Distance Measurement using Ultrasonic Sensor and Arduino

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Abstract:
The project is designed to develop distance measurement system using ultrasonic waves and interfaced with arduino. 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. 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.

I. 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 propagate 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 UnoR3. Programming and hardware part of ultrasonic sensor interfacing with arduino UnoR3.

BLOCK DIAGRAM

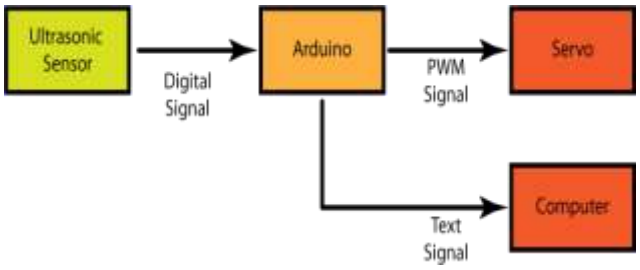


Figure.1. block diagram

ARDUINO –AT MEGA328

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 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.

Figure.2. Pin diagram of arduino At Mega328

ULTRASONIC SENSOR-SR04

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.

Figure.3. Ultrasonic sensor-sr04

LCD-16*2

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

A **16x2 LCD** means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

Figure.4. LCD 16*2

BATTERY-9V/12V

5V regulated power supply is required for both arduino and ultrasonic sensor and is obtained from 12V rechargeable Li-Ion battery. 5V DC is achieved by voltage regulator 7805.

Figure.5.Battery-9 v/12 v

Potentiometer

Potentiometer is a device used to measure the internal resistance of a cell, to compare the e.m.f. of two cells and potential difference across a resistor. It consists of a long wire of uniform cross sectional area and of 10 m in length. The material of wire should have a high resistivity and low temperature coefficient. The wires are stretched parallel to each other on a wooden board. The wires are joined in series by using thick copper strips. A meter scale is also attached on the wooden board. It works on the principle that when a constant current flows through a wire of uniform cross sectional area, potential difference between its two points is directly proportional to the length of the wire between the two points.

II. CONCLUSION

Distance measurement using ultrasonic sensor and arduino 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.

III. FUTURE SCOPE

I. New prototyping hardware & capability & interfacing with other consumer electronics/tv/smartphones & flooding of shields .

II. Mining equipments may require where entail.

III. Already compatible with many major simulation software like MATLAB & lab view, we may see even move flexible programming environment & development option

IV. Using temp. Compensation, it can be used over wide temp range.

V. Height meauserment, agriculture velide, collision /protection can be other application.

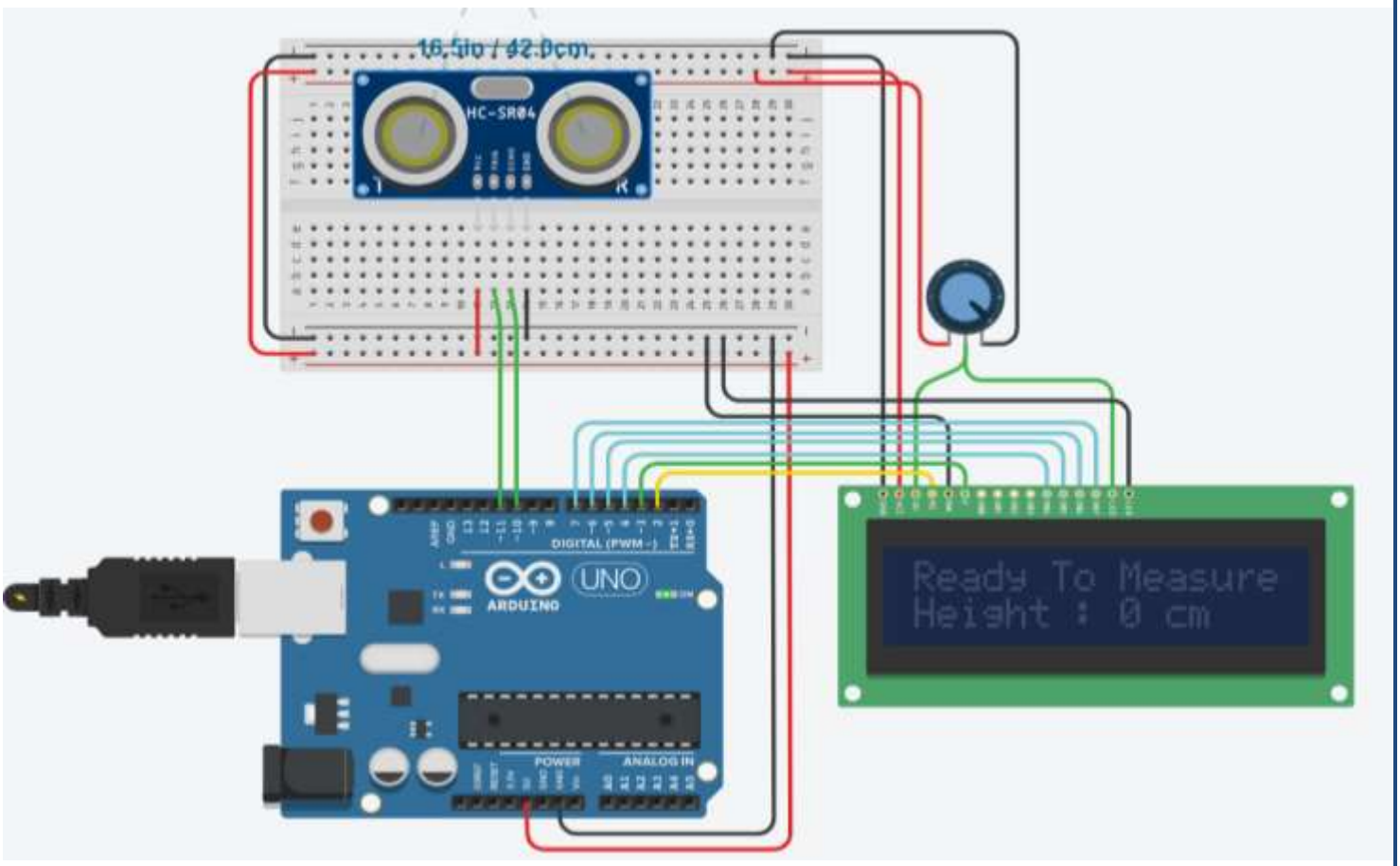
IV. REFERENCES

[1]. " Basic circuit Analysis" by k.v.v murthy

[2]. Digital circuit /Digital Integrated Budronies "by H.Taub D .schilling

[3]. "Transduces & instrumentation"(sensory by D.V.S moth

TINKERCAD REPRESENTATION



CODE:

```
#include <LiquidCrystal.h>

const int trigPin = 11;
const int echoPin = 10;

long duration;
int distance;
bool measured = false;
int maxReferenceHeight = 500;
int referenceHeight;
int maxHeight = 220;
int minHeight = 30;

const int rsPin = 2;
const int enablePin = 3;
const int data_4 = 4;
const int data_5 = 5;
const int data_6 = 6;
const int data_7 = 7;

LiquidCrystal lcd(rsPin,
enablePin, data_4, data_5, data_6,
data_7);
// 16*2 LCD Display | RS - 42,
Enable - 44, Data - 46, 48, 50, 52
(R/W - GND)

void setup() {
  // put your setup code here, to
run once:
  lcd.begin(16, 2);
  lcd.clear();
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
}

void loop() {
  if (measured == false){
    lcdInitialAlert();
    clearTrigger();
    triggerON(10);
    distance = distanceMeasured();
    printDistanceToLCD(distance);
    measured = true;
  }
}

void clearTrigger(){
  // Clears the trigPin
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
}

void triggerON(int MicroSeconds){
  // Sets the trigPin on HIGH
state for X micro seconds
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(MicroSeconds);
  digitalWrite(trigPin, LOW);
}

int distanceMeasured(){
    // Reads the echoPin, returns
the sound wave travel time in
microseconds
    duration = pulseIn(echoPin,
HIGH);
    // Calculating the distance
    distance = duration*0.034/2;
    Serial.print("Distance: ");
    Serial.println(distance);
    return distance;
}

void printDistanceToLCD(int
distance){
  lcd.setCursor(0, 1);
  lcd.print("Height : ");
  lcd.print(distance);
  lcd.print(" cm");
}

void lcdInitialAlert(){
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Ready To Measure");
  delay(2000);
}
```