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A EXPERIMENT ON COLLISION AVOIDANCE SYSTEM FOR VEHICLE APPLICATIONS

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ABSTRACT:
Accidents occur so often and with such uncertainty these days. Accidents produce the most damage, serious injuries, and sometimes even fatalities. The driver's failure to apply the brake in a timely manner is the primary cause of these collisions. Preventive measures, such as improving visibility, putting headlights on cars, windshield wipers, tire traction, etc., were put into place to reduce the chance of an accident. We are now in the process of actively preventing collisions while providing the highest level of safety for drivers and even pedestrians. Thus, in this study, we try to provide a novel automated vehicle accident avoidance system. The purpose of this project is to develop new technology that will enable drivers to use sensors to stop their automobiles automatically when they come across obstacles rather than manually applying the brake pedal. The primary objective of this study is to develop a sensor-based embedded system that can assist drivers in avoiding crashes on the road in order to save lives and prevent financial loss.

I.INTRODUCTION OF PROJECT

Collision avoidance systems concentrates on advanced ideas such as pre-crash sensing, an ultrasonic sensor is used to sense the object in front of the vehicle and gives the signal to the microcontroller unit. Based on the signal received from the ultrasonic sensor, the microcontroller unit sends a signal to the braking unit for applying the brake automatically. A collision avoidance system, also known as a pre-crash system, forward collision warning system, or collision mitigating system, is an automobile safety system designed to prevent or reduce the severity of a collision. It uses radar (all-weather) and sometimes laser (LIDAR) and camera (employing image recognition) to detect an imminent crash. GPS sensors can detect fixed dangers such as approaching stop signs through a location database. Once an impending collision is detected, these systems provide a warning to the driver. When the collision becomes imminent, they take action autonomously without any driver input (by braking or steering or both). Collision avoidance by braking is appropriate at low vehicle speeds (e.g. below 50 km/h (31 mph)), while collision avoidance by steering may be more appropriate at higher vehicle speeds if lanes are clear. Cars with collision avoidance may also be equipped with adaptive cruise control, using the same forward-looking sensors According to the global road safety partnership annual report 2014 [1], as many as 1.24 million people died each year due to various road accidents occurring throughout the world. Apart from the above-mentioned death toll, almost50 million people become victim of critical life-altering injuries. This is a global humanitarian disaster and this is 8th leading cause of the death globally. According to the World Health Organization, road traffic

injuries caused an estimated 1.35 million deaths worldwide in the year 2016.[6] According to the 2013 global survey of traffic collisions by the UN World Health Organization, India suffered a road fatality rate of 16.6 per 100,000 people in 2013. India's average traffic collision fatality rate was similar to the world average rate of 17.4 deaths per 100,000 people, less than the low-income countries which averaged 24.1 deaths per 100,000, and higher than the high-income countries which reported the lowest average rate of 9.2 deaths per 100,000 in 2013.[5]

II. LITERATURE SURVEY

[1.1] Predictive vehicle collision avoidance system using raspberry-bi it seemed like to avoid accidents in the blind spot area using ultrasonic sensor using raspberry-bi module. The ultrasonic sensor works like radar system to detect the obstacles in the blind spot that can Cause the accidence but it is cheaper than it. In addition to that the ultrasonic sensor is used to measure the distance between the vehicle and the obstacles and saved the distance safe before fatalities happened and alerting the driver before the accidence using two ways visualization using light emitting diode (LED) and make a sound using buzzer and the driver alone apply the brake or steering to controlling on the speed. The main advantage of ultrasonic sensor is that it provides highest reliability in getting proximity and has lesser absorption than RF and IR frequencies.

[1.2] Advanced Accident Avoidance System for Automobiles. This paper discussed the most important factors of accident due to the intersection accident and the bad weather and this whether to some extent either the heavy rain, huge ice or high darkness. Indeed, this bad weather conditions the driver feel very harsh to drive the vehicle and can't controlling the car. In this paper there are for types of sensors such as lm35 temperature sensor and humidity sensor and those sensors are used to check the weather states and alert the driver if any thinks happen in the weather. And there are a substation number of ultrasonic sensors to detect the near car and infrared sensors used to detect the forward cars by using burst of light to measure the cars speed, distance and position those sensors were fixed in the both car sides and in the forward of the vehicle to avoid all the cars and any barrier and alert the driver. This system was provided by Global System for Mobile communications (GSM) and Global Positioning System (GPS) module. If the accidence were happened then the system automatically takes position of the car and sends it to the police office and the driver family to save the driver and passenger's health.

[1.3] Internet of Car: Accident Sensing, Indication and Safety with Alert system. In this paper we are discussing how to use ultrasonic sensor and radar system and laser to detect the obstacles such as humans, animals or vehicles and send the car and driver information to the police and their siblings and controlling of the brake system, the steering system and doors. And determine the accidence coordinates and send the data via GSM module in addition to that the data can send the data via Wi-Fi to the twitter. Actually, the main technology used is Obstacle detection & indication sensor in this method we use the photoelectric sensor it mainly consists of transmitter and receiver. In the two side of cars there are two sensors to detect the obstacles. The indicator used the redlight emitting diode (LED) when it finds obstacles. Subsequently the second method is used is passive infrared (PIR) sensor or we can say human detection sensors. The importance of this sensor to detect the human near the car and give the car order to avoid this human. To detect the accidence here they used complex three axis accelerometer. This sensor mainly detects the

accidence when the car deviate by angle from the road in addition to that the system were provided by relay circuit to protect the car from battery ignition when the accidence occurs and this system uses GUS designed by android platform to monitor and tracking the vehicle.

[1.4] Vehicle collision avoidance system prototype that will alert drivers to their surroundings and potentially hazardous driving situations. This system is needed to reduce the number of vehicle accidents on the road. Such a system would lead to improved efficiency of the road usage and limit human as well as economic losses. The proposed system will use ultrasonic sensors to provide blind spot coverage, while utilizing long-range radar to detect possible frontal collisions. The system will be implementable on a variety of standard cars with easy installation. While the system will not provide any autonomous action to avoid collisions, it will warn the driver through both audible and visual warnings. The system will be evaluated through rigorous testing in order to develop an algorithm that encompasses most of the countless circumstances encountered on the road. Once the system is implemented, the system will accurately detect the presence of surrounding vehicles with minimal false positives and the driver will be alerted to any possible accident, giving him or her adequate time to respond

III.DESIGN OF HARDWARE

This chapter briefly explains about the Hardware. It discuss the circuit diagram of each module in detail.

ARDUINO UNO

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode. Arduino board has the following new features:

- 1.0 pin out: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible both with the board that use the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin, that is reserved for future purposes.

- Stronger RESET circuit.

- Atmega 16U2 replace the 8U2.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

Fig: ARDUINO UNO

POWER SUPPLY:

The power supplies are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can by broken down into a series of blocks, each of which performs a particular function. A d.c power supply which maintains the output voltage constant irrespective of a.c mains fluctuations or load variations is known as "Regulated D.C Power Supply".

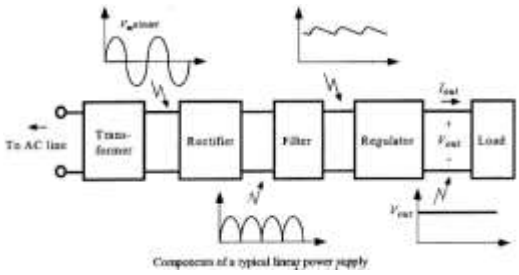


Fig: Block Diagram of Power Supply

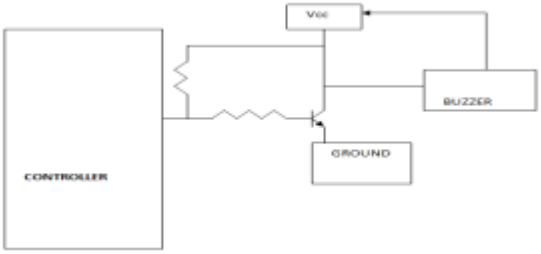
LCD DISPLAY

A model described here is for its low price and great possibilities most frequently used in practice. It is based on the HD44780 microcontroller (Hitachi) and can display messages in two lines with 16 characters each. It displays all the alphabets, Greek letters, punctuation marks, mathematical symbols etc. In addition, it is possible to display symbols that user makes up on its own. Automatic shifting message on display (shift left and right), appearance of the pointer, backlight etc. are considered as useful characteristics.

Fig: LCD

BUZZER

Digital systems and microcontroller pins lack sufficient current to drive the circuits like relays, buzzer circuits etc. While these circuits require around 10milli amps to be operated, the microcontroller's pin can provide a maximum of 1-2milli amps current. For this reason, a driver such as a power transistor is placed in between the microcontroller and the buzzer circuit.



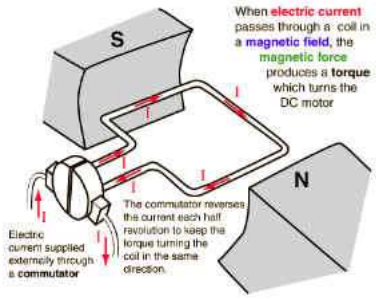
L293D:

The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications. All inputs are TTL compatible. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo- Darlington source. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN

and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled, and their outputs are active and in phase with their inputs. When the enable input is low, those drivers are disabled, and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications.

DC MOTOR

A DC motor is designed to run on DC electric power. Two examples of pure DC designs are Michael Faraday's homopolar motor (which is uncommon), and the ball bearin motor, which is (so far) a novelty. By far the most common DC motor types are the brushed and brushless types, which use internal and external commutation respectively to create an oscillating AC current from the DC source -- so they are not purely DC machines in a strict sense.



Ultrasonic sensor:

The sensor is primarily intended to be used in security systems for detection of moving objects, but can be effectively involved in intelligent children's toys, automatic door opening devices, and sports training and contact-less-speed measurement equipment.

Modern security systems utilize various types of sensors to detect unauthorized object access attempts. The sensor collection includes infrared, microwave and ultrasound devices, which are intended to detect moving objects. Each type of sensor is characterized by its own advantages and drawbacks. Microwave sensors are effective in large apartments because microwaves pass through dielectric materials. But these sensors consist of expensive super-high frequency components and their radiation is unhealthy for living organisms.

Infrared sensors are characterized by high sensitivity, low cost and are widely used. But, these sensors can generate false alarm signals if heating systems are active or temperature change speed exceeds some threshold level. Moreover, infrared sensors appreciably lose sensitivity if small insects penetrate the sensor lens. Ultrasound motion detection sensors are characterized by small power consumption, suitable cost and high sensitivity. That it why this kind of sensor is commonly used in home, office and car security systems. Existing ultrasound sensors consist of multiple passive and active components and are relatively complicated for production and testing. Sensors often times require a laborious tuning process.

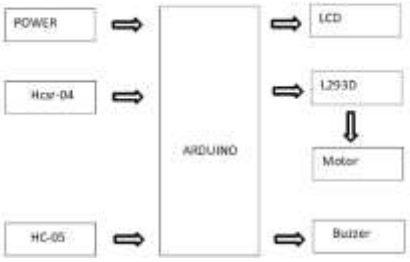
Bluetooth

Bluetoot**h** is a wireless protocol utilizing short-range communications technology facilitating data transmission over short distances from fixed and/or mobile devices, creating wireless personal area networks (PANs). The intent behind the development of Bluetooth was the creation of a single digital wireless protocol, capable of connecting multiple devices and overcoming issues arising from synchronization of these devices. Bluetooth uses a very robust radio technology called frequency hopping spread spectrum. It chops up the data being sent and transmits chunks of it on up to 75 different frequencies. In its basic mode, the modulation is Gaussian frequency shift keying (GFSK). It can achieve a gross data rate of 1 Mb/s. Bluetooth provides a way to connect and exchange information

between devices such as mobile phones, telephones, laptops, personal computers, printers, GPS receivers, digital cameras, and video game consoles over a secure, globally unlicensed Industrial, Scientific, and Medical (ISM) 2.4 GHz short-range radio frequency bandwidth. The Bluetooth specifications are developed and licensed by the Bluetooth Special Interest Group (SIG). The Bluetooth SIG consists of companies in the areas of telecommunication, computing, networking, and consumer electronics.

Bluetooth is a standard and communications protocol primarily designed for low power consumption, with a short range (power-class-dependent: 1 meter, 10 meters, 100 meters) based on low-cost transceiver microchips in each device. Bluetooth enables these devices to communicate with each other when they are in range. The devices use a radio communications system, so they do not have to be in line of sight of each other, and can even be in other rooms, as long as the received transmission is powerful enough. Bluetooth device class indicates the type of device and the supported services of which the information is transmitted during the discovery process.

IV. BLOCK DIAGRAM



V.CONCLUSION

The installation and construction of the collision avoidance system is done on a very basic and approachable model. The sensors are capable of accurately measuring shorter range distances. The driver does not need to enter anything; the system runs automatically. Consequently, this autonomous braking system can stop the car to avoid an accident.

FUTURE SCOPE

1.1. As the Internet of Things has expanded, package tracking has become simpler. Using the internet instead of GSM services is another way to cut communication costs.

2.2. The box may be built inside the wall so that the outside world can only see the receiving compartment lid, further securing the gift and the box itself.

3.3. The box can be linked to artificial intelligence systems like Google Assistant or Alexia.

4. To further innovate, biometric verification at the customer location could be incorporated.

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