ECGR5196 LAB 3

GROUP: 29

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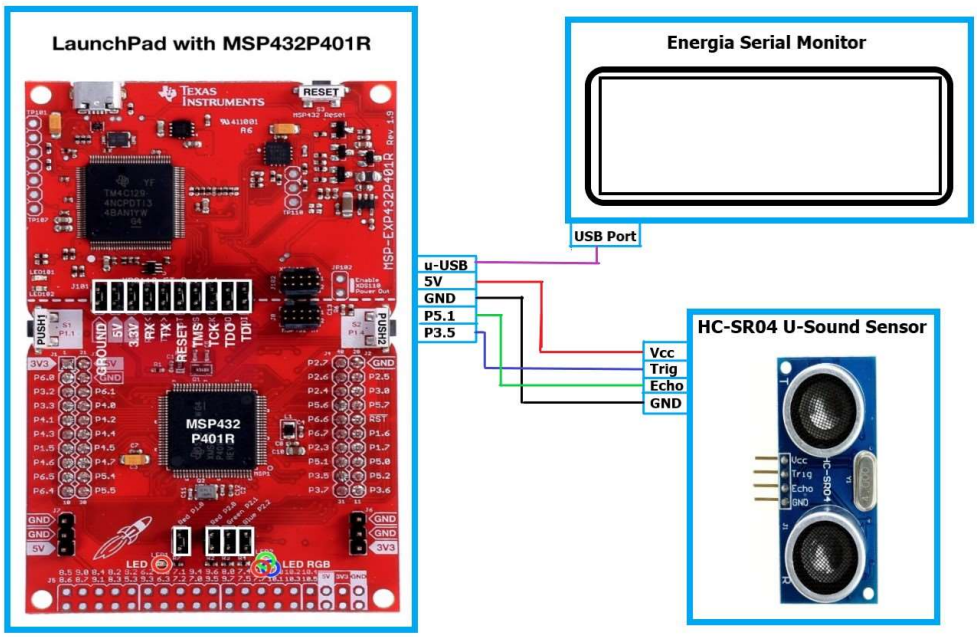
VIDEO LINK:

https://drive.google.com/drive/folders/1DlGaiaChuohQGhLfaMQKAh8pc6fPK2UG?usp=sharing

OBJECTIVE: The main objective is to run a simple program that reads five values of an ultrasound sensor and finds the best number that represents a measured distance.

CIRCUIT DIAGRAM:

HIGH LEVEL CIRCUIT DIAGRAM



COMMENTARY:

- Introduction

  This is a one-part lab which is aimed at enabling students gain a practical understanding of how ultrasound sensors interfaced with a microcontroller work.

- Materials
  - MSP-EXP432P401R Board
  - HC-SR04 Ultra-Sound Sensor
  - F-M Jumper Wires
  - Energia 1.8.11E23

- Theory

  The HC-SR04 works by sending an ultrasonic pulse and then sensing it as it returns. With a microcontroller (and the use of the pulseIn function) it is possible to measure the time the pulse took to travel out, reflect off an object, and return. Knowing the speed of sound, the distance to the object can be calculated.

- Results

  Dr Conrad advised we use a level converter to control the voltage of the echo pin. I unfortunately purchased one of the cheap level converters on Amazon which did not work properly. The level converter kept outputting 1.2V instead of 3.3V, so I had to connect it directly to the pins on the board. I was successfully able to get good outputs from the ultra-sound sensor and monitored the outputs via the Energia Serial Monitor.

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CODE:

```
/*
HC-SR04 Ultrasonic Distance Sensor Example
Demonstrates sensing distance with the HC-SR04 using Texas Instruments
LaunchPads.

Created by Frank Milburn 5 Jun 2015
```

```
Released into the public domain.

Modified by James Conrad 8 Jun 2020
Modified by Somtochukwu Anyaegbu 28 March 2020

*/

const int trigPin = 32;                         //This is Port Pin 3.5 on the MSP432
Launchpad
const int echoPin = 33;                         //This is Port Pin 5.1 on the MSP432
Launchpad


void setup() {
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);

  Serial.begin(9600);
  delay(5000);
  Serial.println("Start HC-SR04 Test");
}

void loop() {
  long Midcm;
  long centimeters;

  int pulseLength[5],x,i,j,tmp;

  for (x=0; x<5; x++) {                          //Loop for ascending ordering

    digitalWrite(trigPin, LOW);                  // send low to get a clean pulse
    delayMicroseconds(5);                        // let it settle
    digitalWrite(trigPin, HIGH);                 // send high to trigger device
    delayMicroseconds(10);                       // let it settle

    pulseLength[x] = pulseIn(echoPin, HIGH);     // measure pulse coming back
```

```
    centimeters = pulseLength[x] / 58;

    Serial.print("Distance = ");
    Serial.print(centimeters);
    Serial.println(" centimeters");
    delay(1000);
  }

    /* Sort five readings */

    for (i=0; i<5; i++) {                       //Loop for ascending ordering
      for (int j = 0; j < 5; j++) {             //Loop for comparing other values
        if (pulseLength[j] > pulseLength[i]) { //Comparing other array elements
          tmp = pulseLength[i];                 //Using temp var for storing last value
          pulseLength[i] = pulseLength[j];      //replacing value
          pulseLength[j] = tmp;                 //storing last value
        }
      }
    }

      /* Print middle one */
      Midcm = pulseLength[2] / 58;
      Serial.print("Median Distance = ");
      Serial.print(Midcm);
      Serial.println(" centimeters");
      delay(5000);

      Serial.println("End HC-SR04 Test.");

}
```