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ACCIDENT ANALYSIS AND AVOIDANCE BY V2V COMMUNICATION USING LIFI TECHNOLOGY

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ABSTRACT

Every day, 1214 road accidents occur in our country which leads to loss of many lives. Most of the accidents occur due to rash driving, drunk and drive. In this paper, a prototype model of a device which prevents accidents based on the Vehicle to Vehicle Communication is proposed. It is implemented using Light Fidelity Technology for fast data transfer. This has, Arduino UNO, Arduino MEGA to control and a Switch to activate the whole process. In this design, the transmitter vehicle is fitted with LED which transfers the data and it is received with the Photodiode present in the receiver vehicle thus preventing the accidents by applying brake automatically. Ultrasonic and Crash sensors are used, GPS send the location using GSM in case of accidents. Our proposed system is, simple, efficient, low cost and user friendly to prevent accidents.

Keywords: V2V Communication, Li-Fi, Accident prevention, Arduino, Sensors.

I. INTRODUCTION

In the fast running world, everyone is in the need to cross continents for their daily survival. But on their way to achieve success, unfortunately they face accidents due to various reasons anytime of the day. Due to this there is a need for an accident prevention system. Our proposed system adopted V2V Communication to prevent road accidents. Using V2V Communication, two vehicles can communicate with each other wirelessly using Li-Fi technology. The proposed system is a prototype model, portable and highly reliable system which sends alert messages to hospitals in case of accidents. This system consists of Arduino UNO, Arduino MEGA, DC Motor, LED, Photodiode, LCD, Ultrasonic senor, Crash sensor, GPS, GSM and Switch along with power supply. Arduino integrated development environment is used to simplify the user interface of the model. When the switch is made ON connected with the Arduino UNO, stops running and sends the light signal using LED. The photodiode detects the signal and stops the second vehicle. If two vehicles reach too close the ultrasonic sensor sends an alert. In case of accidents, the crash sensor senses it and sends the GPS location using the GSM to the concerned server. All outputs are monitored using the serial monitor and displayed in the LCD device.

II. HARDWARE REQUIREMENTS

Arduino Boards

Arduino is an open-source electronics platform of both hardware and software. Arduino UNO and Arduino ATMEGA 2560 are the two microcontrollers used in our project. The former is used in the transmitter section and the latter is used in receiver section. These Arduino boards are programmed via Universal Serial Bus(USB) Arduino ATmega2560 consists of 16 analog and 54 digital input output pins, operates at 5V and has a memory of about 8kb so entire coding can be stored in it. Arduino UNO is a microcontroller board based on ATmega 328. It consists of 20 digital input output pins and operates at 12V for maximum. The Arduino boards ae used because they are handy, cost efficient and highly reliable.

DC Motor and Switch

A DC Motor is an electrical machine that runs on direct current power. These motors convert electrical energy to mechanical energy. A geared DC Motor features a gear assembly attached to the motor. The speed of motor is measured in terms of rotations of the shaft per minute and it is termed as RPM. In our project a DC Motor is used and it acts as the vehicle. The input of a DC motor is current/voltage and its output is torque.The motor drivers will

acts as interfacing devices between microcontrollers and motors. Motor drivers will act as current amplifiers since they take a low current control signal and provide a high current signal. This high current signal is used to drive the motors. A Switch is used initiate the whole process. A single pole double throw(SPDT) switch is used, which has 3 terminals, one for input and two for the outputs respectively. Whenever the switch is made ON the motors stops running indicating the brake applied in the vehicle.

Li-Fi

Li-Fi technology is a wireless communication system in which light is used as a carrier signal instead of radio frequency as in Wi-Fi. Li-Fi is mainly used for its wider bandwidth and faster data transmission. In our paper, we use Li-Fi transmitter and Li-Fi receiver. The transmitter section consists of an LED and receiver section is fitted with the Photodiode. Data is fed into LED, it then sends data at rapid speed to the photodiode. The signal is captured by the photodiode and is converted into suitable form. Thus accidents are prevented with the help of light using V2V Communication.

Sensors

In our project, three sensors namely ultrasonic sensor, crash sensor and gas sensor are used. The HC-SR04 Ultrasonic sensor is a senor which operates at 5V. It measures a distance of about 80 cm accurately. So accidents can be prevented even at a short distance. Crash sensor is an Arduino compatible device which is used to detect collision or accidents. This operates at 5V with one output pin and GND, VCC pins. The Gas sensor MQ-3 is used for alcohol detection in drivers. This is connected in series and needs a power supply of 5V. In addition to these, a buzzer is used to alert the drivers at each step. An LCD device is used to display all the outputs step by step.

GPS and GSM

Here, we use GPS-SIM 28 and GSM-SIM 900A modules. Whenever the accidents are detected with the help of crash sensor it displays and sends the message to the concerned server using the GSM, for further accurate details GPS is used for accurate location of the accident occurred. The Global System for Mobile Communication (GSM) SIM-900A is equipped with RS232 cable and can be programmed with languages like Embedded C.The Global Positioning System (GPS) is a satellite-based navigation system made up of at least 24 satellites. GPS works in any weather conditions. To calculate your 2-D position (latitude and longitude) and track movement, a GPS receiver must be locked on to the signal of at least 3 satellites.

Software Requirements

The software requirements of our project include,

- Arduino IDE
- Embedded C Language

III. BLOCK DIAGRAMS

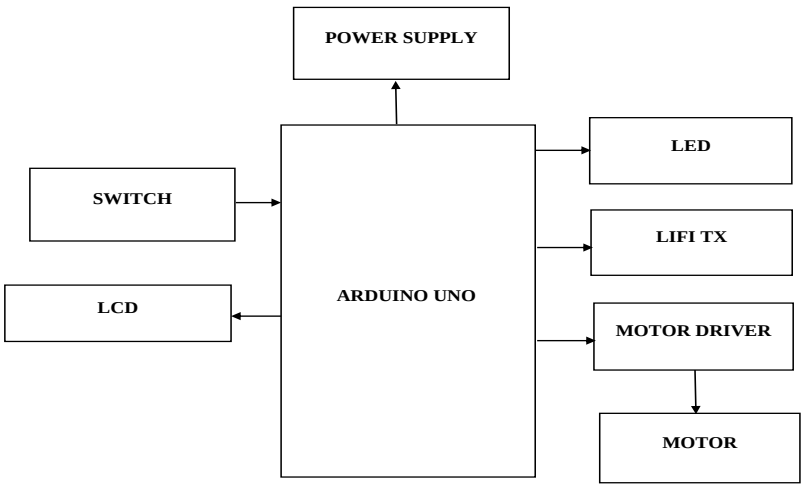

Figure:1 Transmitter Block Diagram

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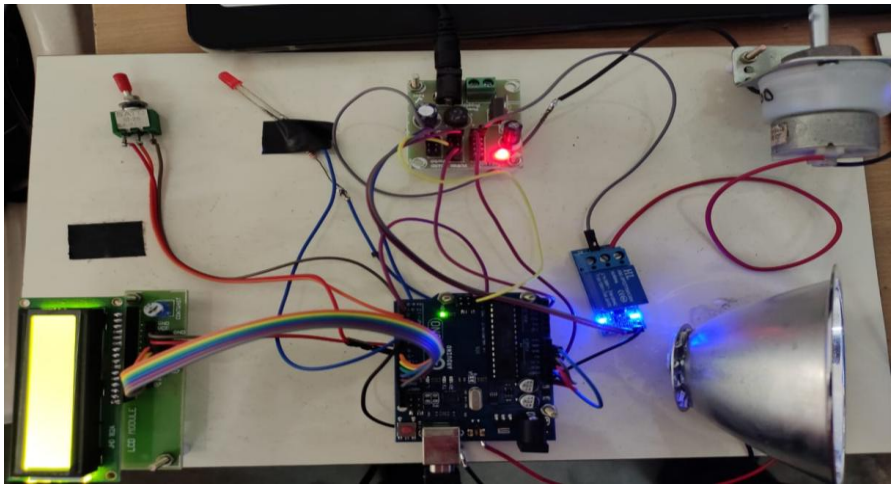

Figure: 2 Transmitter Section

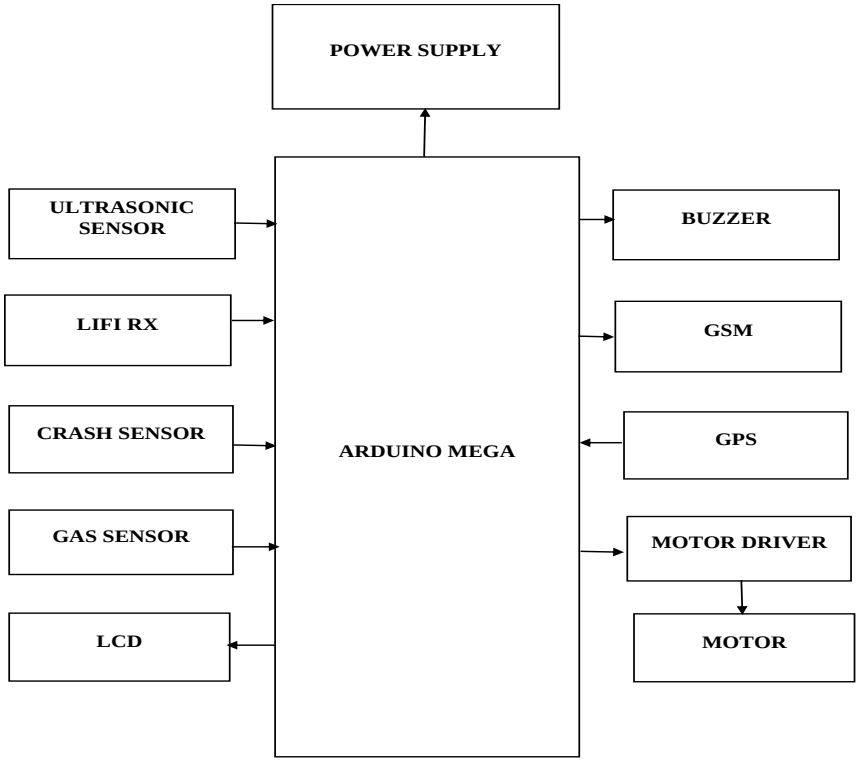

Figure: 3 Receiver Block Diagram

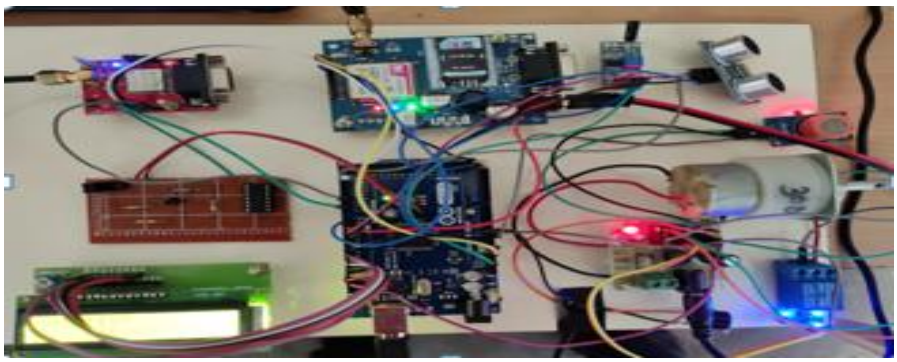

Figure:4 Receiver Section

IV. WORKING AND ANALYSIS

Here, we use two Arduino microcontrollers which acts as the brain of our system, so the entire program is stored in it. In our proposed system, we have two sections, transmitter section and receiver section. In transmitter section, the vehicle will stop using switch (brake), the motor will stop and LED glows (Brake Light) on facing any obstacle. This stop condition information of the vehicle upfront is transmitted wirelessly using Li-Fi Transmitter. In the receiver section, the transmitted information is received using Li-Fi Receiver and buzzer will produce alarm as an alert signal for the driver in another vehicle. The receiver section has features like ultrasonic sensor which is used to calculate and maintain the distance between two vehicles to prevent accidents. Crash sensor is used in vehicle for accident detection. Once vehicles collided each other, the sensor detects and shares the location using GPS and sends the message to the respective person using GSM.

V. CONCLUSION

In this paper, the concept of Li-Fi Technology is implemented along with existing techniques used for V2V Communications. The existing systems are not powerful enough to prevent road accidents. Main purpose of our system is fast process, low cost of development, acceptable quality, accurate tracking. This paper put forth a technique that prevents accidents and also instantaneously intimates the concerned authorities. As a future work, a camera can used as an addition to capture the image of an accident and process it for more accuracy and prevent accidents.

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