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LIFI BASED ADVANCED ACCIDENT DETECTION SYSTEMS

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Abstract: Due to its huge application in intelligent transport systems, road accident detection is now one of the most interesting sectors. Having to be untrained drivers who consume alcohol while driving over speed, sleep while driving is the main causes of these road accidents. There have been numerous solutions to prevent such accidents on the road. But this was not prevented by any of them. Within this paper we present an innovative LIFI accident identification. This paper provides a smart system for the prevention and detection of accidents for human safety. This component has various sensors such as eye blink sensor, alcohol sensor, ultrasonic sensor and MEMS sensor. If the sensor detects a low distance between the rider and drunken alcohol, then the data can be sent to the other vehicle, which is going ahead. And if the driving driver sleeps, the eye-blink sensor detects it and warns the driver. Simultaneously speed is reduced to the engine. This document is very useful for accident control detection and monitoring by transmitting and receiving signal into LIFI sensors precisely.

Keywords—LIFI (Light Fidelity); Accident detection; Ultrasonic sensor; Eye blink sensor; Gas sensor; MEMS sensor; Arduino, LCD

I. INTRODUCTION

Our lives have been made easier with rapid technological and infrastructural growth. The introduction of these technologies has also increased traffic risk and frequent road accidents. As there are no weak emergency facilities in our country, people are at high risk for their lives. There are numerous causes referred to in [2] for road accidents, and many factors have been found in fig [1] in unfamiliar drivers and in poor road conditions.

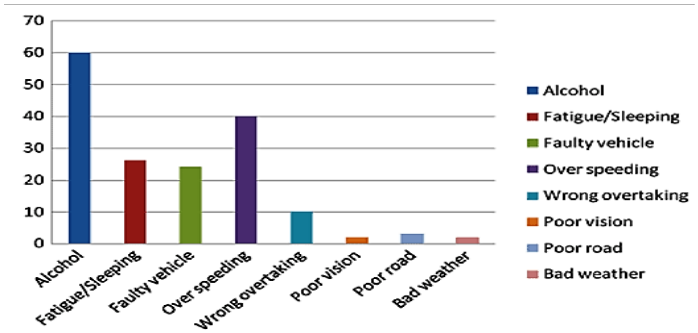

Fig 1 Statistics causes for road accidents.

Data tables [1] in figure [2], according to the WHO Status Survey 2016. The Law Commission of India describes a serious road accident occurring in our country, which, according to the National Crime Records at the Office of Road Transportations and Highway Ministers, causes a death of 17 Indians each hour on the road [3].

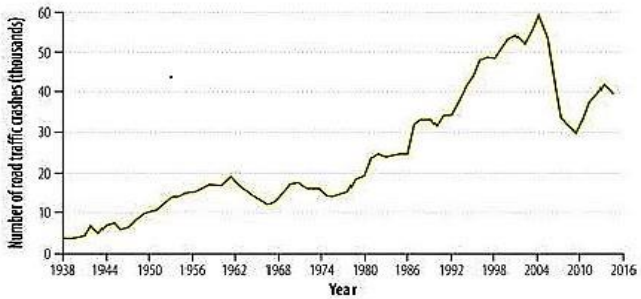

Fig 2 WHO Status graph.

LIFI

With LIFI innovation, we are offering a new solution to problems in road accident detection. In today's age, it is an new technology. At Edinburgh, UK, Harold Hass has invented LIFI technology. It works beyond the obvious electromagnetic light waves. The unmistakable light is used as a medium for the transmission of data. LIFI is high light wave streams and can be quickly switched ON andOFF, therefore its reaction time is less than 1 micro second which can not be detected by the human eye. LIFI complements RF components like wifi, mobile networks or other components. LIFI is highly efficient , high bandwidth and safe. These techniques are defined in [4-5] and their process is explained in figure [3].

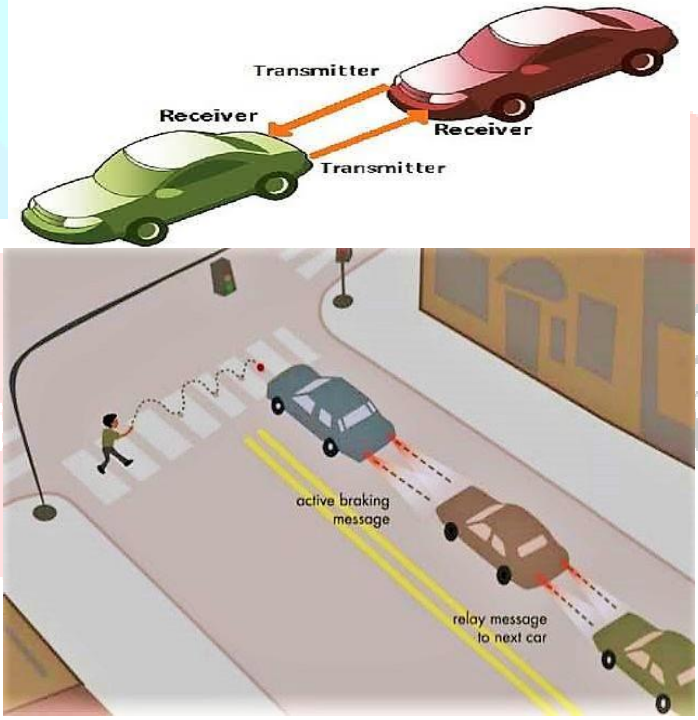

Fig 3 Data transmission between vehicles by using LIFI.

II. EXISTING METHOD

Arduino Based Accident Prevention and Identification System referred to in [6], which is already an existing methodology. It was developed with the assistance of GPS and GSM. An accelerometer will also be used to measure the speed and quantity of tilting when something is struck. If the speed of the car exceeds the maximum speed for the road, a warning is automatically issued. The GPS shall also locate the geography of the location and send an SMS using a GSM. The major drawback for this system is the detection of accidents by radio waves.

III. LITERATURE SURVEY

Wireless communication systems with LIFI technology are undergoing tremendous research. Intelligent voice communication and device switching[7] based on the LIFI explained that the communication medium as a light is similar to other wireless communication. Instead of radio signals, visible light can be used for data transfer between the system. This is commonly referred to as VLC by the LIFI uses light source to wirelessly transmit data. Sending and receiving of visual data (LOS) are both the main drawback for this system.

The vehicle-to - vehicle communication system using LIFI technology has been identified by Abdulsalam et al.[8]. To avoid accidents and collisions between cars, this program is too enforced. Two basic concepts were dealt with. First, when braking is applied, the message is sent to vehicle 2 with sensed speed rear lights. A photo diode on the front of the vehicle will receive the alert. Another approach is that vehicles are at the intersection T, vehicle 1 continuously sends its speed warning through the headlight LEDs to vehicle 2. This speed is compared to the photodiode obtained in vehicle 2 and if another vehicle is present, the driver will be aware of the situation. The biggest drawback for these devices is the internet connection which can lead to hacking.

In future wireless communication, Banerjee et al. worked for LIFI[9]. LIFI is light carrier communication. A simple LED bulb can be used to transmit data. One on the LED is 1 and off the LED is 0. This binary data stream is so swift that a human eye can not detect it, which means that the rate of information transmission is so high. We relay the data digitally in this transmission. The transmitter is interfaced by a numerical keyboard and the receiver interfaced with one. Switches therefore represent 9 switchs at the transmitter and the seven segment display is used for displaying them at the receiver.

Bera et al . have developed their ideas for a chat and gaming application[10] using LIFI technology. LIFI here, LEDs with constant current are used as transmitters. This current is often varied to get 1 and 0. If led is ON a digital 1 is transmitted and led is OFF a digital 0. The LEDs are switched so quickly that these fluctuations can not be observed. Such LEDs are flickered so rapidly that the LEDs can be continuously visualised.

Sheela M & Deepika A introduces LIFI technology to monitor and control industrial machinery. It regulates the question of industrial parameters , such as temperature, current , voltage and gas variation. If microcontroller data detection is carried out, the data is transmitted via LIFI to the computer connecting and warned[19].

The concept of predicting the current state of the automated device by means of temperature sensors, IR sensors and other sensors put within and facilitated [11]. Internet-based soft-i-robot security is modelled in complex, unstructured situations using soft computing paradigms to solve issues and make decisions [12], [18]. The model has sensory support systems for detecting incidents, capturing images and sending servers, and preventing the obstacle can be achieved via IoT [13], [14]. Power consumption of automation systems should be set up to be small and effective modulation techniques to minimize power during transmission can be applied [15]; Without EMI it is also possible to manipulate high power management better result for the drivers [16], [17].

IV. BLOCK DIAGRAM

1. LIFI RECEIVER BLOCK DIAGRAM [FRONT CAR]

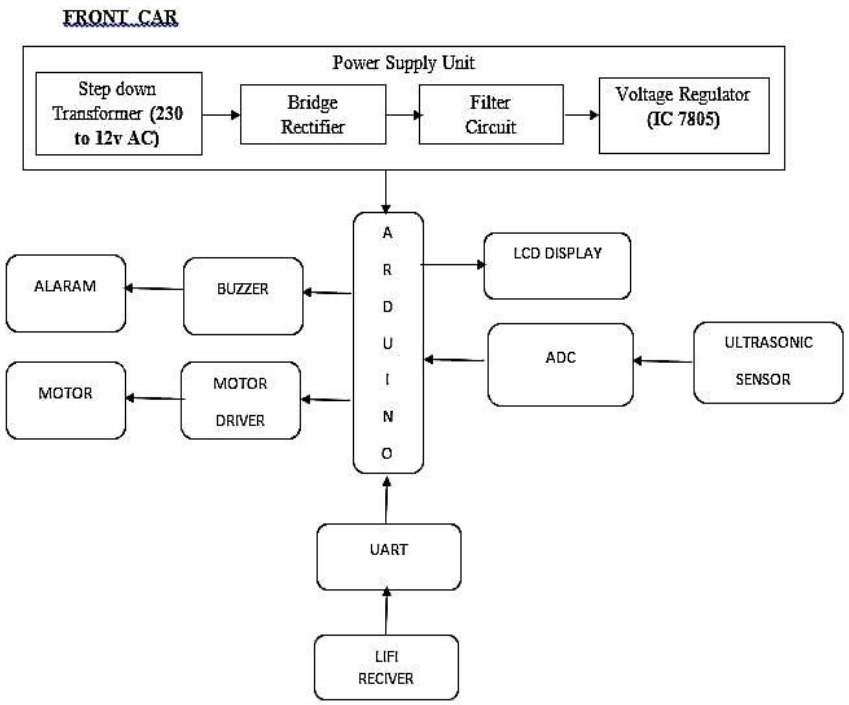

Fig 4 Front vehicle block diagram

2. LIFI TRANSMITTER BLOCK DIAGRAM [BACK CAR]

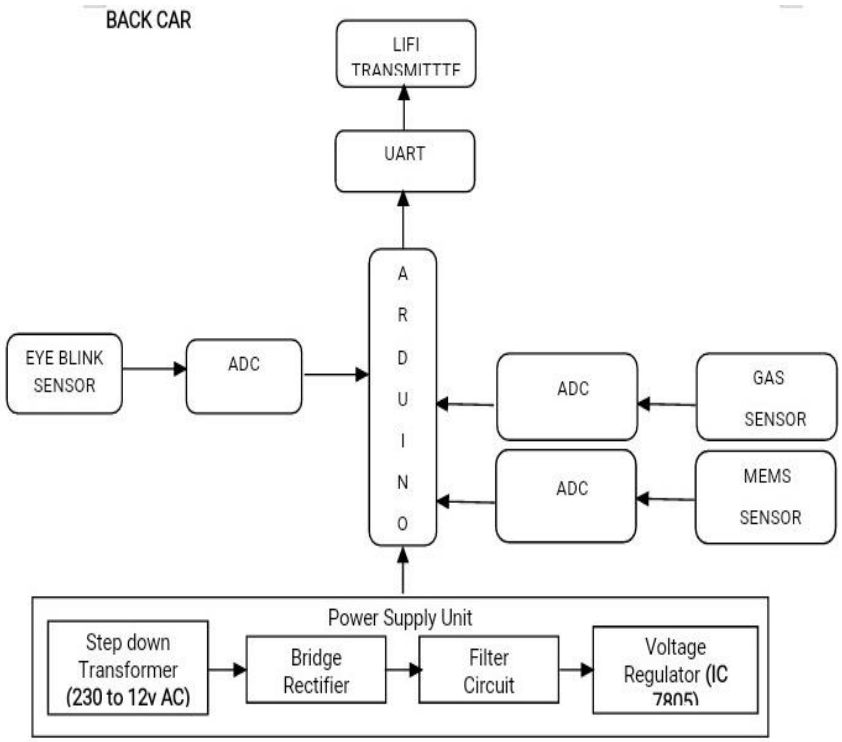

Fig 5 Back vehicle block diagram

From fig [4] and fig [5] shows the block diagram for front end and back end parts of vehicle.

V. WORKING PROCESS FOR PROPOSED SYSTEM

This proposed system is implemented with the LIFI technology (Light Fidelity). Each vehicle was linked. This LIFI system is used for the transmission and receipt of vehicle information. The entire system is to be made up of the transmitter and receiver part for the transfer of data using LIFI, through interfacing connections and different sensors.

1. TRANSMITTER SECTION

As is demonstrated in Fig [4], the simple LIFI transmitter module is the back end prototype with a transformer, rectifier, filter circuit and control unit for vehicle supply. Transformers are used to convert AC electricity with little power loss from one voltage to another. Transformers only work with AC power and this is one of the reasons why power supplies are in AC. This has two types, step-ups raise the tension and step-downs decrease the tension. In order to reduce a dangerous (20 V) high power supply to a safer low voltage, the interfacing circuit required, the majority used a step-down transformer.

The supply of reduced AC in the rectifier is introduced. Rectifier used for transforming AC supply into DC. It generates full-wave varying DC power supply in a bridge rectifier. The entire AC wave (positive and negative sections) is used from the full-wave rectifier. Now smoothing or filtering is done through a large electrical capacitor connected to the DC supply, which supplies the output current when the different DC voltages from the rectification system fall unflat DC to smooth DC (solid line). The linear regulator is used for the stabilization and adjustment of the voltage at (5-12V) for critical electronic application. The rib and noise in the output current should be reduced significantly. Linear controllers often provide current limitation, protect the electrical supply and the connected circuit from overflow.

The supply DC current is transmitted from the voltage regulator into Arduino Uno is an ATmego328p-based microcontroller module. It consists of 14 digital input / output pins with 6 analog inputs, 16 Mhz crystal oscillate, USB connection, power jack, ICSP header and reset button, of which 6 can be used as PWM outputs. Here the power source of the ATmega328p is automatically selected and controlled (6-20v).

The data transmission from the input signals of the motor vehicle (motor driver), which is tested and data every minute, are entered continually in the microcontroller. The L293D H-bridge driver for two-way driving applications is the most common engine. The L293D IC can be used to drive the DC motor in either direction. L293D is a 16-pin IC that is able to simultaneously control in either direction a group of two DC motors. This means that you can use a single L293D IC to control two DC motors. The signals transmit via ADC and UART. The universal asynchronous receiver (UART) takes bytes of data and sequentially transmits the single bits. A second UART reassembles the bits in full bytes at the destination. A shift register is included in each UART, which constitutes the critical conversion method for serial and parallel types.

Alcohol Sensor to detection of the presence of alcohol vapor in Breathalyzer's or an Alarm Unit. This sensor unit provides high sensitivity and a fast response time. The unit works with an easy drive and provides excellent long-life stability. If all the acetic acid is extracted from the fuel cell, the system is able to test another sample. It now detects and transmits the signals to the front vehicle through LIFI transmitters.

The Eye Snap with an IR sensor is measured and controlled. Infrarot rays are transmitted in our eyes by the IR transmitter. The IR receiver receives reflected infraround eye rays. If the eye is closed, the output of the IR recipient is large otherwise the output of the IR recipient is small. This indicates whether the eye shuts or opens. This output is provided with an alarm logic circuit. This sensor reduces the accident by blinking the eye. One blinking sensor in the vehicle is attached here, where someone is losing consciousness and signaling by alarm. When switching is activated, the device runs for a fixed time of 1-120 seconds. Adjusting the timer knob in the direction of the clock raises the runtime and reduces in the opposite direction.

The MEMS sensor (A3G4250D) is a low-power 3-axis angular rate sensor that provides unparalleled zero rate stability and temperature- and time-sensitivity. It comprises a sensor element and an IC interface that provides a standard SPI digital interface to the outside world by providing the measured angular rate. These sensors now always detect and provide the microcontroller with time set in the circuit interface.

2. RECEIVER SECTION

As shown in the Fig[5], an ultrasonic sensor, alarm, LCD and any other component is a simple module of LIFI receiver which is the prototype for a front end. The transmission to Vehicle 2 by rear lights made by LIFI technique is a process when Vehicle 1 detects its distance or objects before your vehicle. The message is received so that it can automatically slow down the vehicle.

In order to determine distances from an object like bats do, the ultrasonic sensor (HC-SR04) uses sonar. With high precision and reliable readings, it provides excellent non-contact range detection in an easy-to-use box. It is 2 to 400 cm long or 1 to 15 feet long. Sunlight or black materials such as Sharp Rangefinders do not impact its operation (although acoustically sensitive materials such as fabric can hardly be discovered). The transmitter and receptor module are complete.

A fluid crystal display (LCD) is a thin , flat panel shaped, electronically modulated optical display, made up of any color or monochrome pixels that are filled with fluid crystals and displayed before a light source (backlight) or reflector. It is transparent when the liquid is not enabled. The molecular turbulence, when the fluid is turned on, causes light to spread in all directions and the cell seems bright. This displays the requested post.

Signaling system is a buzzer or beeper, and it works with 50 to 60 cycles from a stepped-down AC voltage. The tonality of the speakers is therefore proportional to the frequency of operation. To "tune" the note, the condenser C can be used. The rated value is 0.001uF; the increase in capability decreases the buzzer sound.

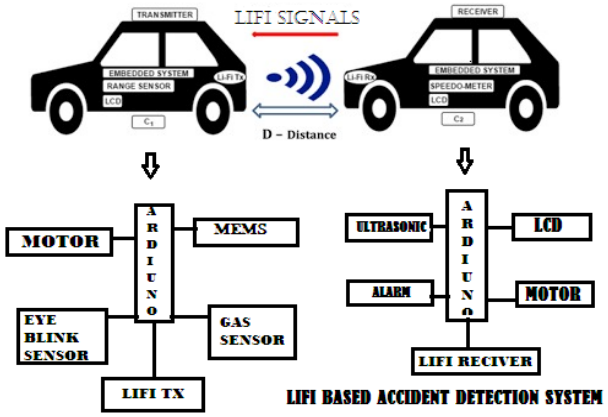

Fig 6 Real-time implementation of LIFI system.

VI. CIRCUIT DIAGRAM

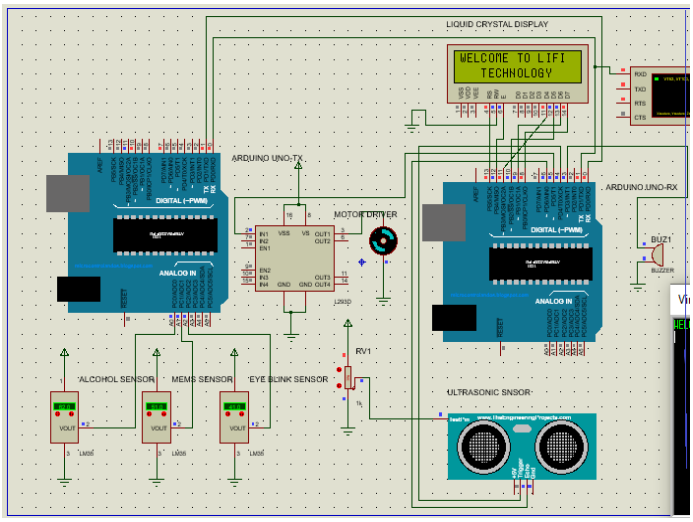

Fig 7 Simulated circuit design

The Proteus simulation program provides the simulated circuit design. Our primary control unit is Arduino here. It first fetches and finally executes through LIFI after it receives data from the respective sensors. The system design was connected via various sensors, engine driver, DC engine driver, LCD and buzzer displayed in Fig [7].

VII. HARDWARE INTERFACING CIRCUIT

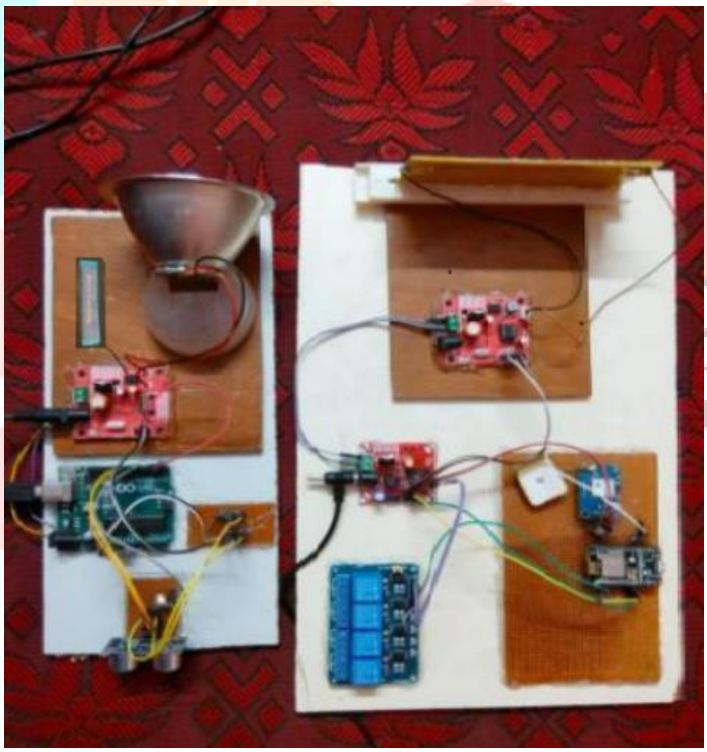

Fig 8 Hardware interfacing circuit.

VIII. RESULT ANALYSIS

STIMULATED OUTUPT RESULTS **EXPLANATION**

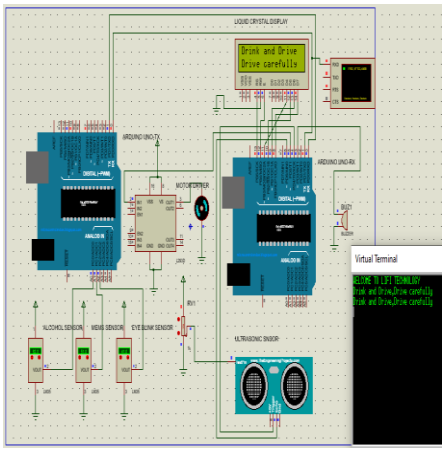

Fig [9] Drunk & Drive simulation.

GAS SENSOR

If the gas sensor detects whether the rider consumes alcohol, the data is transmitted via LIFI via microcontroller to avoid starting. Fig [9] introduces virtual simulation by means of security tools.

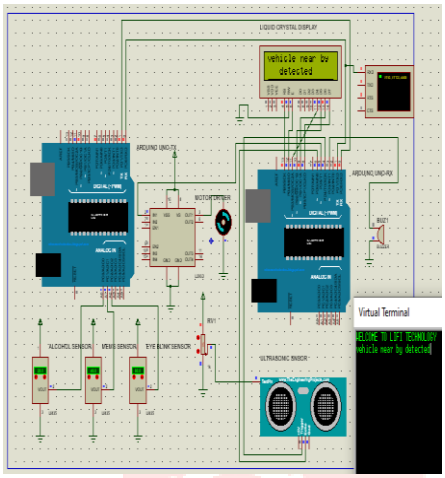

Fig [10] Vehicle overtaking simulation

ULTRASONIC SENSOR

This ultrasonic sensor recognizes minimum distance from other vehicles, and if the distance can be reduced the system automatically provides information via LIFI to reduce the engine speed.

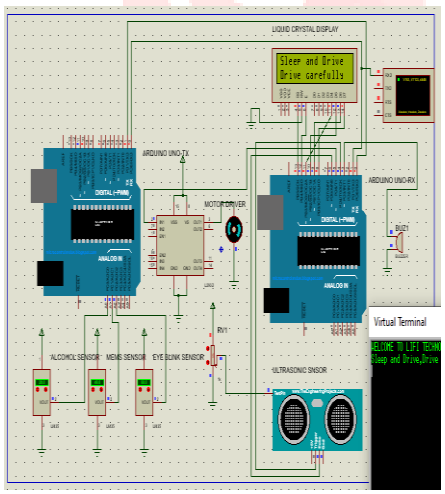

Fig [11] Sleep and drive stimulation

EYE BLINK SENSOR

These sensors are used to detect a rider's sleep or sleepiness, and they can warn a rider with a buzzer.

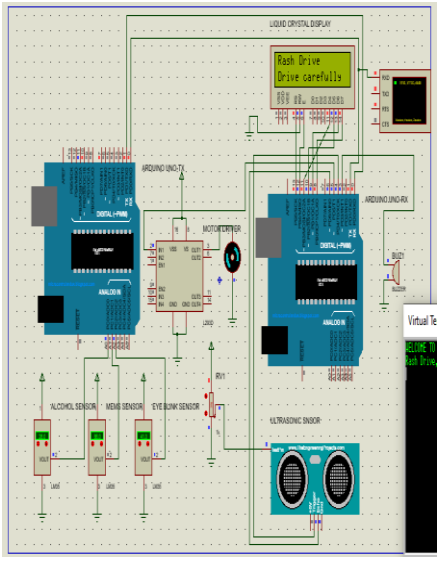

Fig [12] Rash drive stimulation

MEMS SENSOR

If the range of this sensor detection is reduced and maintained using the MEMS sensor on protective software, the angle or axis of the road can be calculated.

IX. COMPARISON AND ANALYSIS

Table 1: Comparison and analysis

Parameters	LIFI	WIFI	Ethernet
IEEE Standards	IEEE 802.15.7	IEEE 802.11b	IEEE 802.3 standards
Frequency Band	Light does not require frequency	2.4 GHZ	100 - 500 MHZ
Costs	Cheap	Expensive	Medium
Data Transmission Medium	Light	Radio Spectrum	STP,UTP, OF
Network Topology	Point-to-Point	Point-to-Point	Bus - Star topology
Speed	1-3.5Gbps	54-250Mbps	10-1000 Mbps
Range	Based on LED	20-100 meters	(100-185) meters
Security	High	Medium	High
Power Energy	Available	Less available	Available
Reliability	High	High	Very High
Release	2011	1990	1980
Data Transfer	Greater than 1Gbps	Mbps	bps

X. CONCLUSION

This paper provided a brief review of the technical detection of automatic accidents. It will save many people's lives on paths, which are unavoidable. These signal data transmitted by LIFI are implemented successfully with different sensors. The previous accident detection technique was overcome by this system.

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