

# LI-FI BASED COMMUNICATION BETWEEN VEHICLES TO AVOID ACCIDENTS ON ROAD

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**Abstract** - High number of accidents are having placed all over the world due to the collision between automobile vehicles. More than 1.2 million peoples died in road accidents in 2020, according to the report of the world health organization (WHO) i.e., Car accident statistics are jarring at night. Despite 60 percent less traffic on the roads, more than 40 percent of all fatal car accidents occur at night. Sunlight provides the strongest light source. vehicle and people safety are very important. The idea here is proposing to reduce the misshapes of accidents in our daily lives and avoid accident between vehicles. There are various reasons for such adverse condition that results in death or disabilities. This involves sudden loss of driver's conscious, brake failures, loss of traction on tires. These dangerous situations can be overcome if there is communication protocol used in all vehicles on the road and depending on their position drivers control the vehicles to avoid road accidents. There are various vehicular methods and protocols are available. These radio frequency (RF) based communication idea has some limitations i.e., data interference, spectrum break and security issues. These drawbacks can be overcome by using Visible Light Communication. this produces high frequency bandwidth, standard security, interference reduction, and highspeed data rate. Visible Light Communication is a data communication system which uses visible light for high-rate data transmission and receiving operation. This method of technology is called as Light Fidelity (Li-Fi). This presents the highly accurate method to avoid accidents between two vehicles.

**Index Terms:** Ultra sonic sensor, Arduino UNO, LCD panel, Buzzer, LIFI Rx&Tx etc.,

## 1. INTRODUCTION

The field of science and technology is rapidly moving towards its advancement. The human being is utilizing this change of technology for the comfort and time saving. Progress varies from wired to wireless communication; and in wireless communication human being has moved one step on upstairs and invented Li-Fi, [5] light fidelity technology. Harald Hass is known as the father of Li-Fi from university of

Edinburgh who told about existence of this technology in his TED [7] talks. According to Harald, the heart of this technology lies in the intensity and the potential of light emitting diodes. Li-Fi is an upcoming technology in near future which uses visible light spectrum for transmission of data which is 10,000 times more than the band used in Wi-Fi technology [9]. As large number of users are demanding for Wi-Fi thus RF spectrum is constantly being used and resulting in clogged signal. The solution is to use Li-Fi technology. The idea is to use light bulbs at our homes as a source for transferring data. Road accidents are resulted in the loss of human lives. These accidents occurred due to the collision between vehicles. Studies reveals, majority of accidents are due to following vehicle are unaware of the actions of vehicle ahead. Collision can be avoided if the vehicle ahead can communicate with the rear vehicle. There are many techniques to implement such communication prototype i.e., 5.9 GHz Dedicated Short-Range Communication DSRC [11] wireless in which two vehicles can communicate at the frequency of 5.9 GHz and Vehicular Ad-Hoc network which is the application of MANETs [10] in which two vehicles can communicate by wireless fidelity. The purpose of using Li-Fi is to implement a system that is cost effective and has high data rate.

## 2. PROJECT OBJECTIVE

The objective of this project is used to avoid the accidents between vehicles at night time [13] especially in highways by using Arduino programming and li-fi (light fidelity).

## 3. PROPOSED SYSTEM

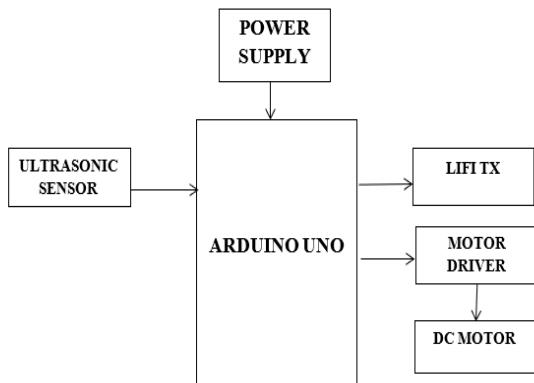
In our proposed system, vehicles are communicating each other, so that the possibility of accident happens less.

Here, we have Visual light-based[12] communication between vehicles so that, the vehicle informs to other.

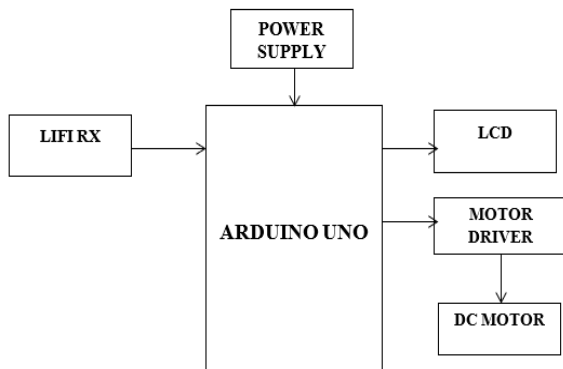
Arduino ide.  
Embedded c

#### 4. BLOCK DIAGRAM

TRANSMITTER:



RECEIVER:



#### 5. ADVANTAGES

The vehicle itself sends operational information to the vehicle near by it.  
Faster response.

#### 6.SYSTEM SPECIFICATION

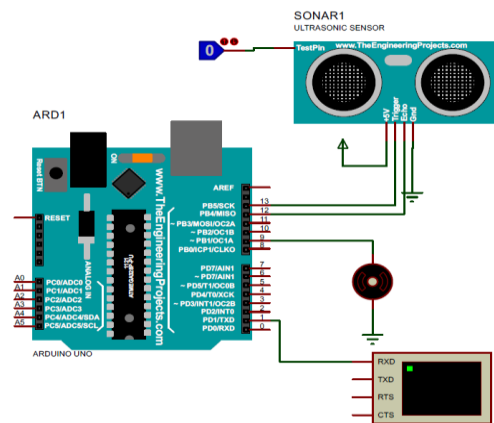
##### 6.1 HARDWARE REQUIREMENTS:

- Arduino uno (2).
- Lcd (2).
- Motor driver (2).
- Dc motor (2).
- Li-fi rx & tx.
- Buzzer.
- Ultrasonic sensor.

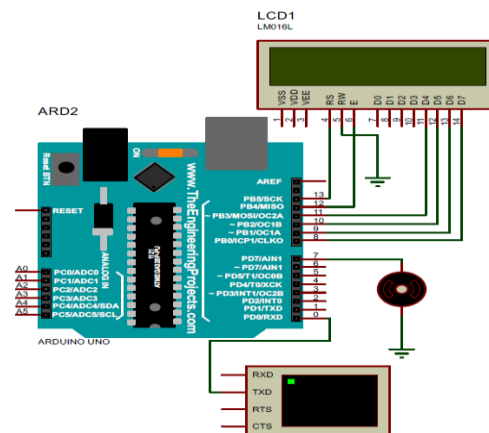
#### 7. SOFTWARE REQUIREMENTS:

#### 8. CIRCUIT DIAGRAM:

##### TRANSMITTER



##### RECEIVER



#### 9. WORKING PRINCIPLE

On the transmitter circuit, the ultrasonic sensor is used to detect the obstacle with the soundwaves and it is the input to the controller and immediately alerts the driver with a buzzer sound.

The ultrasonic sensor detects the obstacles for a distance of 10m. The buzzer used in this proto-type is piezo electric[14] buzzer of operating voltage 3v – 220v.

After detecting the obstacle, the controller will reduce the speed of the motor of the vehicle with the help of motor driver.

Now to inform the vehicle that is coming behind us, we use LIFI (Light fidelity) technology. We use a LED on the transmitter circuit to pass the information.

On the receiver circuit, a photo diode is used which gets the information from the transmitter's [16]LED.

So, the controller of the receiver circuit gets the information that the vehicle that is in front of them have stopped and it is programmed to reduce the speed of the vehicle (receiver circuit).

## 10. RESULT

While driving a car in the highway at night time, if we found the person who is going in front suddenly stops the car then to avoid accident an ultrasonic sensor is used to reduce the speed of our vehicle and a buzzer to alert us. In order to pass the information to the person who is coming behind us we use a LIFI technology and it helps him to reduce the speed of his vehicle in order to avoid any accidents. This LIFI [18]technology can be used in real time to avoid such brutal incidents

## 5. CONCLUSIONS

This project presented the cost-effective method to avoid collision between two vehicles (i.e., front and rear vehicles) by using LIFI technology. The concept of emergence of LIFI technology along with the methodology of V2V communication has been introduced efficiently.

The project presents a simple module of vehicle-to-vehicle communication through visible light communication that can be implemented in future vehicles. The idea of using simple LED[17] lights as transmitter, photo diode as a receiver and simple circuitry makes it cost effective.

At transmitter speed sensor is used to process the speed and brake status of the vehicles to transmit over rear light/brake light of the vehicle. At the receiver side photo diode detects this and the buzzer is alarmed to indicate brake. This module is cost effective. The prototypes of the real time transmitter and receiver circuits [15]are presented.

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