

Implementation of Li-fi in Intervehicular Communication for Accident Avoidance

R. AKSHAYA¹, T. DEEPIKA², P. K. LEKSHMI³, R. KANMANI⁴

^{1,2} Dept. of Electrical and Communication Engineering, Coimbatore Sri Ramakrishna Institute of Technology

Abstract – This project serves as a savior to avoid road accidents. Here a recent technology called Li-Fi (Light Fidelity) is inculcated. Light fidelity is the latest technology that uses the fastest source i.e., light for communication. This is cost efficient and an effective way. In day to day life we use LED based light for illumination, so it can be used for communication because of advantage like fast switching and safe to human vision. It assists the drivers to take decision correctly and avoid collision. Using this Li-Fi the data is transmitted from one vehicle to another. Ultrasonic sensor is used to measure the distance between two vehicles. In this proposal the automatic brake is applied when the driver is alike. If a boozier is driving the vehicle, it's detected using alcohol sensor and also data are transmitted to receiver vehicle, buzzer rings and displayed about the existing scenario as programmed. Vehicle to vehicle communication has a bright future and act as a complement to the present RF communication by achieving higher efficiency. In this speedy world this technology suits the most.

Indexed Terms: Alcohol sensor, Automatic brake, Li-Fi, Ultrasonic senso, Vehicle-to-vehicle communication

I. INTRODUCTION

In the last century a new wireless world emerged with the introduction of radio. It was the first wireless technology to use light for transmission of voice. The invention of radio communication was given higher priority. After the invention of mobile phone, radio communication has become very popular. Most of the countries in the world has an alarming record in number of death due to more number of accidents. These accidents can be avoided by using vehicle to vehicle communication technology. Vehicle communication can be classified into two types. One is vehicle to vehicle communication and another is vehicle to infrastructure communication. We have selected car as a experimenting vehicle. The latter deals with the communication between the car and the road side infrastructure. This contrive is to conveyance basic safety information between the two vehicles and to alert the drivers regarding the consequences. The setup is assisted with an ultrasonic

sensor to measure the inter vehicular distance. Here the arduino masters the entire circuit and is programmed to notify the driver about the destructions. It also detects the obstacles even in night time. The second vital component is the alcohol sensor. When the person who drives the car is drunk, the buzzer rings and the brake is automatically applied to the alike person's car as well as the data is transferred to the receiver car. Receiver car is the one which gets into the line of sight.

II. IDENTIFY, RESEARCH AND COLLECT IDEA

Husain Fidvi ET. al have developed vehicle to vehicle communication without the need of wifi or 3G wireless network and GPS. Then in this flight PIC sonar was used that sends short pulse which is undetectable by human ear. Programmable Interface was utilized. The time between the transmission and reception of echo will give the distance between the vehicles. It is detected using microcontroller. The advantage of light has paved a way for several research works. The light has ample frequency spectrum and so its adopted for short-range wireless communication. In this work inexpensive mechanism for vehicle to vehicle has been aimed. Recently LED based optical wireless system is enforced. Now a days VLC (visible light communication) is gaining vital importance. LED can be modulated at high speed and this serves as a huge advantage. Light-Fidelity is the transmission of information utilizing detects light by sending information through a LED light that fluctuates quicker than the human eye.

Rahul R. Sharma, Akshay Sanganal, Sandhya Pati "Usage of A Simple Li-Fi Based System" manages the most fundamental Li-Fi based framework to exchange information from one Personal computer to another personal computer [6]. The Paper comprises

mainly LED bulbs that means of connectivity by sending data through light spectrum in an optical wireless medium for signal propagation. The usage of LED removes the need of complex wireless networks and protocols. In this work, the trend concept of Light-Fidelity had been introduced along with existing techniques and the classical trends used for vehicle to vehicle communications. The proposed system is cost effective it reduce the accident and also this paper focuses on LiFi as a sensible complement to the existing RF based communication. For these purposes, we thoroughly analyzed the difference between VLC and LiFi, the issues in RF based communication that can be addressed by LiFi, the working mechanism of LiFi, its pros and cons and finally we studied the application of LiFi. Using Li-Fi transmitter and receiver kit, it determine to enhance the quality of Intelligent Transportation system with the help of Visible light communication technology. The Vehicle to vehicle communication system consisting of the Li-Fi transmitters placed on a front vehicle and the Li-Fi receiver is placed on a back vehicle. The main aim of the paper is to design a module for communication between intervehicles and to conserve safe distance between vehicles and accident will be prevented. In this paper the implementation of the new digital communication technology that uses visible light, known as Li-Fi (Light Fidelity) or VLC (Visual Light Communication), and apply it for inter- vehicle communication. The proposed system of this project use of Li-Fi Technology and mainly of LED bulbs as a means of connectivity by sending data through optical spectrum as an optical wireless medium for signal propagation.

III. STUDIES AND FINDINGS

The main objective of our project is to develop a smart system that can track the vehicle, and implement advanced technologies in cars for making it more intelligent and interactive for avoiding accidents on roads using light fidelity mechanism. Four main constraints must be achieved accordingly

- Acquiring and transmitting data.
- Analysis of speed.
- Automatic braking system.
- Distance mapping.

The proposed system of this project is inter-vehicles communication using optical wireless model having high data rates and the transmission distances is near about 1m to 2m. The transmission of information from one vehicle to another vehicle required LED. Using switching control system, input data is given for the transmitter section. According to the data, the microcontroller generates a stream of 1s and 0s its translate the data in binary. This paper we are presenting the communication between inter-vehicle using light as medium and maintain safe distance between vehicles and to avoid accidents. Ultrasonic sensor is measure the distance between two vehicles, if the vehicle distance is less than respective threshold value, the data is transmitted to the receiver vehicle and buzzer also rung. Alcohol sensor is to check the driver is intoxicated or not, if the driver is intoxicated a buzzer is activated and automatic brake will apply. Here the block diagram of the proposed is given below fig 1

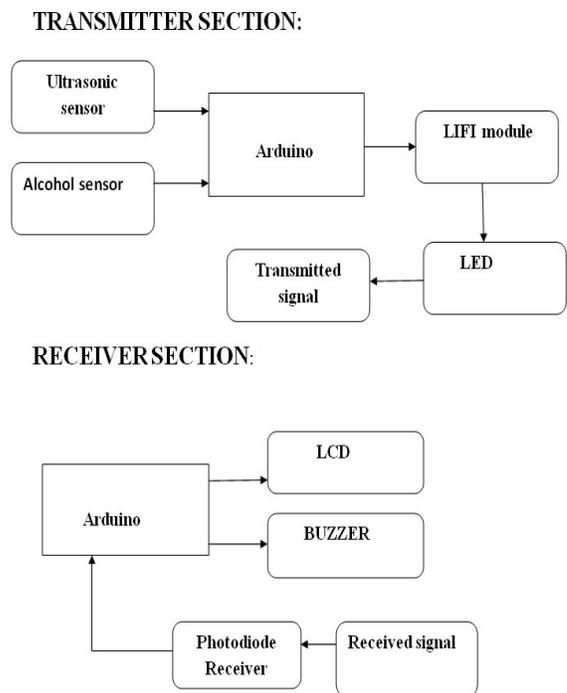


Fig. 1: Block diagram for proposed system

Here important component of this paper

1. LIFI MODULE:

Li-Fi is Light Fidelity it provides transmission of data through light by using led that varies in intensity faster the human eye. The heart of this technology is a high brightness LED. fig 2 The transmitter consist of light source and receiver circuit receive the data

via light waves. Compared to radio waves this is friendlier to humans as it does not emit immense radiation.

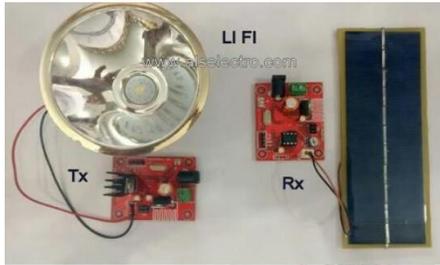


Fig. 2: Li-Fi module

2. ULTRASONIC SENSOR (HC-SR04):

This uses sound instead of light for detection. The operation includes when an electric pulse with high voltage is applied to the ultrasonic transducer it vibrates in a specific spectrum of frequency and generate the burst of sound waves. If the object comes into the line of sight sound reflects as echo and an electric pulse is generated.



Fig. 3: Ultrasonic sensor

The distance is measured with the help of time taken between the transmission and reception. fig 3

3. ALCOHOL SENSOR (MQ-2):

The alcohol sensor detects the presence of alcohol in air. MQ-3 is a gas sensor for detection of alcohol. It consists of tin dioxide and a heating element inside the tubular casing. The external surface of the sensor is bounded by the stainless steel net and a connection port is on the posterior end fig 4. When this sensor breaths the ethyl alcohol, it gets oxidized to acetic acid and passes through the heating element. The decline in resistance will intimate the presence of alcohol.



Fig. 4: Alcohol sensor

4. ARDUINO NANO:

It is the software firm and open source hardware user community that designs and manufactures single board micro controller. They can build microcontroller for building interactive objects that can both sense and control both physically and digitally. FLASH and EEPROM are used for storage. Micro controller is programmed using accent of features form c and c++.

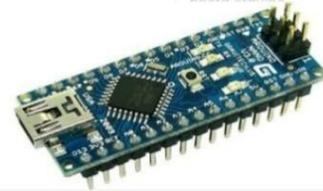


Fig. 5: Arduino

5. BUZZER:

Buzzer is the device which produces the sound under certain constrains as specified by the user. It is also called as beeper and is used as audio signaling device



Fig. 6: Buzzer

IV. ALGORITHM

- Step 1: Initialize the LCD, Arduino, and the Li-Fi Module
- Step 2: Entire sensor module is ignited and data from the various sensor are transfer to the controller
- Step 3: All the data transmitted of processed and communicated via LED
- Step 4: Ultrasonic sensor sense the data and send the data to controller. Alcohol sensor sense and buzzer runs when condton is met.
- Step 5: If the vehicle reaches the line of sight the warning message is transferred to the receiver vehicle and also buzzer runs

Step 6: If the driver is intoxicated the buzzer rings ones again and the brake will be applied automatically.

V. EXPERIMENTAL SETUP

The Transmitter section is inculcated with various sensors interfaced with the control unit. The Top view of the front vehicle consists of an LCD and buzzer so that driver receives the alerting message fig 7. He may become cautious of the upcoming hazardous consequences. The Posterior portion consist of ultrasonic sensor to measure the Intervehicular distance fig 6. An alcohol sensor is implemented to find whether the driver is intoxicated by alcohol .In both the situation safety related message are transmitted via LED and displayed in LCD, so that the front vehicle can be intimated. Once the data is transmitted the brake is automatically applied in the case of intoxication of driver .When the speed or distance crosses the line of sight, the speed is automatically controlled with the help of distance indicated by the ultrasonic sensor. This helps us to avoid accidents to a greater extent and in turn the mortality rate is reduced.

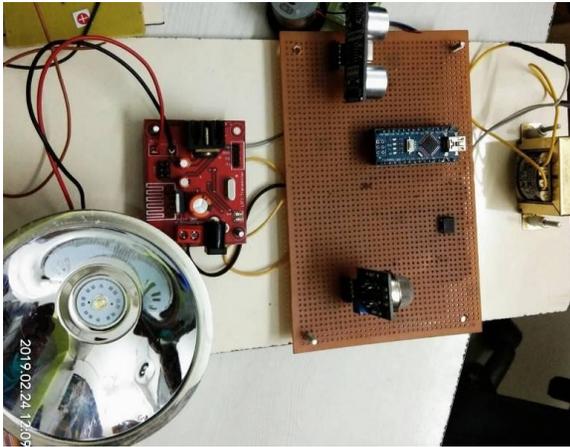


Fig. 7: Transmitter section

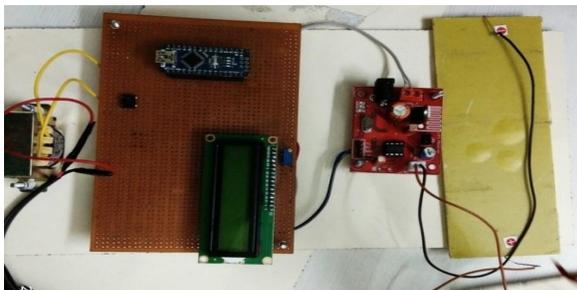


Fig. 8: Receiver Section

VI. CONCLUSION

The transmission of data has been made easier and faster by using Li-Fi .This is effective to avoid road accident .Every single LED will act as the wifi hotspot to transmit data. Thus Li-Fi is devoid of radio wave that creates harmful effect for living. The Future scope of this project is the extension to vehicle to infrastructure communication to pave a way for smart city.

VII. ACKNOWLEDGEMENT

Our heartfelt thanks are to the personalities for helping us to bring out this project in a successful manner.

We would like to express our sincere gratitude and hearty thanks to our principal Dr. M. Paulraj for providing all kind of technologies to bring out excellence for us.

We express our profound thanks to Dr. H. Mangalam, Head of the Department, Electronics and Communication Engineering for extending her kind help in using all facilities in labs. We extend our thanks to our project coordinator Dr. D. Binu, Assistant Professor. Department of Electronics and communication Engineering

We take immense pleasure to thank our beloved project guide MS. R. Kanmani, Assistant Professor, Department of Electronics and communication Engineering for spending her valuable time in guiding us and for her constant encouragement through the success of this project.

Finally we would like to express our heartfelt thanks to our beloved parents for their blessing, our parents for their help and wishes for successful completion of this project

REFERENCES

- [1] D. N. S. Ravikumar & G. Nagarajan, "Vehicle to Vehicle Communication using Li-Fi Technology", International Journal of

- Pure and Applied Mathematics ,Volume 119
No.7,2018 pp.519-522
- [2] Mr. T. N. Prabhu & B. Mohankumar, "A Light Fidelity Mechanism for Accident Detection in Intelligent Transportation System", Journal of Network Security Computer Networks, Volume 4 Issue 3,2018 pp.10-16
- [3] Samreen N. Shaikh & Dr. S. R. Patil, "Vehicle to Vehicle Communication for Smart cities", International Journal of Advanced Engineering, Management and Science, Volume 2 Issue-9,2016 pp.1574-1578
- [4] Dahmani Mohammed & Meche Abdelkrim, "International Conference on Control Engineering and Information Technology", December 2016 pp.16-18
- [5] Adharsh. M & Ashok kumar. M , "Vehicle to Vehicle Communication using Light Fidelity", International Journal of Computer Application, Volume 164- No 2, April 2017 pp.5-8
- [6] Rashmi Thakur, Sneha Balkawade & Vishakhmore," Intervehicular communication using Li-Fi", International journal for applied Science and Engineering Technology", Volume 6 Issue I, January 2018 pp.1210-1212
- [7] Sushant Patil & Shubhankar Mali, "Vehicle to Vehicle communication system using Li-Fi technology", IJSART Volume- 3 Issue-6,2017 pp. 34-37