

VEHICLE TO VEHICLE COMMUNICATION USING LI-FI TECHNOLOGY

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Abstract—This paper presents the latest technology called as LI-FI which has been developing a lot in few years. Using the concept of LI-FI two vehicle are communicated with the help of LEDs bulbs with the help of transmitter and receiver circuit. With the help of this technology the road accident can be controlled and many human life can be saved. A very chip device called as ultrasonic sensor which is used to measure the distance is used here just to communicate the two vehicles when they comes in the contact in some range which is preferred for the ultrasonic sensor. Using this LI-FI the data are transmitted from one vehicle to another. The data that is transmitted through LI-FI can be any data like audio, video or text. This technology was introduced few years back, which needs more systematic enquiry on its sustainability for traffic control purpose. This concept can be implemented at very low cost and with higher efficiency. At present, the day to day activities use lot of LEDs based lights for illumination, which can also be used for communication because of the advantages like fast switching, high power efficiency and safe to human vision. Hence, this project presents about eco-friendly data communication between vehicle to vehicle through visible light which consists of the white LEDs that transmit audio signals to the receiver. The receiver circuit consists of solar panel connected with the amplifier and speakers to recover back the amplified version of original input signal. VLC has a bright future and it acts as a complement to the present RF communication by achieving higher efficiency.

Index Terms— Li-Fi, LEDs, VLC, RF, Ultrasonic sensor, vehicle.

I. INTRODUCTION

IN the last century, radio was introduced and implemented and gave rise to the new wireless world. It will be very surprising to know that the first wireless transmission of voice was done by the help of light waves. In 1880 the scientist Alexander Grahame Bell discovered the first wireless voice communication with the range over a distance of 213 m. this invention was one of the greatest invention for him but the invention of radio communication was given high priority and his invention was covered by radio communication[1].

As mobile phone came across the world the radio communication became more popular and due to lots of mobile appeared to the face of public so the popularity was increased for the radio communication.

Li-Fi is transmission of data through light by using fiber optics and sending data through a LED that varies in intensity, faster than the human eye can follow. Integrated chips inside LED will do the processing and amplification of data. The light intensity can be manipulated to send data by very small changes in the results[2,3]. The technology transfers Thousands of data simultaneously in higher speed with the help of special modulation and demodulation technique. 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[4]. 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 doesn't notice A light sensitive device (photo detector) receives the signal and converts it back into original data[5]. 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)[6]. 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 proposed system can be used in where a smart traffic transportation system needed. It consists of transmitter, and the receiver. Vehicle to Vehicle data transmission through visible LED light Thus, installation cost and environmental effects are very less in this proposed system.

Vehicle to vehicle communication is the most effective solution we have used in order to reduce accidents that comes on a daily news. In Li-Fi technology for vehicle-to-Vehicle data transmission we use LED light. In this technology there is elimination disappearance of protocols are used so in Li-Fi technology complexity is not too much. The aim of designing this system is highly reliable which will give any desired data transmission between transmitter and receiver mounted on the vehicle.

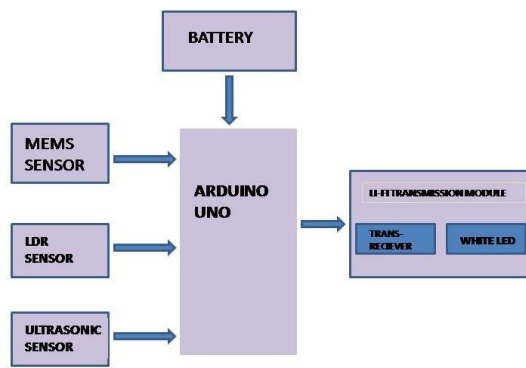


Fig. 1 Proposed System

The LI-FI technology uses the light to transmit the data so that the space requirement is less. The System is controlled with Micro-controller that has been implemented using a Arduino uno and thus reducing the time wasted by the system. In this presented prototype, LI-FI brings the data transfer rate to a greater extent of value. It also consists of a LED and which is good but in this the speed of transmitting rate becomes higher which is its merit. This LI-FI in 2011 was developed and introduced in the consideration of WI-FI so the name is LI-FI only in this system used visible light instead of radio frequency. In order to compare the speed both the tech and to overcome with the jam of network let us consider that a Li-Fi/Wi-Fi hybrid down-link system model is considered. This hybrid network covers a particular indoor area by NC Li-Fi apps and a single Wi-Fi AP. In the scenario, users are uniformly distributed and move randomly. All of the aps are connected to a CU through error free inter-connection links. Each Li-Fi is a large light emitting diode (LED) lamp which contains many low power leds, and each user has a photo detector (PD). It is assumed that all of the pds are oriented perpendicular to the oar. The angle obtained by the system is irradiation is equal when compared to angle of incidence. The field of view (fov) of the LEDs can be designed so that the transmission can be contained within a certain space. The walls also sometimes block the light and make its intensity to be very low and interference between rooms.

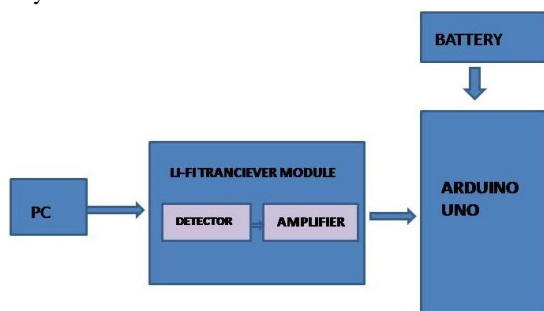


Fig. 2 Modified System

The receive section consists of a photodiode, e.g. silicon photo detector or an Infrared germanium cylindrical detector. The photo detector act as the demodulator and when the incoming

received signal based on the sequence of 1s and 0s. The demodulated signal is then sent to a filter to remove unwanted noise This filtered signal is now amplified using signal amplification mechanism. The filtered and amplified signal is then given to an output device such as an LCD display or a speaker. The input signal is thus remotely transmitted and received.

III. ASSEMBLED HARDWARES

A. ARDUINO UNO CONTROLLER

Arduino is a microcontroller or it can be called as tool for making computers that can sense and control more of the physical and real world than your desktop computer. It's physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino projects have the tendency to stand-alone, or they can be helped by the software section running on your computer. The boards can be assembled by hand or purchased preassembled from the market, it is available very easily. The arduino IDE is the software platform which can be downloaded for free. The Arduino programming language is an implementation of Wiring and defining the devices used, a similar physical computing platform, which is based on the Processing multimedia programming environment. The below figure is arduino uno.



Fig. 3 Arduino

B. Ultrasonic sensor

Ultrasonic sensor is the device which is used to measure the distance. The working principle of the ultrasonic sensor is that it uses high intensity of sound waves and the sound waves are returned as the echo to the sensor, with the help of this concept the distance are measured. Here in this project ultrasonic sensor are used to measure the distance between the two vehicle when the come nearer to some extent. As the two vehicles comes across in the contact the data is transferred to the other vehicle about the current status of the vehicle so that the chance of accident reduces.

The below figure 4 is shown how the ultrasonic sensor is placed on the vehicle.



Fig. 4

Ultrasonic sensor

C. Light Depended register (LDR)

Light depended registers are used here to send the data using the LED light. When the led lights will fall on this LDR the receiving circuit will be activated and will start to receive the data sent from the vehicle. The vehicle having the front face will have the transmitting circuit and the back of the vehicle will have the receiving unit.



Fig. 5 LDR

IV. ASSEMBLED HARDWARES

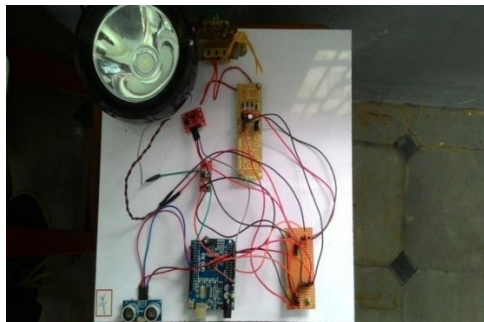


Fig. 6 Final Hardware TestBed

Thus the hardware is assembled as seen in the figure 6, 12v of power supply is given to the microcontroller and 5v is given to the sensors section, the led light is shown on the hardware which is used to transmit the desirable data from one vehicle to another.

V. TEST BEDS AND EVALUATION

The following above circuit was placed and setup on the two vehicle and was used on the OMR road Chennai, and was observed that the data was transmitted in very efficient way and was found that the vehicular accident can be controlled and can be minimized to some extent using this technology of Li-Fi.

VI. CONCLUSION AND FUTURE WORK

The transmission of data from one vehicle to another is done in a very easier by Li-Fi technology by using led light. Thus this method will help us to avoid road accidents. In future this data transmission using Li-Fi technology will be promised to play a vital role in human's life. Here in this report we are going to sort out the problem like speed and jamming in WI-FI by using LI-FI technology.

In this paper 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 no. 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.

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