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ACCIDENT PREVENTION BY EFFICIENT BRAKE MONITORING AND CONTROLLING SYSTEM

Guided By,

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Abstract

Accidents can happen to anyone, anytime and anywhere. Accidents which happen unexpectedly often result injuries , illness , loss or damage to property and sometimes even death .This project involves the actions or measures taken to minimize , or completely eradicate the potential hazards of an accident. These accidents can be avoided if only there was a mechanism to alert the driver of approaching danger. This can be done by monitoring the distance using ultrasonic sensor and wireless technology. This research describes how a cheap intelligent system design can be implemented to avoid sudden accidents. Automatic Braking is a technology for automobiles to sense an imminent collision with another vehicle, person or obstacle; or a danger such as a high speed approach to a stop sign and to respond with the braking system by either glowing LEDs or vibration produced. The design includes such system that the vehicle speed automatically reduces whenever there is a possible threat of accident.

Keywords – Bluetooth module, ultrasonic sensor, vibration motor, DC motor, Arduino.

I.INTRODUCTION

Driving is a compulsory activity for most people. People use their car to move from one place to other place. The number of vehicle is increasing day by day. Proportionally the numbers of accidents are also increasing. Nowadays, the numbers of accident is so high and uncertainly. Accident will occur every time and everywhere and cause worst damage, serious injury and dead. These accidents are mostly caused by the delay of the driver to hit the brake. The main target for this project is, cars can automatically brake due to obstacles when the sensor senses the obstacles. The braking circuit function is to brake the car automatically when the sensors detect any. Automatic Braking is a technology for automobiles to sense an imminent collision with another vehicle, person or obstacle; or a danger such as a high speed approach to a stop sign and to respond with the braking system by either precharging the brakes or by applying the brakes to slow the vehicle without driver input. Efforts have been reported for sensing vehicle surroundings

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with different visible, non visible (infrared) light and time-of-flight sensors. The ultrasonic sensors are well accepted technology for distance sensing applications. Ultrasonic sensors exhibit a dead zone directly in front of the sensor plane.. This technique allows for both, detection and classification of objects. Combined with US sensors, this can be exploited to design an improved distance measurement system, which provides the measurements with high accuracy.

The additional features included in this system are Automatic Speed reducing in case of emergency. This is done through Bluetooth signal communication. In this, Bluetooth receiver is placed in an area, where the Speed is limited. The Vehicle decodes the transmitted signal from the transmitter, and then automatically reduces the speed into particular rate, and the vehicle stops in that area. This feature is very useful in the safety applications. This decreases several problems in automotive fields. Researchers are always trying to find out a cheap solution to avoid accident automatically. Current researches are mainly based on Artificial Intelligence System. This process is vigorous and the cost is way too high. So to prepare a low cost intelligent system has become a new demand. It is possible to use different sensors and to make a cheap intelligent accident system with which accident can be minimized to a certain extent.

II.EXPERIMENTAL DESCRIPTION

A. Arduino Uno

Arduino microcontroller 328p of operating volt of 5V, 3.3V and frequency of 16MHz is used for this study. It contains Three GND, Analog(A0 through A5 on the UNO),Digital(0 through 13 on the UNO),PWM(3,5,6,9,10And 11 on the UNO). These pins act as normal digital pins, but can also be used for something called Pulse-Width Modulation (PWM). AREF Stands for Analog Reference. Most of the time you can leave this pin alone. It is sometimes used to set an external reference voltage (between 0 and 5 Volts) as the upper limit for the analog input pins. An early Arduino board with an RS-232 serial interface (upper left) and an Atmel ATmega8 microcontroller chip (black, lower right); the 14 digital I/O pins are at the top, the 6 analog input pins at the lower right, and the power connector at the lower left.

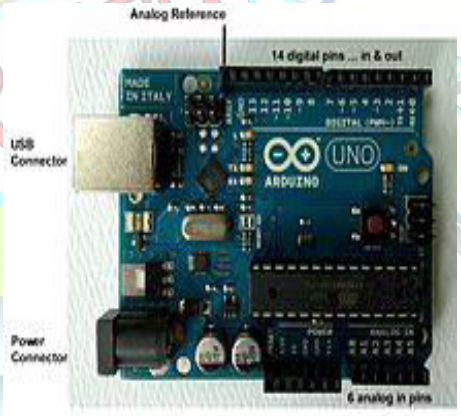

Fig 2.1 Arduino Uno

Most Arduino boards consist of an Atmel 8-bit AVR microcontroller (ATmega8, ATmega168, ATmega328, ATmega1280, ATmega2560) with varying amounts of flash memory, pins, and features. The 32-bit Arduino Due, based on the Atmel SAM3X8E was introduced

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in 2012. The boards use single or double-row pins or female headers that facilitate connections for programming and incorporation into other circuits. These may connect with add-on modules termed *shields*. Multiple and possibly stacked shields may be individually addressable via an I²C serial bus. Most boards include a 5 V linear regulator and a 16 MHz crystal oscillator or ceramic resonator. Some designs, such as the Lily Pad, run at 8 MHz and dispense with the onboard voltage regulator due to specific form-factor restrictions.

Arduino microcontrollers are pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory. The default boot loader of the Arduino UNO is the optiboot loader. Boards are loaded with program code via a serial connection to another computer. Some serial Arduino boards contain a level shifter circuit to convert between RS-232 logic levels and transistor–transistor logic (TTL) level signals. Current Arduino boards are programmed via Universal Serial Bus (USB), implemented using USB-to-serial adapter chips such as the FTDI FT232. Some boards, such as later-model Uno boards, substitute the FTDI chip with a separate AVR chip containing USB-to-serial firmware, which is reprogrammable via its own ICSP header. Other variants, such as the Arduino Mini and the unofficial Board Uno, use a detachable USB-to-serial adapter board or cable, Bluetooth or other methods. When used with traditional microcontroller tools, instead of the Arduino IDE, standard AVR in-system programming (ISP) programming is used.

The Arduino board exposes most of the microcontroller's I/O pins for use by other circuits. The Arduino Uno provide 14 digital I/O pins, six of which can produce pulse-width modulated signals, and six analog inputs, which can also be used as six digital I/O pins. These pins are on the top of the board, via female 0.1-inch (2.54 mm) headers. Several plug-in application shields are also commercially available.

B. Ultrasonic sensor

Fig 2.2 Ultrasonic sensor

The sonar sensor is usually known as Ultrasonic Sonar Sensor. It has four pins. The pins are named VCC, Trig-pin, Echo-pin and ground-pin. The VCC pin stands for power. This is used to power up the sensor. The Trig and Echo pins are connected to the micro-controller.

Actually the sensor emits an ultrasonic sound and searches instantaneously to receive the sound back. It records the time between sending and receiving signals. Then a calculation is made to convert the time duration to distance in the program. These are used to

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achieve optimal positioning for accurate spatial resolution.

It has an effective way to sense the presence of nearby objects and the distance to them. Often robots use these to sense objects or collisions and take appropriate action. Ultrasound is a high frequency sound (typically 40 KHz is used). A short burst of sound waves (often only 8 cycles) is sent out the "Transmit" transducer (left, above). Then the "Receive" transducer listens for an echo. Thus, the principle of ultrasonic distance measurement is as the same as with Radio- based radar.

Distance is calculated as: L = C × T/2, where L is the length, C is the speed of sound in air; T is the time difference from the transmission from the transmitter to the receiver. This is divided by 2 for the two-directions the sound travels. Speed of sound is about: C = 344m / s (20 degrees C room temperature). Speed of sound in air velocity is affected by the air density, and for high accuracy, the temperature must be taken into account, either within the module electronics (In the SRF-06 module we have) or in the Arduino software.

C. Bluetooth Module

Bluetooth devices are capable of communicating with eight other devices simultaneously. They can communicate up to a range of 100m. It can quickly exchange short bursts of information between moving units. It can handle electromagnetically noisy environments and also broadcast communication. It is a low power radio operating in the spectrum of 2.4GHz and a nominal antenna power of 20 dBm.

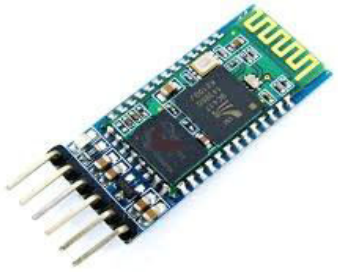

Fig 2.3 Bluetooth module

D. Objective of the Project

The main objective of this project is to intimate the emergency condition while driving the automobile. Intimation is done on following cases

- A circuit, having ultrasonic sensors measures the distance between vehicle and obstacle and when threshold exists intimation is done
- A Bluetooth module sends the analog values from one vehicle to another and in case of short distance vibration is made.
- In case of extreme emergency Automatic Brake System (ABS) is applied.

The obtained Parameters levels are measured the data are transferred through the Arduino microcontroller. The microcontroller read the available data and processed. Transfer the parameter values

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are interfacing to Arduino microcontroller and also send the parameter values through Bluetooth.

III.HARDWARE DESCRIPTION

- **Block Diagram:**

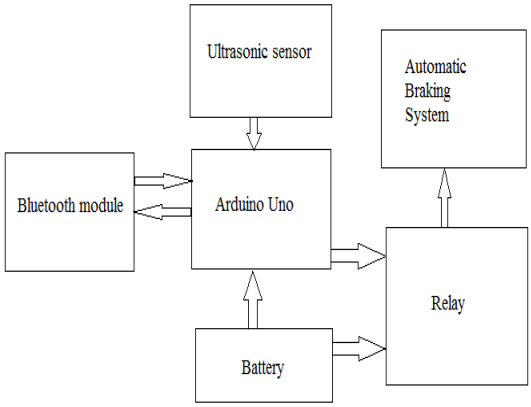

Fig 3.1 Functional Block Diagram

B. Parameters Measurement Descriptions

A. Operation of ultrasonic sensor

From Arduino generate a short 10uS pulse to the Trigger input to start the ranging. The Ultrasonic Module will send out an 8 cycle burst of ultrasound at 40 khz and raise its echo line high.

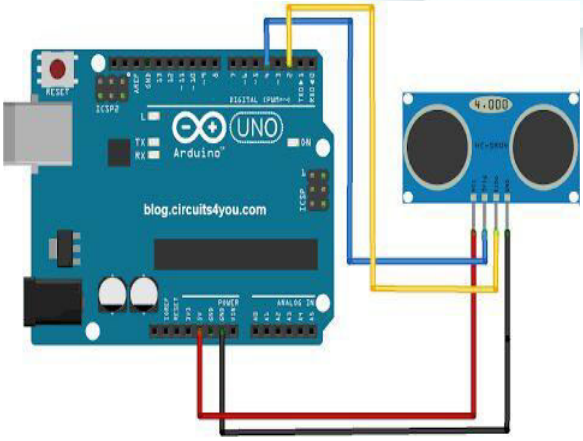

Fig 3.2 Interfacing Ultrasonic Sensor

It then listens for an echo, and as soon as it detects one it lowers the echo line again**.** The echo line is therefore a pulse whose width is proportional to the distance to the object. By timing the pulse it is possible to calculate the range in inches/centimeters. If nothing is detected then the module will lower its echo line anyway after about 30mS. The module provides an echo pulse proportional to distance. If the width of the pulse is measured in uS, then dividing by 58 will give you the distance in cm, or dividing by 148 will give the distance in inches.

The module can be triggered as fast as every 50ms, or 20 times each second. You should wait 50ms before the next trigger, even if the SRF05 detects a close object and the echo pulse is shorter. This is to ensure the ultrasonic "beep" has faded away and will not cause a false echo on the next ranging. The sensor can detect objects within 3cm to 3m range.

5 Pin Modules

Specifications:

- The module includes ultrasonic transmitter, receiver and control circuit.
- Its stable performance and high ranging accuracy make it a popular module in Robotics.
- There are 5 pins out of the module, VCC, Trig, Echo, OUT & GND.
- The name of 4th pin “OUT “is misguiding. As such no output is

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available at this pin. This is a Mode Select pin. Generally, it is left unused.

- It performs best in 30 degrees angle.
- Open source Arduino library is readily available to use.
- It operates at 5V DC & consumes 15mA current. Range of sensing is from 3cm up to 400cm with a resolution of 1cm.
- Trigger pulse width is 10us.

5 pin modules can be used as a 4 pin or 3 pin modules. If you leave out the 4th pin (OUT) in a 5 Pin Module , it behaves as a 4 pin Module. If you Ground the 4th pin then it behaves as a 3 pin PING module. If 4th pin is connected to GND, pin 2 is left out. Now the Trigger Input & Echo Output appears on single pin 3 (behaves as a 3 pin module). So, 4th pin of a 5pin module acts as a Mode Select pin.

The Arduino board sends a short pulse to trigger the detection, then listens for a pulse on the same pin using the pulseIn () function. The duration of this second pulse is equal to the time taken by the ultrasound to travel to the object and back to the sensor. Using the speed of sound, this time can be converted to distance.

B. Operation of Bluetooth module

HC-05 Specifications

- 2.45Ghz Frequency
- Asynchronous Speed 2.1Mbps (max) .160Kbps
- Security**:** Authentication
- Profile: Bluetooth Serial Port
- Power Supply: +3.3 Vdc
- Working Temperature: >20C
- Cost : Around INR 300

HC-05 Description

So, we have six (or four) leads in this module. But we will genuinely care about only four of them. Where, the two are for Vcc and GND. *Vcc= Power Supply (in other words 5V or 3.3V)*

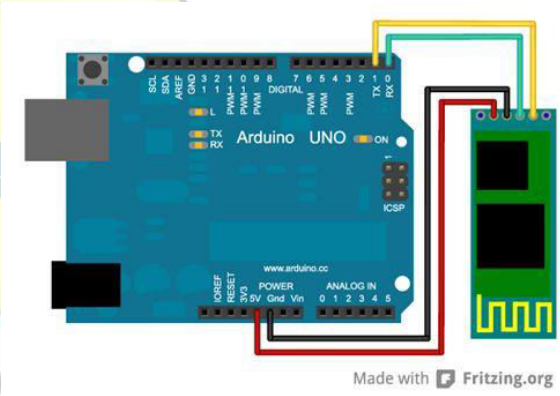

Fig 3.3 Interfacing Bluetooth Module

And the next two leads are for RX (Receiving End) and TX (Transmitting End). From the basic idea, we can say the RX of the module will go to the TX of the Arduino UNO. In the same way, we connect the TX of the module with the RX of the Arduino UNO.

V. SOFTWARE DESCRIPTION

A. Arduino IDE

IT is an open-source computer hardware and software company, project and user community that designs and manufactures microcontroller-based kits

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for building digital devices and interactive objects that can sense and control the physical world.

The Arduino integrated development environment (IDE) is a cross-platform application written in Java, and is derived from the IDE for the Processing programming language and the Wiring projects. Which also supports the languages C and C++.

A typical Arduino C/C++ sketch consists of two functions that are compiled and linked with a program stub *main ()* into an executable cyclic executive program:

Setup (): a function that runs once at the start of a program and that can initialize settings.

Loop (): a function called repeatedly until the board powers off.

After compiling and linking with the GNU tool chain, also included with the IDE distribution, the Arduino IDE employs the program *argued* to convert the executable code into a text file in hexadecimal coding that is loaded into the Arduino board by a loader program in the board's firmware. Arduino more straight forward by allowing the use of an ordinary computer as the programmer. Currently, opt boot loader is the default boot loader installed on Arduino UNO.

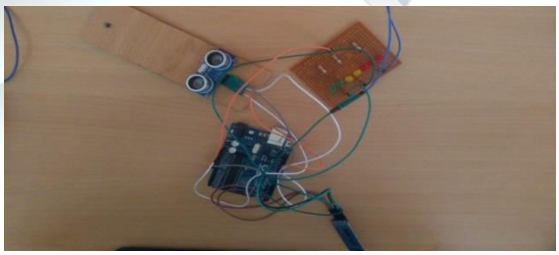
At a conceptual level, when using the Arduino integrated development environment, all boards are programmed over a serial connection. Its implementation varies with the hardware version. Some serial Arduino boards contain a level shifter circuit to convert between RS-232 logic levels and transistor–transistor logic (TTL) level signals. Current Arduino boards are programmed via Universal Serial Bus (USB), implemented using USB-to-serial adapter chips such as the FTDI FT232.

V. RESULT AND DISCUSSION

We measured the distance between two vehicles using Sensor. Then the value of the sensor is checked with the predetermined value. If it matches then corresponding preventive measures are taken.

Alert message is done by LEDs initially. If the vehicles come much closer then intimation is done by vibration motor.

If it is an extreme emergency then the speed of the following vehicle is reduced automatically. Communication is done by Bluetooth.



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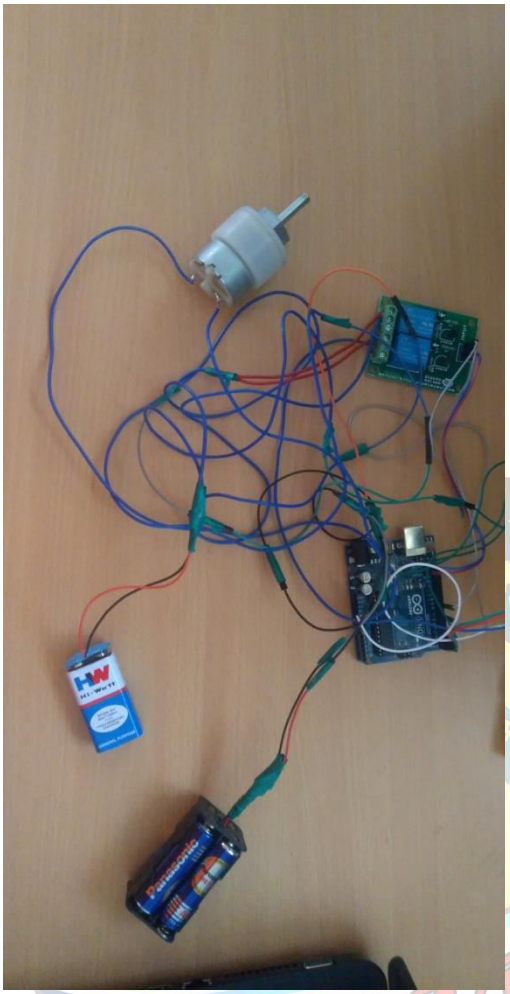

maintaining collision free automobile system and is designed at a low cost.

VI. CONCLUSION

The project is designed keeping in mind the increased accident rates in most of the areas. This Equipment can be effectively used by all two wheeler and four wheeler users. It can be a life saving machine for common people. The components can be easily fixed. The electronic parts are assured safe. This project is simple and efficient in

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