I.K. Gujral Punjab Technical University

Amritsar campus

Project Report
On
Distance Measurement using Ultrasonic Sensor and Arduino

Submitted in partial fulfillment of the requirements
For the award of degree of

BACHELOR OF TECHNOLOGY IN
COMPUTER SCIENCE AND ENGINEERING

Batch (2020-2024)

Submitted by:-

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2023727

DECLARATION

We, hereby declare that the work being presented by me on the project report entitled **Distance Measurement using Ultrasonic Sensor and Arduino,** for partial fulfillment of the award of degree of B.Tech submitted to the department of Computer Science, I.K. GUJRAL Punjab Technical University.

No part of this report has been submitted to any College or University for the reward of any degree to the best of my knowledge.

Head of Department:-

Dr.vipul sharma

Project leader:-

kalimela manjoshroy

CONTENT OF PROJECT

ACKNOWLEDGMENT

We would like to acknowledge the following as being idealistic channels and fresh dimensions in the completion of this project.

We take this opportunity to thank the I.K. Gujral Punjab Technical University for giving me chance to do this project.

We would also like to express my sincere gratitude towards my project guides, Dr. **Vipul Sharma** whose guidance and care made the project successful.

I would like to thank my University Library, for having provided various reference books and magazines related to my project.

ABSTRACT

The project is designed to develop distance measurement system using ultrasonic waves and interfaced with Arduino nano.

We know that human audible range is 20hz to 20khz.

We can utilize these frequency range waves through ultrasonic sensor HC-SR04.

The advantages of this sensor when interfaced with arduino which is a control and sensing system, a pro per distance measurement can be made with new techniques.

As large amounts are spent for hundreds of inflexible circuit boards, the arduino will allow business to bring many more unique devices.

This distance measurement system can be widely used as range meters and as proximity detectors in industries.

The hardware part of ultrasonic sensor is interfaced with Arduino nano.

This method of measurement is efficient way to measure small distances precisely.

The distance of an obstacle from the sensor is measured through ultrasonic sensor.

After knowing the speed of sound the distance can be calculated.

INTRODUCTION

Today's the developing world shows various adventures in every field. In each field the small requirements are very essential to develop big calculations.

By using different sources we can modify it as our requirements and implement in various field. In earlier days the measurements are generally occur through measuring devices.

But now a day's digitalization as is on height. Therefore we use a proper display unit for measurement of distance.

We can use sources such as sound waves which are known as ultrasonic waves using ultrasonic sensors and convert this sound wave for the measurement of various units such as distance, speed.

This technique of distance measurement using ultrasonic in air includes continuous pulse echo method, a burst of pulse is sent for transmission medium and is reflected by an object kept at specific distance.

The time taken for the sound wave to propogate from

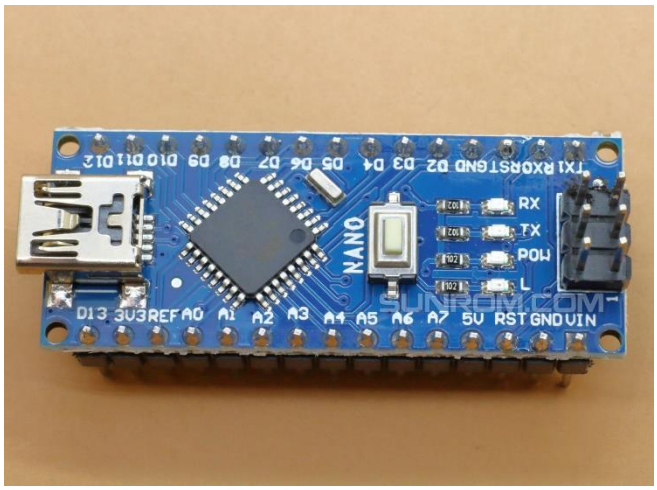
transmitter to receiver is proportional to the distance of the object.

In this distance measurement system we had ultrasonic sensor HC-SR04 interfaced with arduino nano. Programming and hardware part of ultrasonic sensor interfacing with arduino nano.

REQUIREMENT ANALYSIS AND SPECIFICAION

1.Arduino Nano

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz crystal oscillator, 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.



2. ULTRASONIC SENSOR

It emits an ultrasound at 40 000 Hz which travels through the air and if there is an object or obstacle on its path It will bounce back to the module. Considering the travel

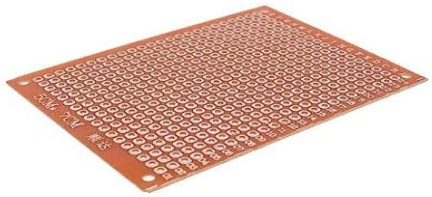
time and the speed of the sound you can calculate the distance.

3.LED

LED stands for **light emitting diode**. LED lighting products produce light up to 90% more efficiently than incandescent light bulbs. An electrical current passes through a microchip, which illuminates the tiny light sources we call LEDs and the result is visible light. To prevent performance issues, the heat LEDs produce is absorbed into a heat sink.

4.PCB BOARD

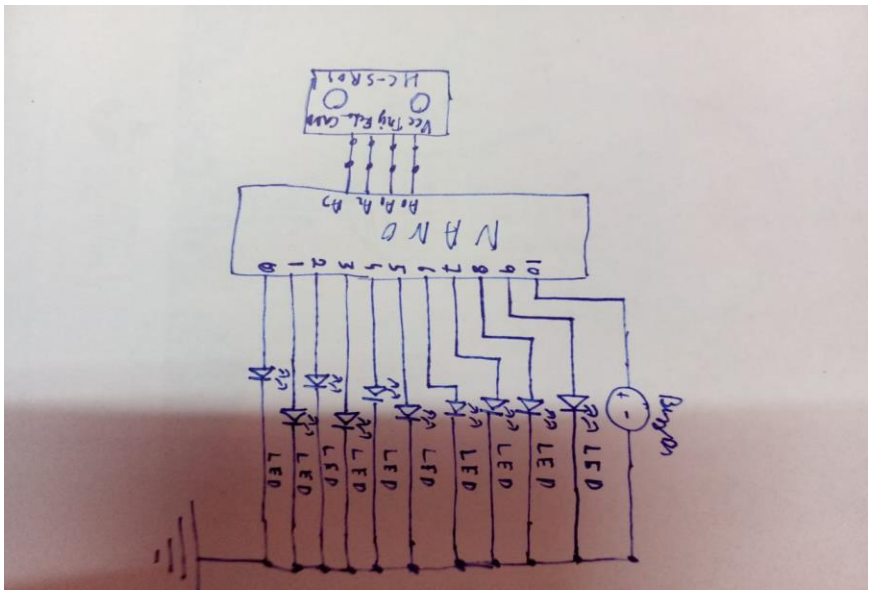
PCBs require additional design effort to lay out the circuit, but manufacturing and assembly are automated. Electronic computer-aided design software is available to do much of the work of layout. Mass-producing circuits with PCBs are **cheaper** and **faster** than with other wiring methods.



5.USB CABLE

The USB cable is a popular, standard cable that enables a computer device to interact with peripheral and other devices. It stands for Universal Serial Bus, and there are various devices that are connected through USB cable, such as keyboards and mice, music players and flash drives, etc.

SYSTEM DESIGN



IMPLEMENTATION

```
#define vcc A0
#define trigpin A1
#define echopin A2
#define gnd A3
float duration=0.0,distance=0.0;
int numberOfPins=0;
float getDistance();
void setup()
{
  pinMode(vcc, OUTPUT);
  pinMode(trigpin, OUTPUT);
  pinMode(echopin, INPUT);
  pinMode(gnd, OUTPUT);
  digitalWrite(vcc, HIGH);
  digitalWrite(gnd, LOW);
  for(int i=2;i<12;i++)
  {
    pinMode(i,OUTPUT);
  }
}

void loop()
{
  if(getDistance()>50)
  {
    for(int i=2;i<12;i++)
    {
      digitalWrite(i,LOW);
    }
  }
  else if(getDistance()<=50)
  {
```

```
  {
    for(int i=2;i<12;i++)
    {
      digitalWrite(i,LOW);
    }
  }
  else if(getDistance()<=50)
  {
    for(int i=2;i<12;i++)
    {
      digitalWrite(i,LOW);
    }
    for(int i=2;i<12;i++)
    {
      digitalWrite(i,LOW);
    }
    numberOfPins=12-getDistance()/5;
    for(int i=2;i<=numberOfPins;i++)
    {
      digitalWrite(i,HIGH);
    }
  }
}
float getDistance()
{
  digitalWrite(trigpin,LOW);
  delayMicroseconds(10);
  digitalWrite(trigpin,HIGH);
  delayMicroseconds(10);
  digitalWrite(trigpin,LOW);
  duration=pulseIn(echopin,HIGH);
  distance=duration*0.034/2;
  return distance;
}
```

RESULT

The working model of the proposed distance measurement system using ultrasonic sensor was successfully designed and implemented.

The circuit was able to measure distance upto 50cm. The LED lights will glow according to the distance.

The red light indicates that object is within 10-20 cm Far.

Circuit was tested to measure various distance . It has a fast response.

The ultrasonic module works good. By using ultrasonic sensor we were able to reduce cost and increase efficiency.

This implementation has been the readily used in the fast growing electronic industry.

CONCLUSION AND FUTURE

Distance measurement using ultrasonic sensor and Arduino nano consist of a transmitter part of ultrasonic module units ultrasonic high frequency waves in the form of polices after collision of these wares with any object, these wares detected by microphone time taken by these wares from transmitter and receiver is used to measure distance from any object. We had used a ultrasonic sensor module of HC-SR04, because this ultrasonic module is initiated with pulse of 10us The distance from any object is calculated from.

Distance =speed*time

The human audible range can be converted measure the distance precisely manner. We can use humidity sensors in future to measure distance in different environment. Using ultrasonic sensor with better specification we can increase the distance measurement range. This system is used in driverless car to detect obstacle.