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Vehicle to Vehicle Communication using LI-FI Technology

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Abstract: ***Wireless communication has become a basic utility in our day to day life such that it becomes a fundamental of our lives and this communication uses the radio spectrum for data transfer. There are issues in using the radio spectrum they are capacity, efficiency, availability and security. The usage of Wi-Fi also causes damage to the ecosystem such as flora and fauna.The defects of the Wi-Fi technology has given birth to the concept of Li-Fi (Light Fidelity) technology. Li-Fi is an advanced technology. This project is concise to vehicle to vehicle communication for avoiding road accidents. We use the ultrasonic sensor, gas sensor, vibration sensor, LCD display, Li-Fi transmitter and receiver. In case of an abnormal condition in the front vehicle, the vehicle at the back will be intimated and will stop on the second. For future enhancement, Li-Fi can be implemented in class rooms where data stored in the server is transmitted through LED lights attached in the ceilings of the classroom and the data can be received through Li-Fi receiver(dongle) which is present with each student in the classroom.***

Keywords: Li-Fi, LEDs

I. INTRODUCTION

There are around 1.4 million cell pole radio waves base stations set, with more than 5 billion cell phones. Cell phones transmit over 600TB of information on a normal reason for consistently. Presently a days remote correspondence utilize radio waves. Yet, radio waves have an issue of effectiveness, accessibility, security and limit. Range is significant necessity for remote correspondence. With headway in innovation and increment in number of clients, existing radio wave range neglects to address the issue and consequently, the limit issue. To determine all the issues, we have concocted the idea of transmitting information remotely through light utilizing LEDs, called as Li-Fi which is a most recent innovation that utilizes LED lights which helps in the transmission of information considerably more quicker, and adaptable due to the sturdiness, effectiveness and high life time attributes that makes Li-Fi idea a superior one. Driven lights are these days generally utilized for individual and authority purposes for their radiant viability improvement.

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Obvious light correspondence (VLC) is another method for remote correspondence utilizing noticeable light. Common transmitters utilized for noticeable light correspondence are obvious light LEDs and recipients are photodiodes and picture sensors.

Being a profoundly populated nation like India and parcel of traffic issues, there is constantly an issue of manual traffic control at whatever point an emergency vehicle shows up along a specific course which isn't powerful. The proposed system aims in using lifi for transmission of data through led light between two vehicles which helps in reducing road accident and promotes safe driving.

II. LITERATURE SURVEY

A. Introduction to indoor networking concepts and challenges in LiFi

An economically accessible Li-Fi organize, was conveyed in a solitary study hall utilizing eight Li-Fi attocell Aps with two extra Wi-Fi APs that serve seven study halls. Every Wi-Fi AP can bolster information rates somewhere in the range of 300 and 867 Mbps, contingent upon the method of activity and transfer speed. Every Li-Fi AP can bolster a roundabout inclusion zone with distances across extending somewhere in the range of 2.8 and 3.5 m. Every Li-Fi AP can bolster a limit of eight clients, this compares to an all out most extreme accumulated information pace of 344 Mbps per study hall. This confirmation of-idea framework utilizes off-the-rack unmodified LED luminaires whose electrical transfer speed is in the locale of 2 MHz whose primary reason for existing is to exhibit the concurrent elements of lighting and remote systems administration utilizing a similar framework. The benefit of this framework is its speed of correspondence which is the idea that we have attempted to guzzle in the proposed paper.

B. What Is Li-Fi ?

Because of the expanding interest for remote information correspondence, the accessible radio range underneath 10 GHz (cm wave correspondence) has gotten inadequate. The remote correspondence industry has reacted to this test by thinking about the radio range over 10 GHz (mm-wave correspondence). In any case, the higher frequencies, f, imply that the way misfortune, expands as per the Friis free space condition also, blockages and shadowing in earthly correspondences are progressively hard to defeat at higher frequencies. Light-Fidelity (Li-Fi) is a continuation of the pattern to move to higher frequencies in the electromagnetic range. A Li-Fi attocell organize utilizes the lighting framework to give completely arranged (multiuser access and handover) remote access. This paper gives some underlying consequences of the downlink execution of a DCO-OFDM-based Li-Fi attocell system and analyzes its exhibition to the best in class RFfemtocell systems.

As a favorable position of actualizing these there the exhibition has been expanded.

C. A new approach to wireless data transmission using visible light

The proposed framework comprise of arduino, photodiode, drove, 16x2 LCD show. The framework proposed in their paper can possibly abuse the current light sources accessible in the earth to shape a strong system of conveying gadgets. This framework exhibits that it is conceivable to have a system arrangement dependent on upon light. On the off chance that the framework is completely actualized, at that point each light source can be utilized as a passage to have the information correspondence office. The framework was tried under various situations to assess the presentation of the framework. The benefit of this framework is that it guarantees effective remote correspondence.

D. Understanding Li-Fi Effect on LED light Quality

The framework has suggested that the effect of Li-Fi on LED can be concentrated by actualizing diverse Li-Fi regulation methods which should be executed and observing the subsequent varieties in the light quality measurements as revealed in our prior work. This is a procedure that could have a place, exorbitant and tedious. It is in this way attractive to build up a straightforward model/instrument from which the effect of Li-Fi on the LED light quality can be evaluated. Such a model will have the option to give an immediate connection between transmitted light quality measurements and the LED's driving current. Since in Li-Fi the LED 's driving current is legitimately balanced, such a model will in this way make it conceivable to precisely evaluate: (1) the varieties in transmitted light quality
at any driving current (2)The most extreme potential varieties in the light quality measurements over the whole powerful scope of the LED. The adjustments in light quality because of Li-Fi would then be able to be contrasted with the business standard with check if the subsequent varieties fall inside the reasonable range or not. This is essentially significant in understanding the effect of Li-Fi on LED light quality and by expansion the prosperity of the clients. To get a current-light quality model, the CRI, CCT and chromaticity of each LED are estimated with an optical spectrometer at various driving flows. For every estimation, at any rate 2000samples are recorded and the mean of these examples is utilized as an information point in the exchange work plots.

E. An Indoor Wireless Visual Sensor Network basing on Light-Fidelity Communication

The framework has proposed an indoor remote correspondence which utilizes Li-Fi to transmit and get picture/video information gathered from the hub source (camera) to the Sink (Final user).Each camera is prepared by a Li-Fi handset that permits correspondence with different hubs of the system. The paper had proposed to utilize a twofold roof to permit the light entry with no deterrent and to utilize optic strands to transmit information over the dividers. By utilizing obvious light waves, the camera hubs can control themselves, they are prepared by handsets that permit charging their batteries and transmit/get Li-Fi information, since this examination centers around the transmission of picture/video data in WVSNs where the measure of visual information gathered by sensors is tremendous. Sensors need to utilize pressure to decrease the measure of information so as to successfully spare stockpiling memory, save the vitality and to fit the information on the accessible system data transmission. H.264 has been picked in this article as a video coding standard to pack the visual information gathered by the hubs. The upside of this framework is that it doesn't make hurt individuals.

F. The Lattice-An intelligent grid for connected car Industry

The proposed framework requires both the transmitter and the recipient to be in a view for the information to transmit appropriately. The vehicle with the collector will be under the road light for 1 or under 1 second. Also, it will arrive at the following streetlight following 2 or 3 seconds. Consequently, the picture of the guide will be shown with better precision when the collector is simply under the streetlight. To keep the guide showed for a more drawn out time, a deferral of 2 s is presented until the vehicle arrives at the following road light. The LED road lights are not being used during the day
henceforth this framework will be useful during the evening time. The utilization of high power LED light sources is accordingly fundamental to get the right guide show. The greatest separation between the LED light source and beneficiary at which a legitimate guide is gotten utilizing the proposed framework is 5.5 m when the picture is transmitted during the evening time. The benefit of this framework is quicker information correspondence. Using LEDs for Li-Fi as an elective source is utilized in our proposed paper.

III. SYSTEM ARCHITECTURE

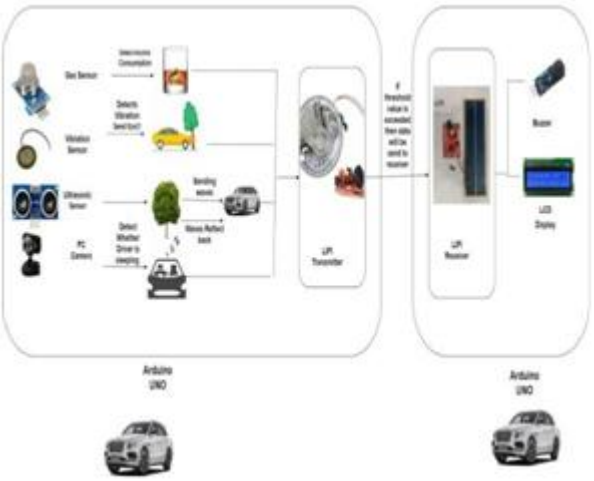

Fig 1. Overall Structural Architecture

Our system consists of a LIFI transmitter and a LIFI receiver which will be attached in all the cars. The transmitter and the receiver will be connected to an arduino UNO board. In addition to it a vibration sensor, a gas sensor(MQ3),an ultrasonic sensor, a PC camera is connected to the arduino UNO board.

An LED bulb which produces light is fixed inside a funnel to avoid scattering of light which is then connected to a solar panel which receives the light.
The data collected from the sensors is converted into binary values. The solar panel receives the light from the LED and the receiver changes the binary values into human readable format. Here the transmission of data happens through light.

IV. FUNCTIONAL ARCHITECTURE

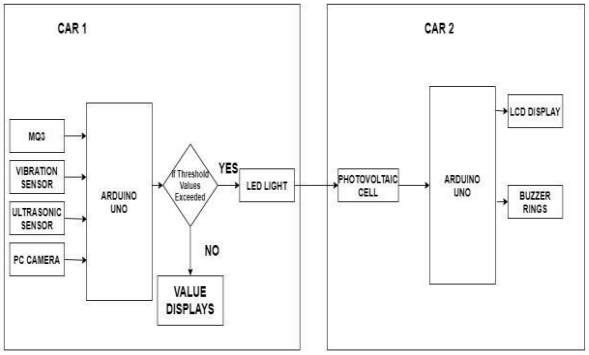

Fig 2. Functional Architecture

V. IMPLEMENTATION OF THE PROPOSED SYSTEM

A. Detection of disturbance:

In this module vibration sensor is utilized to identify the vibration happen in the vehicle, on the off chance that vehicle met with a mishap, at that point the sensor will distinguish the vibration in the vehicle then it will send the alarm message to differentvehicles.

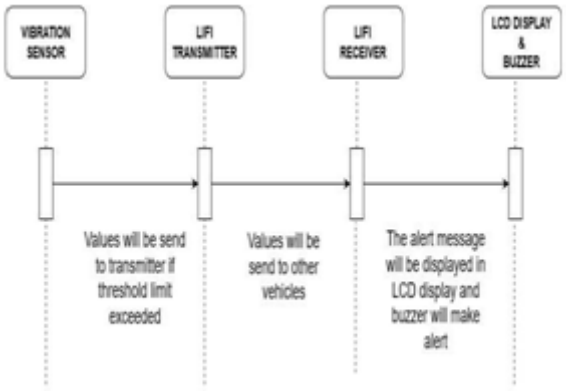

Fig 3. Sequence diagram of detection of disturbance

B. Distance calculation:

In this module ultrasonic sensor is utilized to identify the separation between two articles , ultrasonic sensor has transmitter and recipient, transmitter will transmit the sound waves , on the off chance that any item is close to sensor, at that point the sound waves will hit in the article then that waves will be reflected back to sensor now collector in sensor will get that sound wave and ascertain the separation with the equation

Distance = ½ T x C

(T = Time and C = the speed of sound)
At 20°C (68°F), the speed of sound is 343 meters/second (1125 feet/second), yet this differs relying upon temperature and mugginess

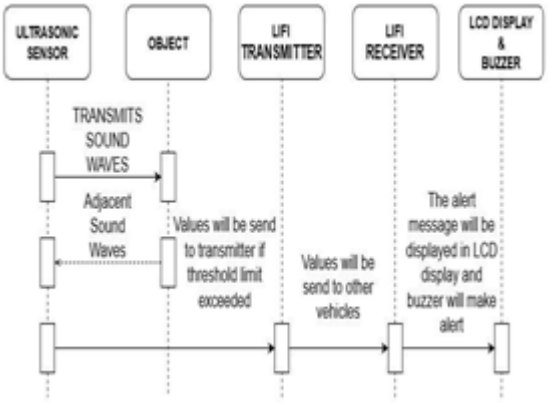

Fig 4. Sequence diagram of distance calculation

C. Monitoring of atmospheric gas or alcohol:

In this module mq3 sensor is used to detect the alcohol content in the vehicle if driver had any alcohol content then sensor will detect it then send an alert message to other vehicles.

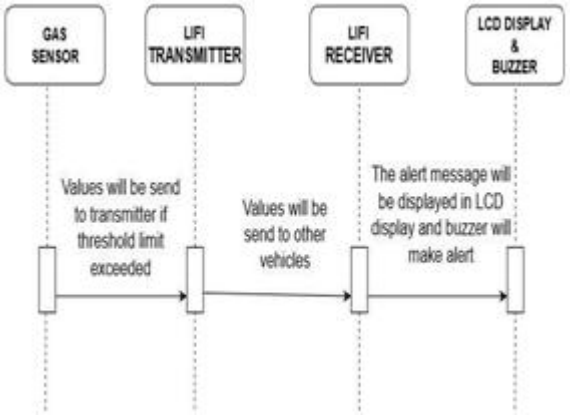

Fig 5. Sequence diagram of monitoring of atmospheric gas and alcohol content

D. Monitoring the face of the driver:

A PC camera, fixed in the transmitter will constantly monitor the face of the driver, if the driver's eyes are closed for more than the given threshold value then the transmitter will capture the image of the driver which will then be sent to the receiver, which will then display an alert message will be displayed in the LCD display and the buzzer will start buzzing.

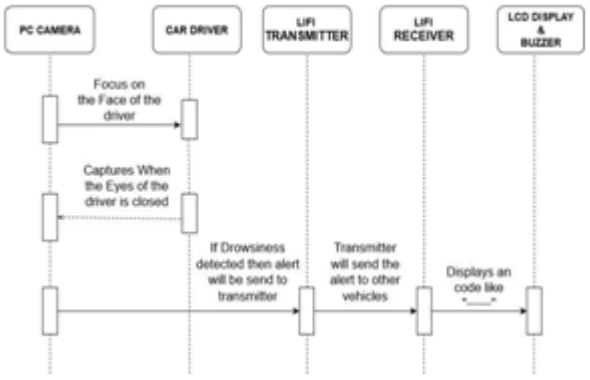

Fig 6. Sequence diagram of monitoring the face of the driver.

VI. WORKING OF LI-FI

Li-Fi utilizes obvious light through overhead lighting for the transmission of information. This is conceivable using a Visible Light Communications (VLC) framework for information transmission.
Communication of Li-Fi consists of two parts

A. Li-Fi Transmitter

First transmitter will be connected to the Arduino board. Then Arduino board will send the data to transmitter, the transmitter will convert the data into binary and make it ready to transfer the data
, now the data will be transferred using LED bulb.If the binary number is 0, then the led will not blink if binary number is 1 the LED will blink. The LED bulb will turn on and off so fast that the human eye cannot see . This is one of the method to transfer the data using Li- Fi.

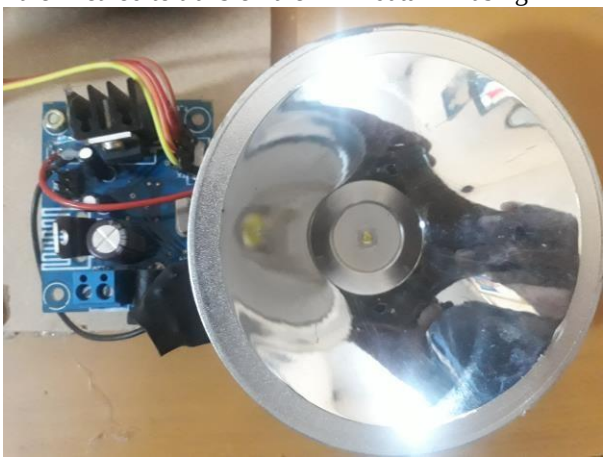

Fig 7. Li-Fi Transmitter

B. Li-Fi Receiver

The Photovoltaic cell will receive the light from the LED then the photovoltaic cell will
send that to the receiver .The receiver will convert that binary data into actual data then send that data to thearduinoboard.

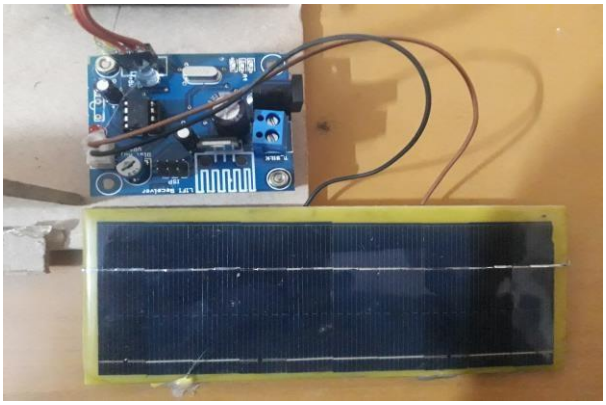

Fig 8. Li-Fi Receiver

VII. RESULTS AND DISCUSSION

This system is specifically designed to ensure safety to the drivers and to the co-passengers by keeping in control of the vehicle using the information obtained from the sensors. By doing so we can avoid most of the road accidents and can promote safe driving.

VIII. CONCLUSION AND FUTUREWORK

This system uses Li-Fi technology which includes many sensors such as MQ3,vibration sensor, ultrasonic sensor, PC camera along with an arduino board, LED light and a solar panel to communicate from one vehicle to another. This system proposes a solution to minimize road accidents, and in the future, it can ensure safety to the drivers along with co-passengers by integrating this system everywhere.

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Buvaneswari S is working as Assistant Professor in Easwari Engineering college, Chennai, Tamil nadu having 15 + years of experience in academics and research. She Completed M.E. Degree in Computer Science and Engineering from Anna University and interested in innovative projects and keen on research work in the area of wireless sensor networks, IoT, algorithms etc.

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