

Advanced V2V Communication using Li-Fi Technology

Sri Muthuvaramahalaxmi P¹ Sankari D² Gowthaman K³ Deepthi P J⁴ N.Vigneshwaran⁵

^{1,2,3,4}UG Student ⁵Assistant Professor

^{1,2,3,4,5}Department of Electronics & Communication Engineering

^{1,2,3,4,5}Knowledge Institute of Technology, Salem, India

Abstract— The main objective of this project is communicating vehicle to vehicle using LI-FI technology. LI-FI transmits data faster than WI-FI. By using this technology we can avoid accident and crash between vehicles. Using the concept of LI-FI two vehicles are communicated with the help of LEDs bulbs in transmitter and receiver circuits. The latest technology called as LI-FI which has been developing a lot in few years helps to reduce the road accident and death count of human. The sensors like ultrasonic sensor which is used to measure the distance, Eye blink sensor is used to detect the driver sleeping in case of Emergency, speed sensor is used to find the speed of other vehicle and alcohol sensor is used to find drunken and drive. Using this LI-FI technology all the sensor data is transmitted from one vehicle LI-FI transmitter to another vehicle LI-FI Receiver. The GPS is used to find the exact location of vehicle in case of accident and emergency message sent to ambulance and their relatives via using GSM modem. The RFID reader is used to read restricted speed limit zones like, school, colleges, hospital to inform the driver to limit the speed.

Keywords: LI-FI, LEDs, ultrasonic sensor, alcohol sensor, eye blink sensor, speed sensor, RFID

I. INTRODUCTION

Li-Fi technology is high intensity brightness LED,,s. Light emitting diodes can be made to switch on and off faster since operating speed of LED,,s is even less than one μ s, than the human eye can detect, causing the light source to be appear continuously. This on-off activity cannot be seen with the naked eyes of the human and that enables a kind of data transmission using binary codes. Switching on and LED is a logic 1, switch off is a logic 0, the data can be encoded from the light wave and the exact information can be achieved. Modulation is so fast that human eye does not notice. A light sensitive device (photo detector) receives the signal and converts it back into original data. This method of using the light waves and frequency in it and sending the required data refers as Visible Light Communication (VLC) though its potential to compete with conventional Wi-Fi has inspired the popular characteristics Li-Fi. Visible Light Communication Li-Fi is one of the very efficient version of Wi-Fi, which is based on visible light communication (VLC). This Li-Fi uses light for data communications medium using visible light waves as optical carrier for data transmission and illumination.

II. PROPOSED SYSTEM

The working proposed system is based on LIFI technology it will transmit a data faster than WIFI. Initially the ultrasonic sensor is find distance between two vehicles. The speed sensor is used to find speed of other vehicle it will come front or back to the vehicle based on this speed sensor

measure the speed. The alcohol sensor is used to find the vehicle is driver is drink and drive. The Eye blink sensor is used to find the driver is sleeping or not. In case of driver is sleeping in case of emergency the emergency alarm is activated. The one of the sensor value going abnormal it will communicate with vehicle to vehicle using LIFI transmitter and LIFI Receiver and the emergency alarm is activated to avoid a two vehicles crash or accident to provide safety of travelling. The LIFI communication is happened using vehicle lights the date transmitted and received each vehicle LIFI transmitter and receiver. The GPS is used to exact location of vehicle communication in case of accident the GPS find the location and emergency message sent to Ambulance mobile number and their relatives via using GSM modem. The RFID reader is used to read a restricted speed limit zones like, school, colleges, hospital to inform the driver to limit the speed.

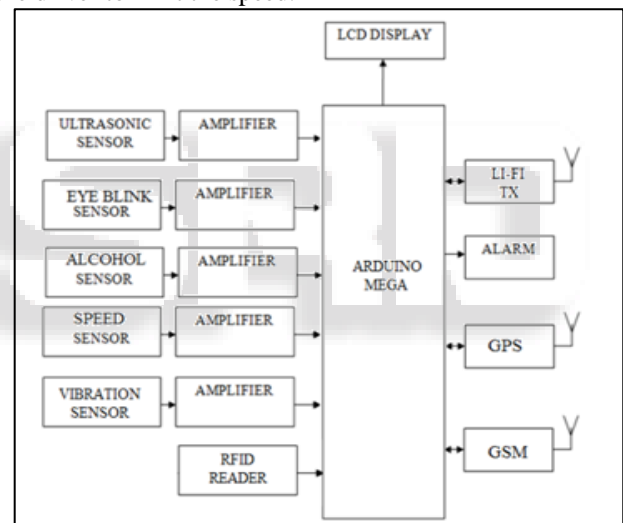


Fig. 1: Block Diagram of Transmitter

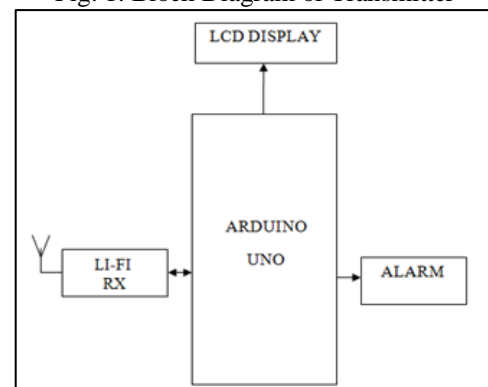


Fig. 2: Block Diagram of Receiver

III. SYSTEM SPECIFICATION

A. Hardware Requirement

- Arduino Mega

- LCD DISPLAY
- Eye Blink Sensor
- Ultrasonic sensor
- Speed sensor
- Alcohol sensor
- Vibration Sensor
- RFID Reader and Tag
- GPS
- GSM
- Alarm
- LIFI-Transmitter and Receiver

B. Software Requirement

- ARDUINO IDE

IV. DESCRIPTION

A. Arduino Uno

Arduino/Genuino Uno is a microcontroller board based on the ATmega328P . It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.



Fig. 3: Arduino

B. LCD Display

Liquid crystal displays (LCDs) have materials which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered form similar to a crystal.



Fig. 4: LCD Display

A liquid crystal display (LCD) is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals (LCs). LCs do not emit light directly.

n front of a light source (backlight) or reflector to produce images in colour or monochrome. The earliest discovery leading to the development of LCD technology, the discovery of liquid crystals, dates from 1888. By 2008, worldwide sales of televisions with LCD screens had surpassed the sale of CRT units.

C. Ultrasonic Sensor

Ultrasonic sensors (also known as transceivers when they both send and receive) work on a principle similar to radar or sonar which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object.



Fig. 5: Ultrasonic sensor

D. IR Sensor

A InfraRed sensor(IR sensor) is an electronic device that measures infrared (IR) light radiating from objects in its field of view.Apparent motion is detected when an infrared source with one temperature, such as a human, passes in front of an infrared source with another temperature, such as a wall.

E. Alcohol sensor

Blood alcohol content (BAC), also called blood alcohol concentration, blood ethanol concentration, or blood alcohol level is most commonly used as a metric of alcohol intoxication for legal or medical purposes.

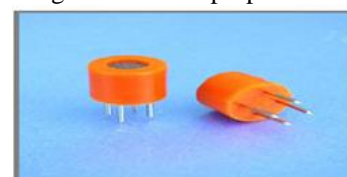


Fig. 6: Alcohol Sensor

F. Vibraton Sensor

A piezoelectric sensor is a device that uses the piezoelectric effect to measure pressure, acceleration, strain or force by converting them to an electrical signal. In the flat region, the sensor can be modeled as a voltage source in series with the sensor's capacitance or a charge source in parallel with the capacitance. For use as a sensor, the flat region of the frequency response plot is typically used, between the high-pass cutoff and the resonant peak. Two main groups of materials are used for piezoelectric sensors: piezoelectric ceramics and single crystal materials.

G. Alarm

An alarm gives an audible or visual warning about a problem or condition. A buzzer or beeper is a signaling device, usually electronic, typically used in automobiles, household appliances such as a microwave oven, or game shows



Fig. 7: Alarm

H. Global Positioning System

The applications of GPS, vehicle tracking and navigational systems have brought this technology to the day-to-day life of the common man. Today GPS fitted cars; ambulances, fleets and police vehicles are common sights on the roads of developed countries. Known by many names such as Automatic Vehicle Locating System (AVLS), Vehicle Tracking and Information System (VTIS), Mobile Asset Management System (MAMS), these systems offer an effective tool for improving the operational efficiency and utilization of vehicles.



Fig. 8: GPS

I. GSM Modem

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. For the purpose of this document, the term GSM modem is used as a generic term to refer to any modem that

supports one or more of the protocols in the GSM evolutionary family, including the 2.5G technologies GPRS and EDGE, as well as the 3G technologies WCDMA, UMTS, HSDPA and HSUPA.

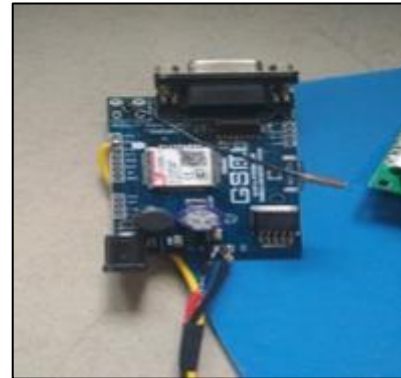


Fig. 9: GSM

J. RFID

The Transponder or tag is fixed on to the baggage to be tracked in the airport. When this tag comes within the range of the reader or integrator, the tag is energized. Now, this tag transmits the data to the reader. This data is automatically sent to the micro-controller for further processing. The time at which the tag is sensed is sent to the micro-controller from the RTC (Real Time Clock). These details are displayed on LCD (Liquid Crystal Display).

V. SOFTWARE (ARDUINO IDE)

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them. Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom right hand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

A. Advantages

- Compatible size.
- Low cost.
- Reduce the security tensions.

B. Applications

- Used in banks, houses and industries for security system.

C. Implementation

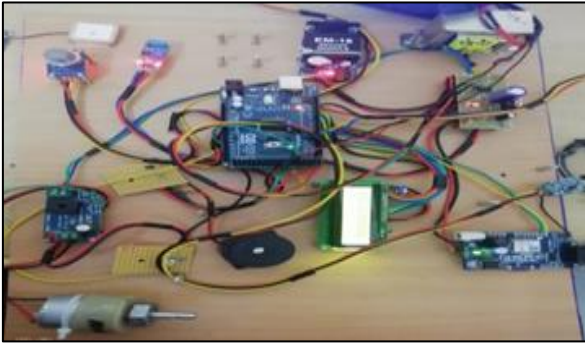


Fig. 10: Implementation of the Transmitter

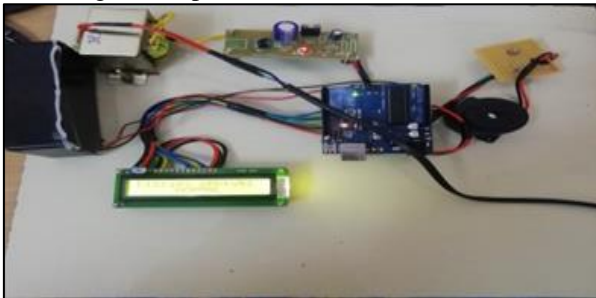


Fig. 11: Implementation of the Receiver

D. Output

SPEED	$\leq 80\text{km/hr}$ Is indicated as normal	$> 80\text{km/hr}$ Is indicated as over speed
DISTANCE	If distance between two vehicle is $> 20\text{cm}$ then the alarm does not rings	If distance between two vehicle is $\leq 20\text{cm}$ then the alarm rings
ALCOHOL DETECTION	If ethanol is not detected in blood concentration then "ALCOHOL NOT DETECTED" message is displayed	If ethanol is detected in blood concentration then "ALCOHOL DETECTED" Message is displayed

- Eye blink sensor detects and displays "DRIVER IS SLEEPY" message.
- In case of accidents, "ACCIDENT OCCURRED" message is sent to the ambulance, police station and neighbor phone numbers along with the location of the accident occurred place.
- TRAFFIC SIGN BOARDS are identified using RFID and the corresponding sign is displayed along with the buzzer sound.

VI. CONCLUSION

The main feature of this paper is the LIFI Technology. It transmits the data faster and communication is happened quickly. The safety travelling is must for every human. The accident death count is increasing day by day. For this reason we are creating this project to provide safety travelling. In this effective way of designing a vehicle to vehicle communication, avoids the chance of accident.

VII. FUTURE ENHANCEMENT

In this work it is concluded that the possibilities are numerous and can be explored further this technology is in manufacturing process to produce every bulb to become a Wi-Fi hotspot to transmit wireless data. In the WI-FI we come to know that the speed and the jamming are really take place which is today's problem because number of users are increasing. But this traffic problem get reduces to a great number by using LI-Fi technology and this will proceed towards the cleaner, greener, safer and brighter future in this world without radio wave, because radio waves create a harmful effect for living thing, but Li-Fi is the optical wireless communication for data, audio and video streaming in LEDs.

In future this system helps the communication much easier than other system. It involves Li-Fi communication, we can use these system in places such as Industries, offices etc.

REFERENCES

- [1] "Toyota and Lexus to launch technology to connect vehicles and infrastructure in the U.S. in 2021," accessed: April16,2018.[Online]. Available:<http://corporatenews.pressroom.toyota.com/releases/toyotaand-lexus-to-launch-technology-connect-vehicles-infrastructure-in-u-s-2021.htm>
- [2] "Cadillacs CTS sedans can now talk to each other, which may make driving way less deadly," accessed: March 9, 2017. [Online]. Available:<https://www.theverge.com/2017/3/9/14869110/cadillac-ctssedan-v2v-communication-dsrc-gm>
- [3] "VW will offer V2X wireless in Europe by 2019," accessed:March9,2017.[Online]. Available: <https://www.theconnectedcar.com/>
- [4] K. A. Hafeez, L. Zhao, B. Ma, and J. W. Mark, "Performance analysis and enhancement of the dsrc for vanet's safety applications," IEEE Transactions on Vehicular Technology, vol. 62, no. 7, pp. 3069–3083,2013.
- [5] A. Rostami, B. Cheng, G. Bansal, K. Sjoberg, M. Gruteser, and "Kenney," "Stability challenges and enhancements for vehicular channelcongestion control approaches," IEEE Transactions on Intelligent Transportation Systems, vol. 17, no.10,pp.2935–2948,2016.
- [6] SAE International, "On-board system requirements for V2V safety communications," Technical Report Society of AutomotiveEngineering,2016.
- [7] R. Chen, W.-L. Jin, and A. Regan, "Broadcasting safety information in vehicular networks: issues and approaches," IEEEnetwork,vol.24,no.1,2010.
- [8] H. Hartenstein and L. Laberteaux, "A tutorial survey on vehicular adhoc networks," IEEE Communications magazine, vol.46,no.6,2008.
- [9] P. Gupta and P. R. Kumar, "The capacity of wireless networks," IEEETransactions on information theory, vol. 46, no.2,pp.388–404,2000.
- [10]C. Campolo and A. Molinaro, "Multichannel communications in vehicular ad hoc networks: a survey," IEEE CommunicationsMagazine.