiple Hops. *IEICE Trans. Commun*, E82-B (10), October 1999.
[4] www.8051projects.com
[5] www.car-to-car.org

ABOUT AUTHORS

[1] Ms.J. Raga priya received the B.Tech degree from SITAMS, Chittoor Dist, A.P, and currently persuing M.Tech with Embedded Systems specialization in KEC, Chittoor Dist, A.P, India. Her Interested areas are Communications, Embedded and Electronics.

[2] Dr.G.N. Kodanda Ramaiah, HOD-ECE, KEC is working as a Professor in Dept. of ECE, KEC, Kuppam, Chittoor Dist, A.P, and India. He has vast years' of experience in teaching field. His interested areas are speech recognition and Embedded systems. He has co-authored for several Conference Papers. He thought several subjects for under graduate and post graduate students.