

AVOIDING ROAD ACCIDENT USING LIFI TECHNOLOGY

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ABSTRACT

The Proposed work attempts to implement a system for the prevention of road accidents using Li-Fi technology. Li-Fi is similar to Wi-Fi but uses light as a transmission medium instead of radio waves. It works by using LEDs for data transmission. Light Fidelity uses visible light as a transmission medium. The focus of the proposed work is Vehicle to Vehicle (V2V) communication system which uses a wireless communication technology using a LED transmitter in which the vehicle is equipped to transmit the information continuously to the opposite vehicle ahead it using head light.

KEY WORDS: Vehicle to Vehicle, Li-Fi, Arduino, Visible light communication.

1.1 INTRODUCTION:

On Average, 400 people in India die in road accidents every day. A world bank reported that India accounts for 11 percent of global road-accident deaths which is the highest in the world. For the past decades, 1.3 million people were died and 5 million were injured in accident. There are many reasons for road accident, and are listed in figure [1].

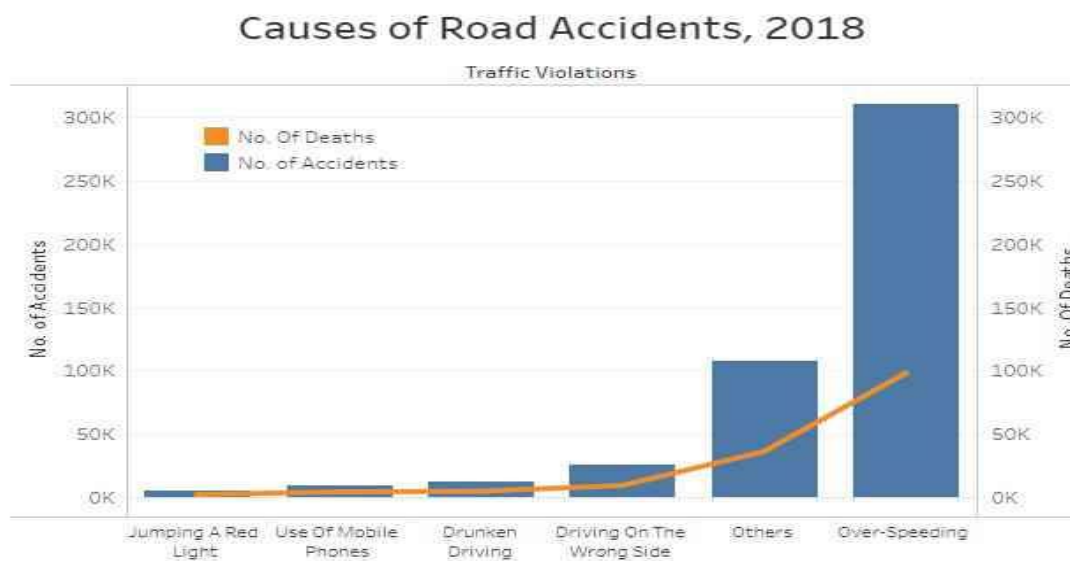


Fig: 1 Road accidents in India

Harald hass, a professor from the University of Edinburgh, UK introduced an idea of communication through light as termed as “li-fi or light-fidelity”. Li-Fi is a transmission of data through illumination i.e., sending data through a LED light bulb that varies its intensity faster than human eye can full. Li-Fi is the light-based Wi-Fi which uses light instead of radio waves to transmit information. Li-Fi transmits data faster than Wi-Fi. It is highly efficient, safer to use and has large bandwidth. The Process of Li-Fi technology in vehicle is defined in figure [2].

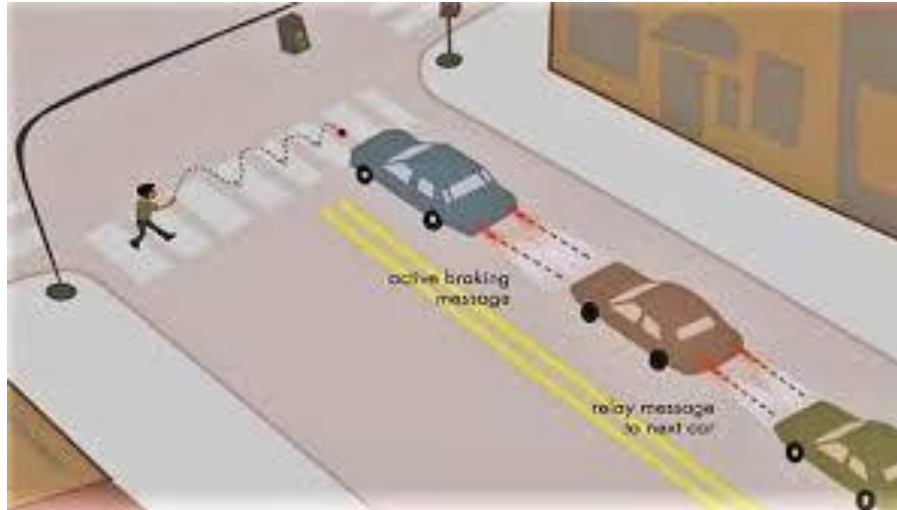


Fig: 2 Transmission of data in vehicles using Li- Fi

1.2 EXISTING METHOD

Arduino based accident prevention system was developed with the help of GPS and GSM. An accelerometer was used, which detects the velocity of the vehicle with respect to time. When the vehicle exceeds the maximum speed, a signal will be sent as an SMS using Arduino and GSM module. The main disadvantage was that the accidents were detected by using radio waves.

The vehicle to vehicle (V2V) communication is the communication between two vehicles to exchange data about their speed, location and heading but this method is done by radio waves.

1.3 LITERATURE SURVEY

As we know that Wi-Fi is fully networked and bi-directional wireless communication technology where data is transmitted using radio waves. While in the case of Li-Fi technology, the data is transmitted in the form of visible light using LED light source. The car LED headlights which are used as a light source can also be used to transmit the data. Li-Fi is high speed, bi-directional, fully networked wireless communication where it allows connectivity within the space illuminated by the light.

When a constant current is provided to this LED bulb, it provides the constant illumination or constant brightness. So, changing the current that is flowing through the LED bulb, the illumination or brightness of the bulb will change. So, this principle is used for transmitting the data wirelessly using Li-Fi technology. So, if no current or minimum current is flowing through this LED bulb then, the brightness of the LED source will be minimum and that will be treated as 0, so digital 0 will be transmitted at the receiver side. Similarly, when the bulb is ON, or the maximum amount of current is flowing through this LED bulb then the illumination or brightness of the LED bulb will be maximum and that will be treated as a 1 so whenever LED is ON, so digital 1 will be transmitted at the receiver side, so in this way, by flickering the LED light source very rapidly we can transmit the data in the form of 1's and 0's to the receiver. If this flickering is happening at million times per second, then we cannot see this flickering by our naked eyes and we can treat this LED bulb source as normal regular bulb source.

Vehicle to Vehicle (V2V) communication is one of the important technologies for supporting automotive services. These services require high data rate transmission. To solve the problem light act as a transmission of data. In vehicle-to-vehicle communication, to avoid accident between two cars Li-Fi technique is used. The light is transmitted as usual by led.

The current vehicle to vehicle (V2V) is done by image sensor using radio waves but it's all connected to the internet by using IOT so the data may be hacked and insecure in driving. When we use the Li-Fi technique there is no need of internet connectivity and the transmission of the data is secure form.

1.4 PROPOSED WORK WITH METHODOLOGY

Li-Fi is the high-speed communication through light by light emitting diodes. Li-Fi and Wi-Fi are quite similar as both transmit data into electromagnetic wave however Wi-Fi uses radio waves and Li-Fi runs in visible light waves as we know visible-light communication (VLC). This will accommodate the photo detector to receive light signals and the signal processing element to convert data into steerable content. An LED light powers a semiconductor light source meaning that the constant current of electricity supplied to an LED light bulb is dipped and then up and down at extremely high speed without being visible to the human eye.

The data is fed into an LED light bulb with signal processing technology it sends data embedded in its beam at rapid speed to the photo detector (photodiode).

In this project the light is transmitting data through Li-Fi communication in this project there are two modules. One is transmitter and another one is receiver. In transmitting site, we have some buttons when we press anyone one of the buttons then the microcontroller send data through Li-Fi module similarly at receiver side the light will be receive the data and given to micro controller.

1.4.1 TRANSMITTER SIDE

As shown in figure [3] of Li-Fi transmitter the Arduino is connected with power supply, Li-Fi module, LED display, sensors, UART and MEMS.

We're using Arduino UNO which is a low-cost, flexible and easy-to-use programmable open-source micro controller board. Arduino UNO features AVR microcontroller Atmega328, 6 analog input pins and 14 digital I/O pins out of which is used as PWM output. the unit comes with 32KB flash memory that is used to store the number of instructions while the SRAM is 2KB and EEPROM is 1KB. The operating voltage of the unit is 5V which projects the

microcontroller on the board and its associated circuitry operates at 5V while the input voltage ranges between 6V to 20V and the recommended input voltage ranges from 7V to 12V. In power supply, it will include filter, transformer, rectifier and control unit of the control unit of the vehicle. The transformer uses AC electricity with low power loss from one voltage to another. To reduce the high-power supply to low voltage the step-down transformer is used. The rectifier is used to convert the AC current to DC current. For filtering a large electrical capacitor is connected to the DC supply.

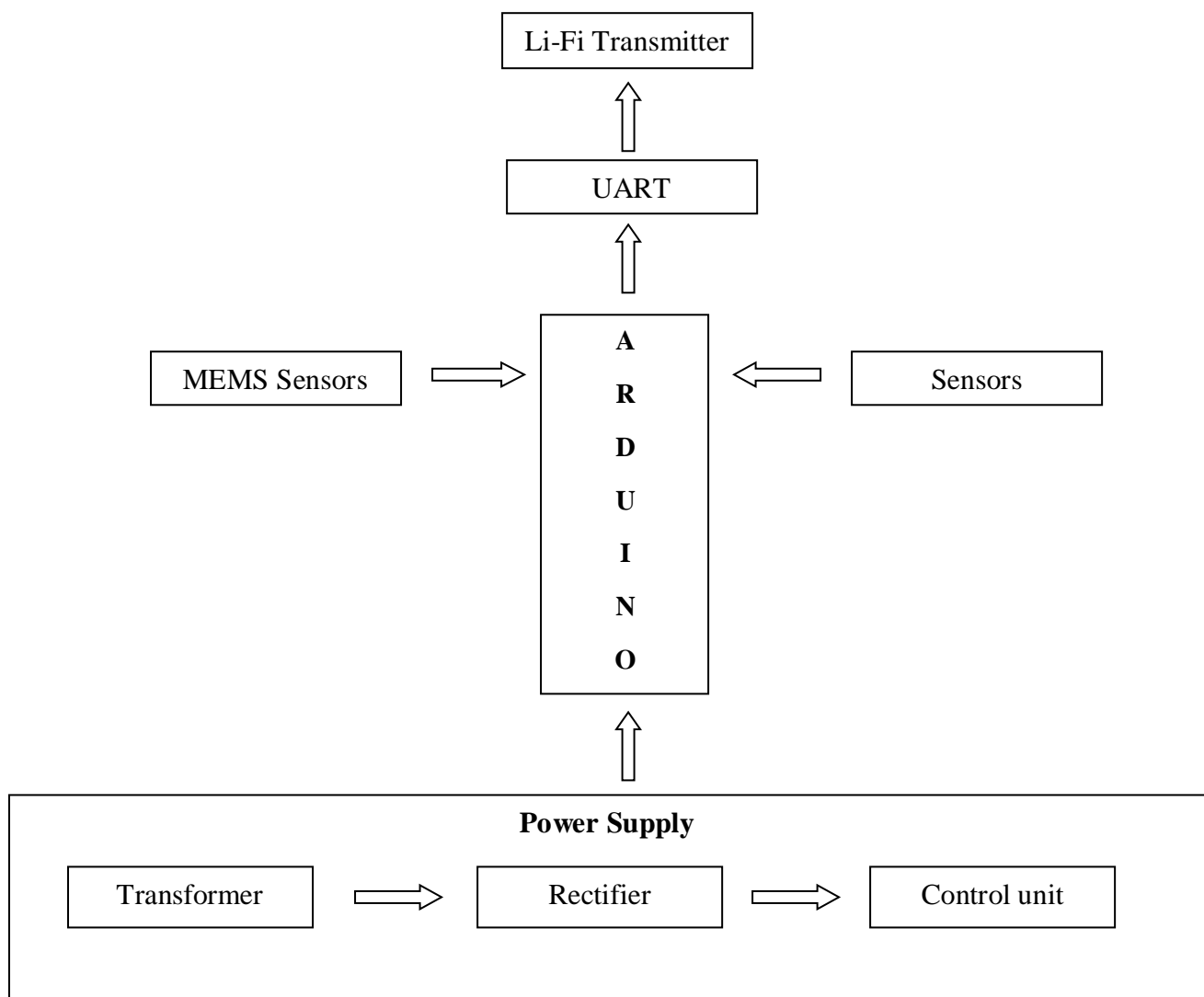


Fig: 3 Block diagram of transmitter side

The input signal is transmitted by L293d which act as a bridge between motor and microcontroller. The L293D is a 16-pin Motor Driver IC which can control a set of two DC motors simultaneously in any direction. The L293D is designed to provide bidirectional drive currents of up to 600 mA (per channel) at voltages from 4.5 V to 36 V.

The MEMS sensors are the A3G4250D which is a low-power 3-axis angular rate sensor able to provide unprecedented stability at zero rate level and sensitivity over temperature and time. It includes a sensing element and an IC interface capable of providing the measured angular rate to the external world through a standard SPI digital interface

UART is a universal asynchronous receiver-transmitter, it is a protocol of serial communication protocol. Data is encoded with UART protocol with 1 start bit, 1 stop bit, no parity bit, 8-bit data length, least significant bit first, and 600 bits per second configuration.

1.4.2 RECIEVER SIDE

The Li-Fi receiver is connected with LED Display, alarm, ultrasonic sensors, power supply, motor, Arduino and photo detector. The transmission to Vehicle 2 by rear lights made by Li-Fi technique is a process when Vehicle 1 detects its distance or objects before your vehicle. The message is received so that it can automatic

ally slow down the vehicle.

Photo detector is used to detect the light in-front of the vehicle to avoid the collision. The ultrasonic sensor is used to detect other objects. A fluid crystal display (LCD) is a thin, flat panel shaped, electronically modulated optical

display, made up of any colour or monochrome pixels that are filled with fluid crystals and displayed before a light source (backlight) or reflector.

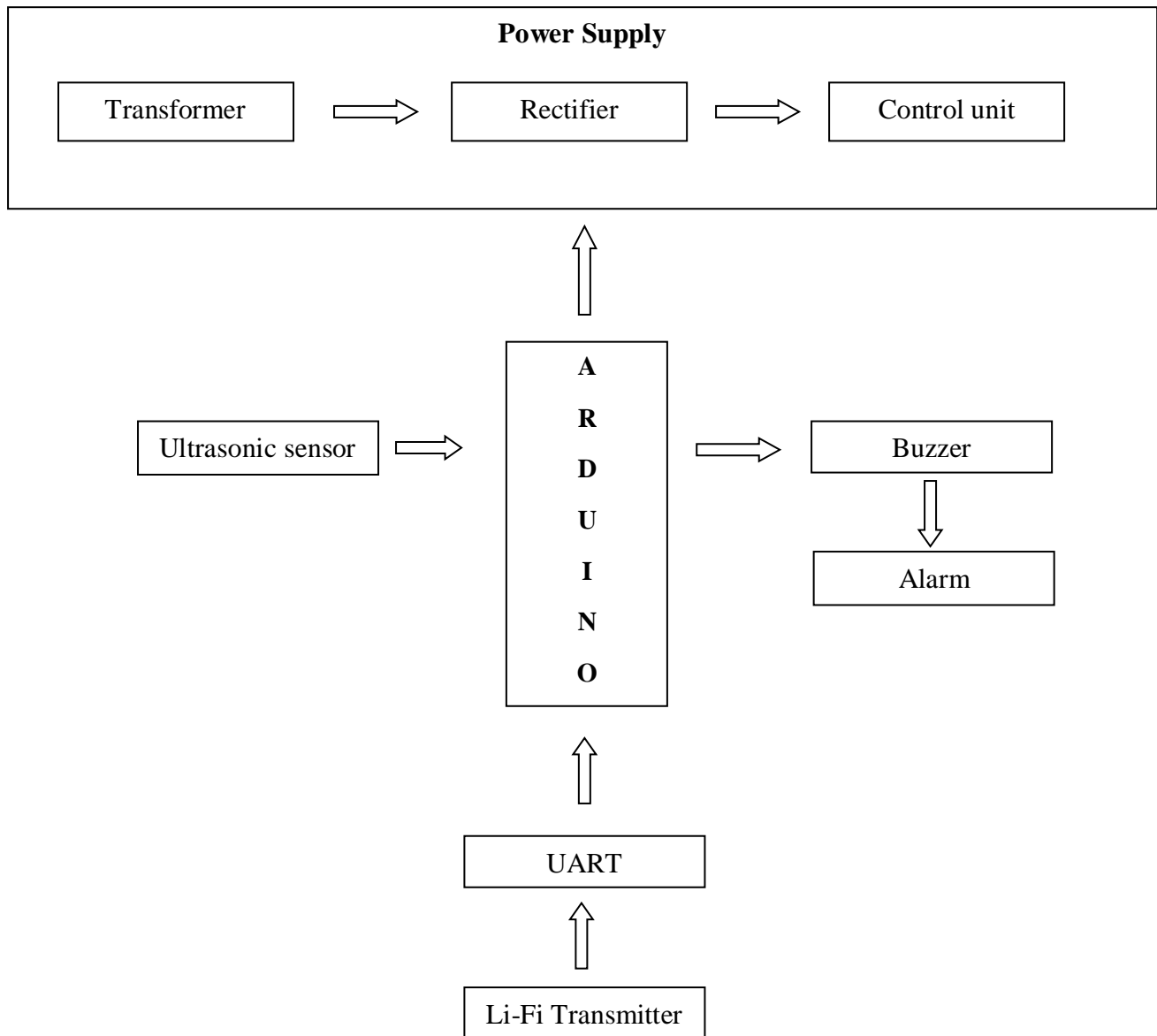


Fig:4 Block Diagram of Receiver side

A buzzer or beeper is an audio signalling device, which may be mechanical. The main function of this is to convert the signal from audio to sound. The pin configuration of the buzzer is shown below [4]. It includes two

pins namely positive and negative. The positive terminal of this is represented with the '+' symbol or a longer terminal. This terminal is powered through 6Volts whereas the negative terminal is represented with the '-' symbol or short terminal and it is connected to the GND terminal.

1.5 IMPLEMENTATION

This system can be implemented by the use of arduino as a controller in the transmitter and receiver end. The arduino fetches the data from the transmitter and executes the data from the sensors through Li-Fi. The system was connected using various sensors, LCD and Buzzer. The input signal is transmitted by L293d using Universal Asynchronous Receiver – Transmitter protocol (UART). The photo detector detects the light and the ultrasonic sensor senses the other objects. The buzzer or beeper sends an alert when it detects any object.

1.6 RESULT

Li-Fi is a high speed wireless communication through LED and Wi-Fi are quite similar as both transmit data electromagnetically. Wi-Fi transfers data through radio waves while Li-Fi transfers data through light waves. The light source is dimmed below the human visibility of light waves to carry the data. Transmission of data within smaller distance provides more security. The main objective of this proposal is to avoid collision of vehicles using vehicle to vehicle (V2V) communication system.

1.7 APPLICATIONS

1.7.1 CELLULAR COMMUNICATION

In external urban environments, the use of Li-Fi enabled street lamps would provide a network of internet access points. In cellular communication, the distance between radio base stations has come down to about 200-500 meters. So, instead of deploying new radio base stations in our cities, street lamps could

provide both, illumination during night, and high speed data communication 24/7. Surprisingly, even when the lights are off as perceived by the eye, full data communication rates are still possible. There is also an additional cost benefit as installing new radio base stations usually comes with large cost – for installation and site lease.

1.7.2 INTELLIGENT TRANSPORTATION SYSTEM

Car headlights and tail lights are steadily being replaced with LED versions. This offers the prospect of car-to-car communication over Li-Fi, allowing development of anti-collision systems and exchange of information on driving conditions between vehicles. Traffic lights already use LED lighting, so that there is also the prospect offered of city wide traffic management systems. This would enable car systems to download information from the network and have real time information on optimal routes to take, and update the network regarding conditions recently experienced by individual vehicles.

1.7.3 VEHICLES AND TRANSPORTATION

Traffic signage, traffic lights and street lamps are adopting LED technology, so there are multiple application opportunities here. VLC can be used for vehicular communication due to the presence of vehicle lights and existing traffic light infrastructure. High-priority applications for vehicle safety communication include collision warning, pre-crash sensing, emergency electronic brake lights, lane-change warning and curve speed warning, among others.

Such high-priority applications require reliable reachability with extremely low latency. Due to extremely low allowable latency in vehicle safety communication, a high-speed VLC system like Li-Fi can be useful.

1.8 CONCLUSION

As compared to Wi-Fi, Li-Fi will be used as a bidirectional wireless communication method. Li-Fi is 100% faster than the Wi-Fi technology and it is minimum of cost. Li-Fi finds major advantage in electromagnetic sensitive areas, such as hospitals, aircrafts, and nuclear power plants, as it does not cause any electromagnetic interference.

In the modern developing world, the increase of transportation needs to reduce accidents and thus a method to avoid vehicle collision has been achieved.

In Future we will be trying to use this data for the control of vehicle to avoid collision. In addition, while the project is targeting on the vehicle to vehicle.

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