

# Li-Fi Based Vehicle to Vehicle Communication

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**Abstract:** The traffic accident detection is becoming one of the interesting fields due to its tremendous application in intelligent transportation systems. Main causes behind these road accidents are lack of unskilled drivers, consuming alcohol while driving, over speed, sleep while driving. Plenty of solutions have been applied to prevent these road accidents. But most of them were failed to prevent this. In this work we present an advanced accident detection using Li-Fi technology. This work provides an intelligent system for accident prevention and detection for human life safety. That prevention part has various sensors like eye blink sensor, alcohol sensor and ultrasonic sensor. If the sensor detects whether the rider consumes alcohol or the distance between two vehicles is low, then it sends that information to another vehicle which is going in front it. So that they can be wide awake and if the driver is sleeping while driving means then the eye blink sensor detects it and give an alert to the driver.

**Keywords:** Eye blink sensor, Alcohol sensor, Mems sensor, Ultrasonic sensor, Arduino UNO, LCD, Buzzer.

## 1. Introduction

In present days the rate of accidents can be increased rapidly. Due to employment the usage of vehicles like cars, bikes can be increased, because of this reason the accidents can be happened due to lack of unskilled drivers, consuming alcohol while driving, over speed, sleep while driving. To reduce the accident rate in the country this paper introduces an optimum solution using Li-Fi which is coined by Prof. Harald Haas. Li-Fi is a derivative of optical wireless communications (OWC) technology, which uses light from light-emitting diodes (LEDs) as a medium to deliver network, mobile, high-speed communication in a similar manner to Wi-Fi. Although Li-Fi LEDs would have to be kept on to transmit data, they could be dimmed to below human visibility while still emitting enough light to carry data [1]. This is also a major bottleneck of the technology. Technologies that allows as roaming between various Li-Fi cells, also known as handover, may allow to seamless transition between Li-Fi. The light waves cannot penetrate walls which makes a much shorter range, though more secure from hacking, relative to Wi-Fi. Both Wi-Fi and Li-Fi transmit data over the electromagnetic spectrum but whereas Wi-Fi utilizes radio waves, Li-Fi use visible light. The visible light spectrum is 10,000 times larger than the entire radio frequency spectrum

## 2. Literature Survey

- In this paper, “Outdoor Visible Light Communication for

inter-vehicle communication using Controlled Area Network” was done by D. R. Kim. It was proposed to use Programmable Interface Controller (PIC) sonar which sends 40 KHz short pulse of sound that is undetectable by human ear.

- In this paper, “Optical Vehicle-to-Vehicle Communication System using LED Transmitter and Camera Receiver” was done by I. Takai. This paper discussed about to develop a cost effective yet inexpensive mechanism for vehicle to vehicle which is light [2].
- In this research paper, “Visible light communication applied on vehicle-to-vehicle networks” was done by I.S. Santos. This paper discussed about a low-cost Vehicle-to- vehicle Communication (V2V) using the concept of Visible Light Communication (VLC). By modulating the vehicles tail lights [3].
- In this research paper, “A vehicle-to-vehicle communication protocol for cooperative collision warning” was done by X. Yang. This paper proposed the vehicle-to-vehicle communication protocol for cooperative collision warning. Emerging wireless technologies for vehicle-to-vehicle (V2V) and vehicle-to-roadside (V2R) communications such as DSRC are promising to dramatically reduce the number of fatal roadway accidents by providing early warnings.

## 3. Working Module

The proposed system is carried out using LIFI technology. The LI-FI system has been connected to each vehicle. That li-fi system is used to transmit and receive information from a vehicle [4]. Here, in this proposed system we have used various sensor like eye blink sensor, ultrasonic sensor, mems sensor and alcohol sensor. These sensors have been connected with a microcontroller to each vehicle. If the rider consumes alcohol, then the alcohol sensor senses it and gives that information to the nearest vehicle going in front of it through LI-FI. Because while drunk and driving the rider may ride with over speed and it may hit the other vehicles which results accidents. The rider should follow a particular distance with other vehicle. When the vehicle really close to next vehicle then the ultrasonic sensor detects it and transmits that information through LI-FI. This will help to reduce the accidents. Mems sensor senses axis of the car, when there is a tilt in axis, it will send message. This mems sensor will help to detect in case of rash driving. And that

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information will be shared with the help of li-fi technology. Here, we used one more sensor called eye blink sensor that detects the drowsiness of a rider which could alert the driver before mishap happens. We have connected an alarm system for that. Here we have used a liquid crystal display to monitor all these parameters.

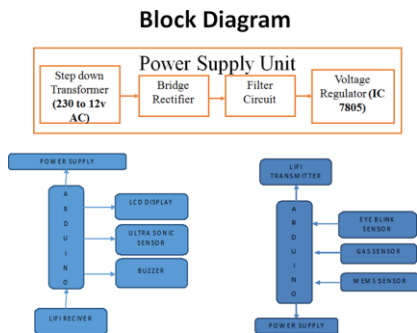


Fig. 1. Block diagram of Li-Fi based vehicle to vehicle communication

#### 4. Components Required

The following components describe their functions which are used in this project.

##### 1) Arduino

The Arduino UNO is a widely used open-source microcontroller board based on the ATmega328. "Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0.

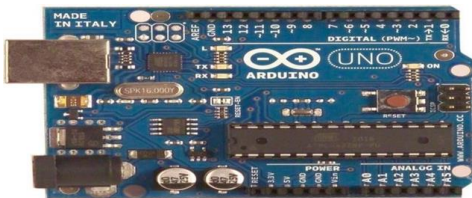


Fig. 2. Arduino

##### 2) IR module

Infra-red sensors are the most often used sensor by amateur roboteers. Infra- red sensors are in the form of diodes with 2 terminals [5]. Here onwards, we will use Tx to refer to a transmitter and Rx to refer to a receiver diode.

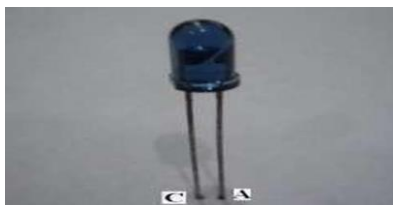


Fig. 3. Infra-red module

##### 3) Eye blink sensor

This project involves measure and controls the eye blink using IR sensor. The IR transmitter and IR receiver are used to transmit and receive the infrared rays in our eye. If the eye is closed means the output of IR receiver is high otherwise the IR receiver output is low [6].

##### 4) Alcohol sensor

Alcohol Sensor for use in Breathalyzer's or in an alarm unit,

to detect the presence of alcohol vapors. This sensor unit offers very high sensitivity, combined with a fast response time.



Fig. 4. Alcohol sensor

##### 5) Ultra sonic sensor

Ultrasonic sensors work on a principle similar to sonar which evaluates distance of a target by interpreting the echoes from ultrasonic sound waves [7]. Its compact size, higher range and easy usability make it a handy sensor for distance measurement and mapping

##### 6) LCD display

Liquid crystal cell displays (LCDs) are used in similar applications where LEDs are used. These applications are display of display of numeric and alphanumeric characters in dot matrix and segmental displays.

##### 7) Buzzer

A buzzer or beeper is a signaling device, the word "buzzer" comes from the rasping noise that buzzers made when they were electromechanical devices, operated from stepped-down AC line voltage at 50 or 60 cycles. Other sounds commonly used to indicate that a button has been pressed are a ring or a beep [8].

#### 5. Implementation and Result Kit Photography

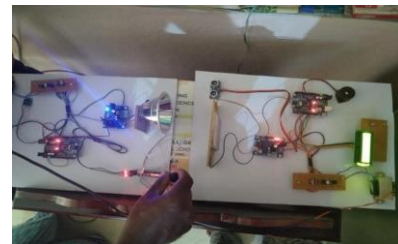


Fig. 5. Li-Fi based vehicle to vehicle communication output



Fig. 6. Alcohol sensor and Eye blink sensor output

#### 6. Conclusion

As a result of increased population, the number of accidents also increased. This is reduced to a great extent by this technology. The Li-Fi helps faster transfer of data between the vehicles. This technology can also be implemented in street lights for data transfer about the traffic. As it employs visible light for communication, this is not restricted in any places. There is no interference in the signals. Hence this technology is far better than other methods of data transfer.

## 7. Future Scope

One of the most important trends for the future is the Internet of Things (IoT). The key requirements for it include:

- Security of the wireless data
- Power for sensors
- Wireless capacity for communications

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