Embedded Systems Class Project 1 Report

Name : K Naveen Kumar

ID : 201451074

Experiment : 1

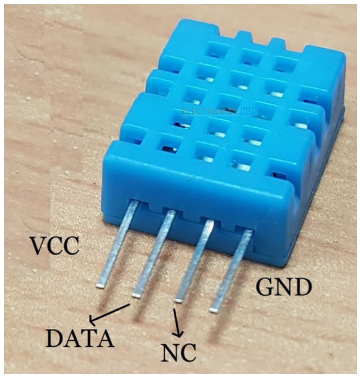
Aim : Automated irrigation system using a GSM modem:

The project is designed to operate a pump for automatic irrigation. It comprises of moisture sensing arrangement interfaced to an op-amp configured as a comparator.,the output of which is sent to a controller such that whenever moisture in the soil reduces, it turns the water pump on.Whenever it results in appropriate moisture content it switches off the motor. The above operations are monitered by the Arduino board.

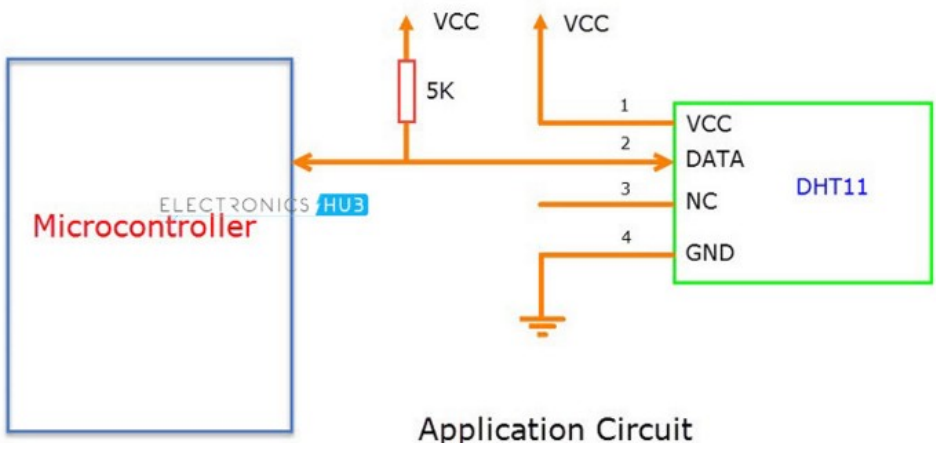
Hardware : Arduino UNO microcontroller, wires , LED, DHT11 humidity sensor.

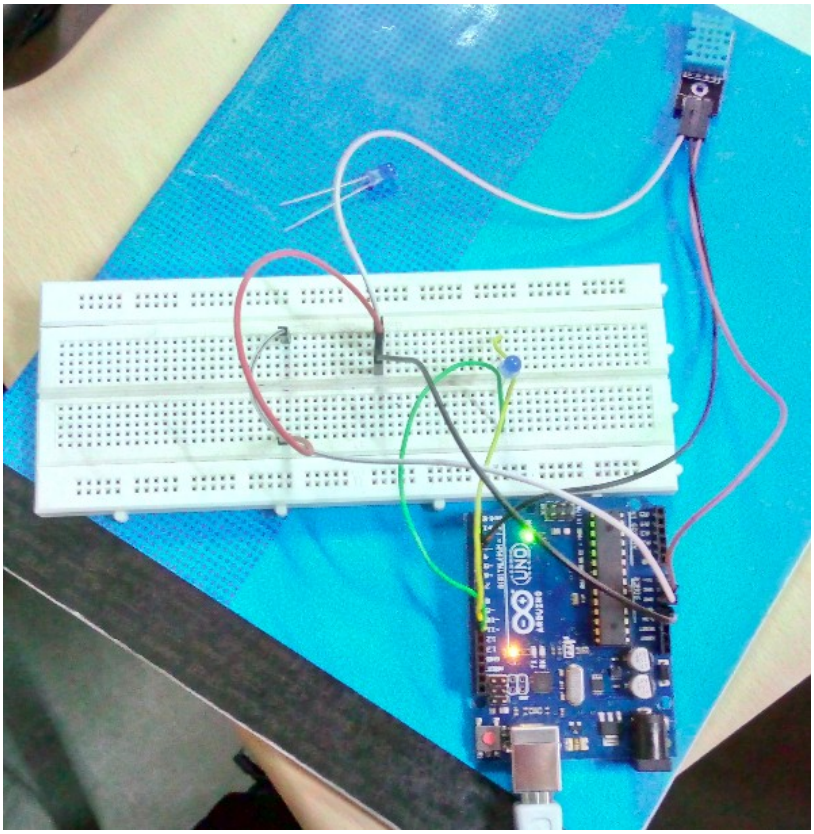
Theory :

- DHT11 is a Humidity and Temperature Sensor, which generates calibrated digital output. DHT11 can be interface with any microcontroller like Arduino, Raspberry Pi, etc. and get instantaneous results. DHT11 is a low cost humidity and temperature sensor which provides high reliability and long term stability
- DHT11 Humidity Sensor consists of 4 pins: VCC, Data Out, Not Connected (NC) and GND. The range of voltage for VCC pin is 3.5V to 5.5V. A 5V supply would do fine. The data from the Data Out pin is a serial digital data.



Connections:





- Vcc of DHT11 is connected to 5v pin of arduino
- Gnd of DHT11 is connected to Gnd pin of arduino
- Data pin of DHT11 is connected to pin 3 of arduino
- Cathode of LED is connected to pin 11
- Anode of LED is connected to pin 10

Program Code :

```
#include<dht.h>
dht DHT;
#define DHT11_PIN 3

void  setup(){
pinMode(10,OUTPUT);
pinMode(11,OUTPUT);
Serial begin(9600);
}
void loop(){

Serial.println("Humidity : ");
Serial.println(DHT.humidity,1);
delay(1000);
int value = DHT.humidity;

//Logic to check for low humidity and turning on led
```

```
if (value>23){
digitalWrite(10,HIGH);
delay(1000);
digitalWrite(11,LOW);
delay(1000);

else{
digitalWrite(10,LOW);
delay(1000);
digitalWrite(11,HIGH);
delay(1000);
}
}
```

Conclusion:

We observe in the serial moniter that when humidity exceeds 23 we see a led blink and if a motor is connected to it, it can be slowed down.Similary if humidity is less than 23 led is off and if a motor is connected to it , it can be raised up.

Experiment : 2

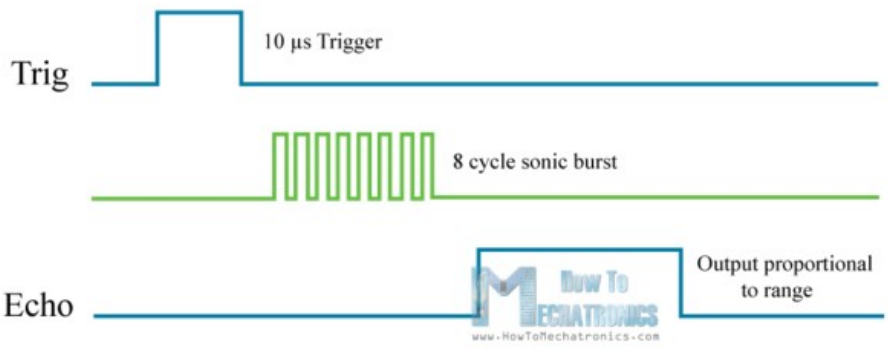
Aim : Speed Checker to detect rash driving on Highways:

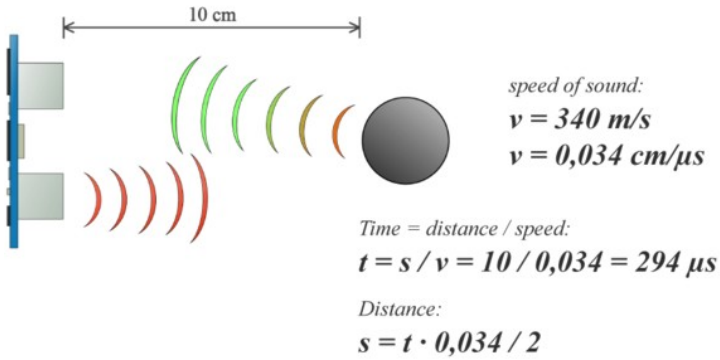
The time difference between 2 spots on a highway, one in advance to the other in the direction of the traffic flow, is sensed and fed to a arduino board to convert the same to the speed of a vehicle and generate a warning upon exceeding specified speed limit.

Hardware : Arduino UNO microcontroller, wires , LED, ultrasonic sensor HCSRO4.

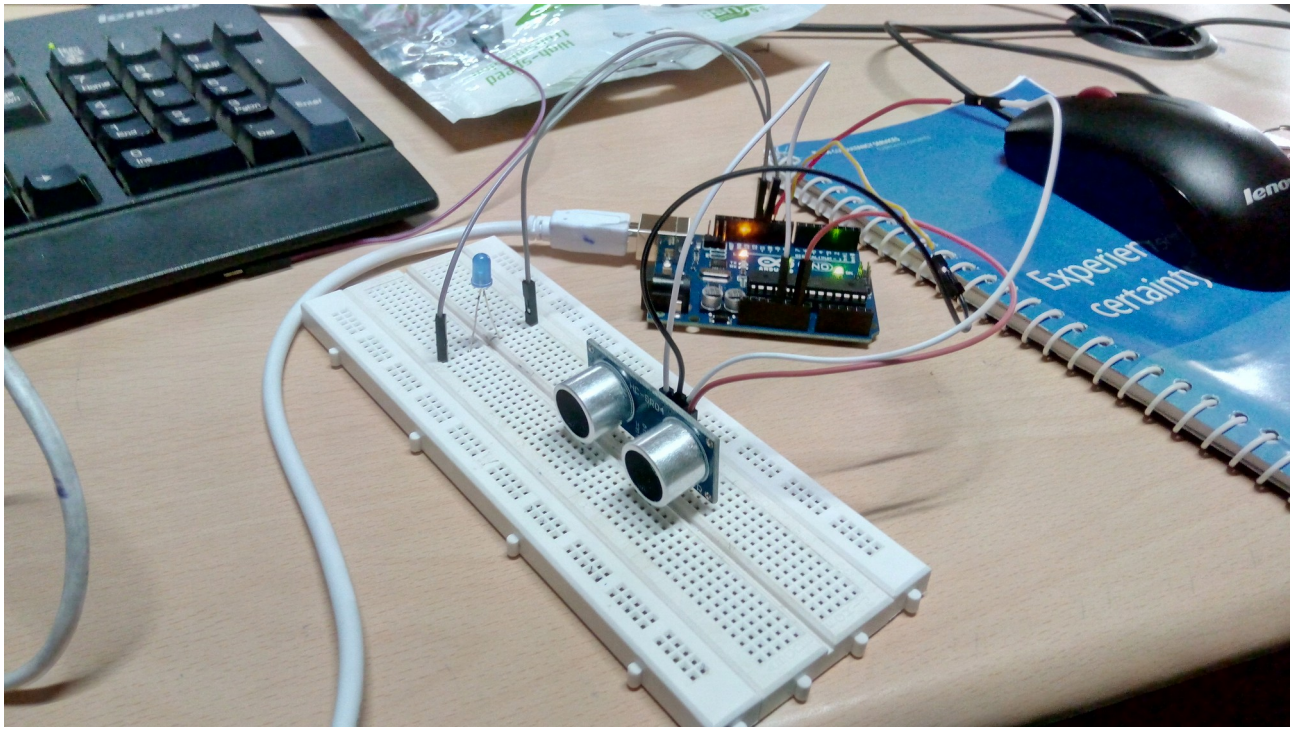
Theory :

- Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit.
- The basic principle of work:
  - Using IO trigger for at least 10us high level signal
  - The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.
  - IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning.
    - Test distance = (high level time×velocity of sound (340M/S) / 2,





Connections:



- Vcc of DHT11 is connected to 5v pin of arduino
- Gnd of DHT11 is connected to Gnd pin of arduino
- Trig pin to pin 9 of arduino
- echo pin to pin 10 of arduino
- Cathode of LED is connected to pin 12
- Anode of LED is connected to pin 11

Program Code :

```
const int trigPin = 9;
const int echoPin = 10;
// defines variables
long duration;
int distance;
int s; //speed
void setup() {
pinMode(trigPin, OUTPUT); // Sets the trigPin as an Output
pinMode(echoPin, INPUT); // Sets the echoPin as an Input

pinMode(11,OUTPUT);
pinMode(12,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;
// Prints the distance on the Serial Monitor
s = 2  * distance *1000 / duration; //delay of 2 seconds

//Logic checking for speed
if (s<0){
  s=0;
  Serial.println("No object detected");
  Serial.print("Speed: ");
  Serial.print(s);
  Serial.println("cm/sec");
```

```
  }
 else{
   Serial.println("object detected");
Serial.print("Speed: ");
Serial.print(s);
Serial.println("cm/sec");
 }

//Blinking the led if the speed limit exceeds
if (s > 30){
  Serial.println("Speed exceeded LED Blink");
  digitalWrite(11,HIGH);
  delay(1000);
  digitalWrite(12,LOW);
  delay(1000);

  }
else{
  Serial.println("Speed normal LED OFF");
  digitalWrite(11,LOW);
  delay(1000);
  digitalWrite(12,HIGH);
  delay(1000);

  }

delay(500);
}
```

Conclusion:

We observe in the serial moniter that when speed exceeds 30 we see a led blink and if a motor is connected to it, it can be slowed down.Similary if speed is less than or equal to 30 led is off and if a motor is connected to it , it can be raised up.