A Field Project Report

on

OBSTACLE DETECTION USING ARDUINO

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DECLARATION

We LEKHANSH AGRAWAL (2115000589), PARTH SINGH CHAUHAN (2115000698), RAM JI DIXIT (2115000823),SURAJ OMAR (2115001019), VAIBHAV SHARMA (2115001075)Hereby declare that the work presented in this project report entitled OBSTACLE DETECTION USING ARDUINO is an authentic record of our own work carried out under supervision of Mr. MAYANK GOYAL (ASSISTANT PROFESSOR, ELECTRICAL ENGINEERING).

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CERTIFICATE

This is to certify that the above statement made by the students is correct to the best of my knowledge and belief.

Date:

Place: Mathura

Name and Signature with Affiliation of Supervisor

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Chapter - 1

Introduction, Motivation and Objective

1.1 INTRODUCTION

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing. Arduino is open-source hardware.

Arduino and Arduino-compatible boards use printed circuit expansion boards called *shields*, which plug into the normally supplied Arduino pin headers. Shields can provide motor controls for 3D printing and other applications, GNSS (satellite navigation), Ethernet, liquid crystal display (LCD), or breadboarding (prototyping).

The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub *main()* into an executable cyclic executive program with the GNU tool chain, also included with the IDE distribution.

1.2 MOTIVATION

Obstacle detection is a concept in lot to detect any objects that are found in our path of movement. It's easily detected and prevents

accidents caused by objects. This concept is implemented in many industrial equipment scenarios -- think robots, forklifts, cranes, etc. This concept gives a minimum level of intelligence to our equipment.

1.3 OBJECTIVE

It can be used as an embedded device which will guide blind people about the obstacles and objects nearby as well as warn them of about dangers. This platform will use powerful image processing Algorithms and object detection techniques that will help the blind to survive in real-life time-based environments. Blind people often tackle with issues such as crossing road in a very traffic-based area and often collide with obstacles. This makes them vulnerable to injury or sometimes even death. There is no device to guide these people to cross roads in very congested traffic-based environment.

In this project an obstacle detection system has built with Arduino. This system mainly uses an ultrasound sensor, buzzer and LED. When the ultrasonic sensor detects an obstacle at a distance <400 cm, the Arduino orders the buzzer to ring and the red LED to light up.

Chapter - 2

Description and Work done

2.1 HARDWARE REQUIREMENT:

1. Arduino UNO
2. Ultrasonic sensor
3. LED
4. Resistor
5. Breadboard
6. Buzzer
7. Connecting wires
8. USB data cable

2.2.1 *ARDUINO UNO*

The Arduino UNO is the best board to get started with electronics and coding. The UNO is the most used and documented board of the whole Arduino family. Arduino UNO is a microcontroller board based on the ATmega328P. 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 an AC-to-DC adapter or battery to get started.

FIGURE 2: ARDUINO UNO

- Arduino Uno is the most used and documented board in the world.
- "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0, now evolved to newer releases.
- It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button.
- Arduino is an open-source hardware, software, and content platform with a worldwide community of over 30 million active users.

2.2.2 *ULTRASONIC SENSOR*

The HC-SR04 ultrasonic sensor uses SONAR to determine the distance of an object just like the bats do. It offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package from2 cm to 400 cm or 1” to 13 feet.

The operation is not affected by sunlight or black material, although acoustically, soft materials like cloth can be difficult to detect. It comes complete with ultrasonic transmitter and receiver module.

FIGURE 3: ULTRASONIC SENSOR

- Working Voltage: 5V (DC)
- Static Current: Less than 2mA
- Output Signal: Electric frequency signal, high level 5V, low level 0V
- Sensor Angle: Not more than 15 degrees
- Detection Distance: 2 cm to 450 cm

2.2.3LED

A **light-emitting diode** (**LED**) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The colour of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor. White light is obtained by using multiple semiconductors or a layer of light-emitting phosphor on the semiconductor device.

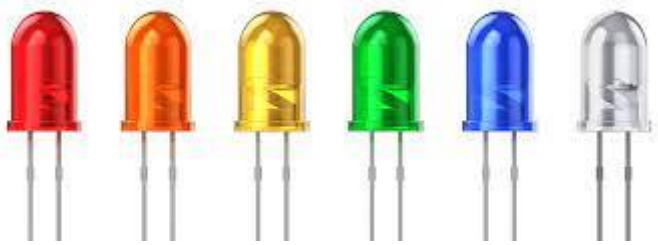


FIGURE 4: LED

2.2.4RESISTOR

A resistor is a linear, passive two-terminal electrical component that implements electrical resistance as a circuit element. The current through a resistor is in direct proportion to the voltage across the resistor's terminals. Thus, the ratio of the voltage applied across a

resistor's terminals to the intensity of current through the circuit is called resistance. The current through a resistor is in directly proportional to the voltage across the resistor's terminals. This relationship is represented by Ohm's law

I=V/R ... (2.2.4.1)

Where I is the current through the conductor in units of amperes, *V* is the potential difference measured across the conductor in units of volts, and *R* is the resistance of the conductor in units of ohms.

FIGURE 5: RESISTOR

2.2.5 BREADBOARD

A breadboard, or protoboard, is a construction base for prototyping of electronics. Originally the word referred to a literal bread board, a polished piece of wood used when slicing bread. In the 1970s the solder less breadboard (a.k.a. plug board, a terminal array board) became available and nowadays the term "breadboard" is commonly used to refer to these.

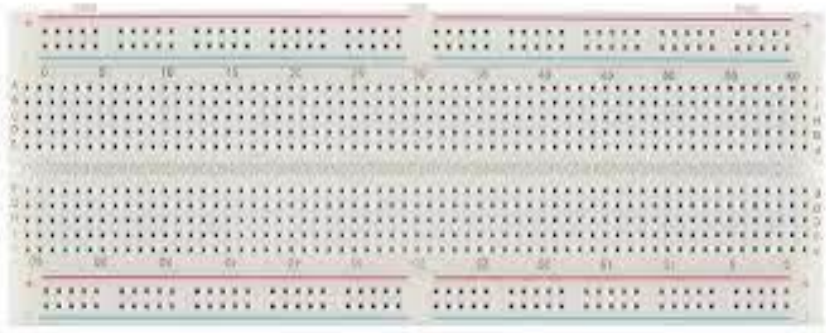


FIGURE 6: BREADBOARD

2.2.6 CONNECTINGWIRES (JUMPER WIRES)

A jump wire (also known as jumper, jumperwire, DuPontwire) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.

FIGURE 7: JUMPER WIRES

- Each cable length about 20 cm /8-inch; 0.127mm, 36 AWG/ single root; Standard 2.54mm headers and sockets.
- The cables can be separated to form an assembly containing the number of wires you require for your connection and to support non-standard odd-spaced headers
- Including 1pcs 40-pin male to female jumper wires, 1pcs 40-pin male to male jumper wires, 1pcs 40-pin female to female jumper wires
- 10 Different Colors, 120units copper cable in total, for making prototypes with boards, stepper motor 3D printer etc.

2.2.7USB cable type A/B Standard USB 2.0 cable.

Make the connection between a USB device and your computer's USB port. This USB 2.0 A/B Gold Device Cable assures that you get maximum performance from USB 2.0 devices (e.g. printers, external hard drives). It supports fast data transfer rates of up to 480 Mbps, and is backward compatible with USB 1.1.

FIGURE 8: USB CABLE

- 1.5 meters with ferrite core high-speed USB 2.0 A-Male to B-Male cable
- Connects mice, keyboards and speed-critical devices, such as external hard drives, printers and cameras to your computer
- Optimal signal clarity and shielding to minimize interference
- Full 2.0 USB capability/480 Mbps transfer speed
- This cable features a standard type-a USB connector on one end and a standard type-b connector on the other.

2.2.8BUZZER

An audio signalling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren.

FIGURE 9: BUZZER

2.3.1Stage 1 [Connecting all hardware]:

Connect the Buzzer positive terminal to the Arduino pin 2 and the negative terminal to the Gnd. Connect the VCC pin of ultrasonic to +5v pin and the Gnd to the ground.

Connect trig pin to pin 10 and echo pin to pin 9.

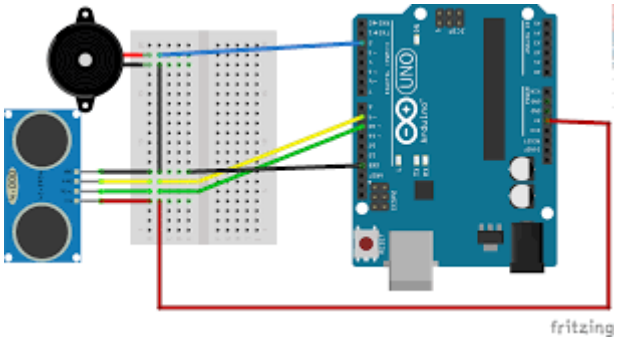


FIGURE 1: HARDWARE CONNECTION

2.3.2Stage 2 [Write& upload code to Arduino]

In this step, write code for Arduino using the Arduino IDE.

1. Download Arduino software.
2. Install and open an Arduino IDE in Laptop
3. Connect your Arduino board to computer using a USB data cable
4. Write the below code into the Arduino IDE.

```
// defines pins numbers
const int trigPin = 9;
const int echoPin = 10;
const int buzzer = 11;
const int ledPin = 13;
```

```
// defines variables
long duration;
int distance;
int safetyDistance;

void setup() {
pinMode(trigPin, OUTPUT); // Sets the trigPin as an Output
pinMode(echoPin, INPUT); // Sets the echoPin as an Input
pinMode(buzzer, OUTPUT);
pinMode(ledPin, OUTPUT);

Serial.begin(9600); // Starts the serial communication
}
void loop() {
// Clears the trigPin
digitalWrite(trigPin, LOW);
delayMicroseconds(2);

// Sets the trigPin on HIGH state for 10 micro seconds
digitalWrite(trigPin, HIGH);
delayMicroseconds(10);

digitalWrite(trigPin, LOW);


// Reads the echoPin, returns the sound wave travel time in
microseconds
duration = pulseIn(echoPin, HIGH);


// Calculating the distance
distance= duration*0.034/2;
```

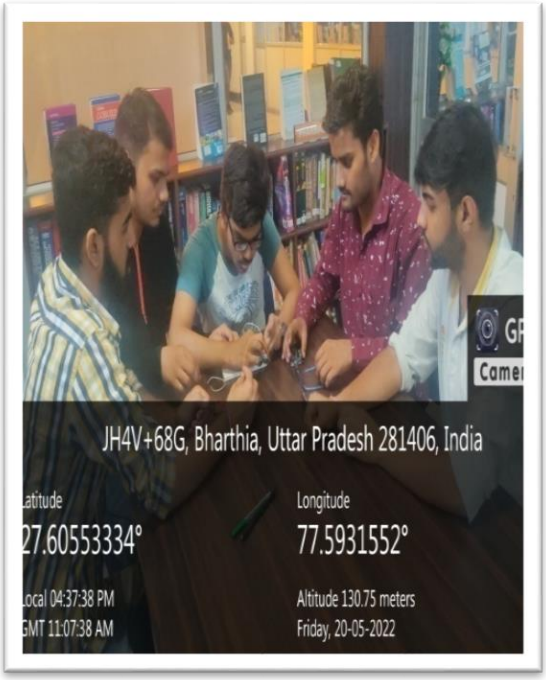
```
safetyDistance = distance;
      if (safetyDistance<= 5){
      digitalWrite(buzzer, HIGH);
      digitalWrite(ledPin, HIGH);
      }
      else{
      digitalWrite(buzzer, LOW);
      digitalWrite(ledPin, LOW);
      }

      // Prints the distance on the Serial Monitor
      Serial.print("Distance: ");
      Serial.println(distance);
      }
```

After the code upload is completed, the device can start to detect an obstacle.

Chapter - 3

Geotagged Images of Students at the place of work



Chapter - 4

Findings and Conclusion

The objective of this project is to design Obstruction Detection device. As described in this report a system is developed that can detect.

With respect to the requirements for obstacle detector the following can be concluded.

1. The system is able to detect objects within the sensing range.
2. This device has the capability to detect obstacles.
3. This can also communicate with PC through its serial port.
4. This offers a low cost and efficient solution for non-contact type obstacle detector.
5. This device is useful for blind persons.
6. This device can be used in obstacle avoiding robot which can be used in

- Obstacle avoiding robots can be used in almost all mobile robot navigation systems.
- They can be used for household work like automatic vacuum cleaning.
- They can also be used in dangerous environments, where human penetration could be fatal.

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