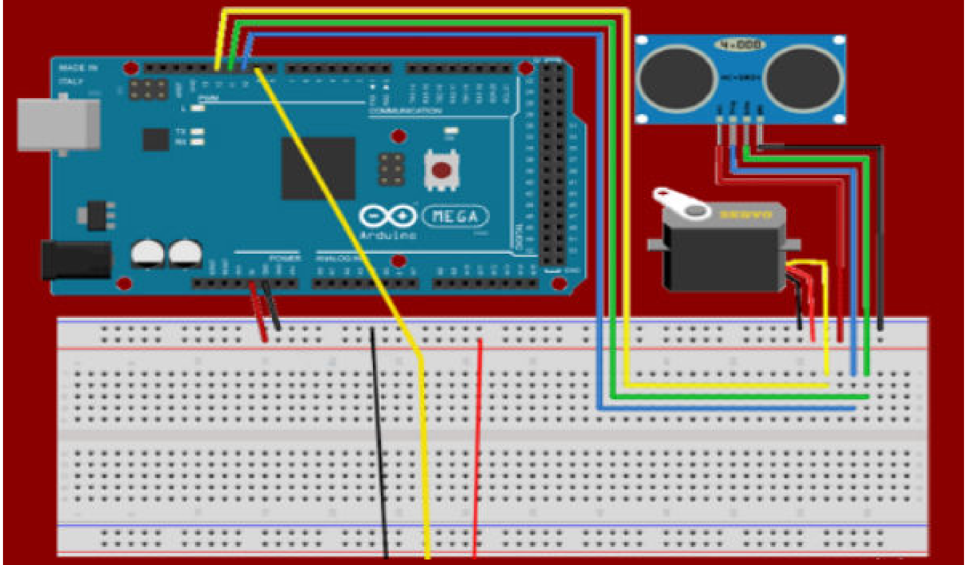

Arduino for the Evil Genius

ProfNaf

Contents

Arduino for the Evil Genius: A Complete Handbook to Develop a Smart Home Security System

Preface

Arduino, onboard micro-controller, has been considered to be a popular gear for building digital devices. With the introduction on Arduino, these digital devices interact with the physical world by sensing and controlling various objects from the environment. This book titled "Arduino for the Evil Genius: a complete handbook to develop a smart home security system" has been prepared and presented also to introduce Arduino for kids and even introduce Arduino for Dummies. also. Thus, this Arduino project handbook provides a step by step guidance along with the relevant codes to develop a smart home gadget, which automates and secures our home. This solution uses Arduino UNO and few other sensors to detect the presence of intruders. Moreover, a ultrasonic sensor is used as a radar which can automatically detect threats. Furthermore, a PIR sensor is used to detect human presence with an integrated alarm system. The book is divided into several chapters where the first chapter discusses on the required hardware and system design. Later, installation of the hardware components and required codes in relevant languages are explained. So, lets enjoy the ride.

ProfNaf
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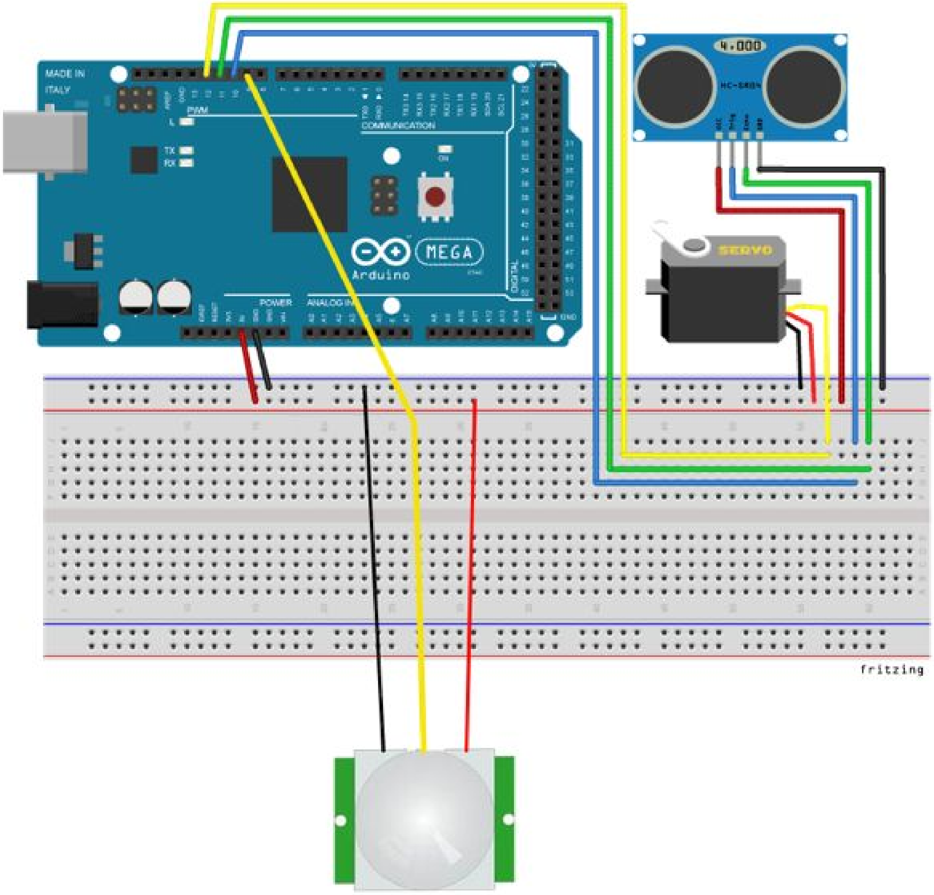
Components and System Design

In order to develop a smart home security system, following components are required,

- Arduino UNO
- Ultrasonic Sensor
- PIR Sensor
- LED light
- Breadboard
- Servo Motor
- Jumpers

Once all the above mentioned components are connected with the breadboard as per the following picture.

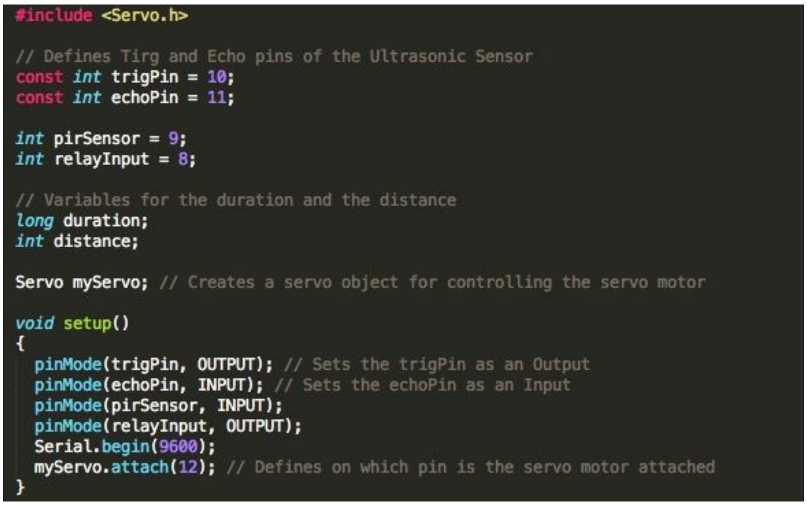


Codes (Arduino UNO and Processing)

Once all the components are plugged in according to the guideline, implement the following codes in your system.

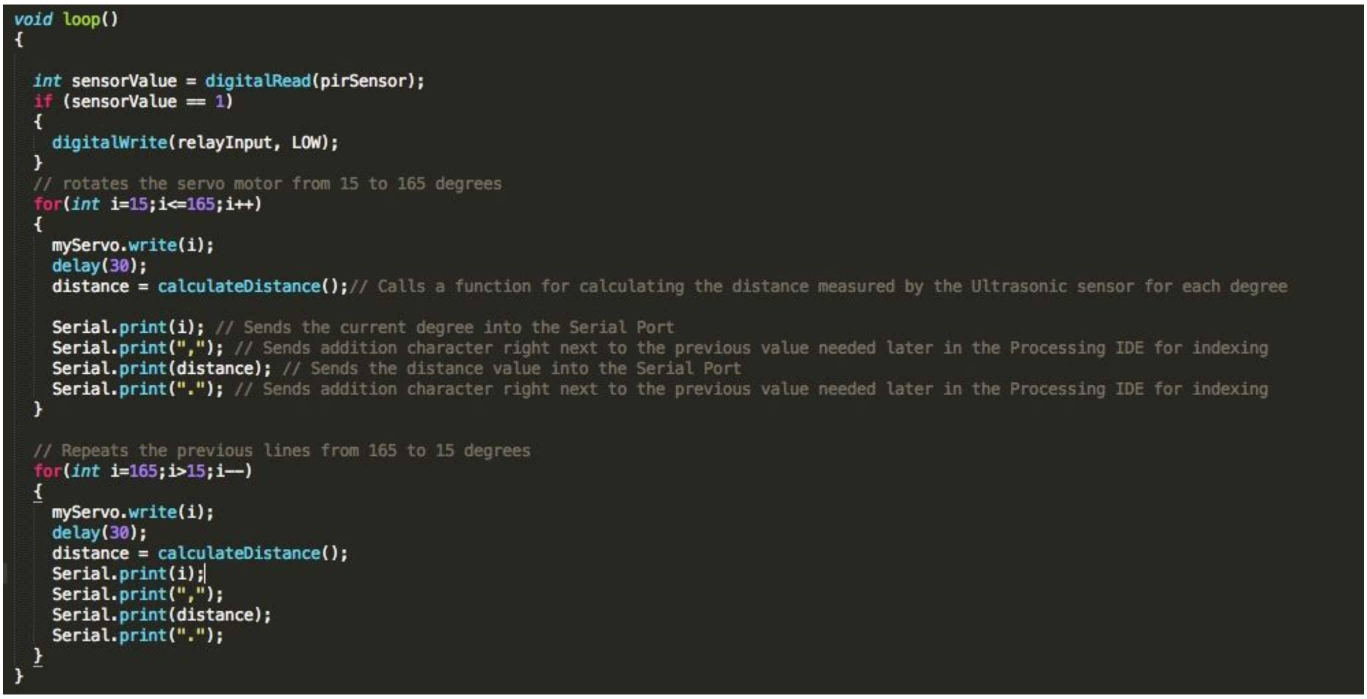
Codes for the Arduino UNO are as follows,

Step 1: Environment Variables and setup method



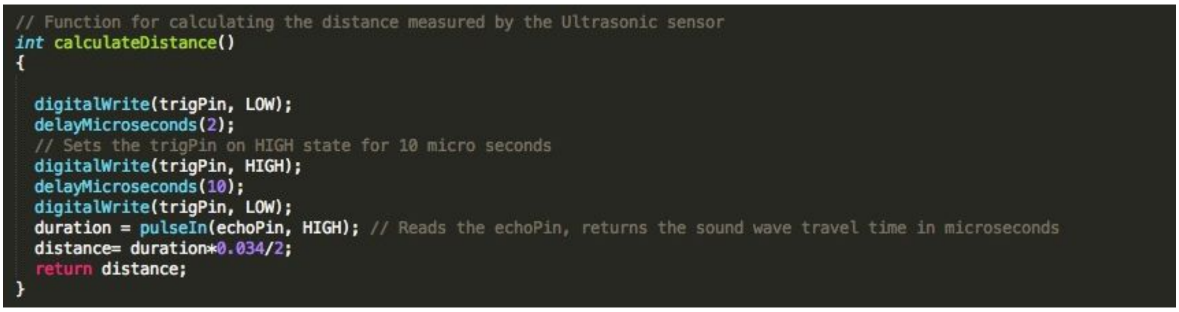
```
#include <Servo.h>

// Defines Tirg and Echo pins of the Ultrasonic Sensor
const int trigPin = 10;
const int echoPin = 11;

int pirSensor = 9;
int relayInput = 8;

// Variables for the duration and the distance
long duration;
int distance;

Servo myServo; // Creates a servo object for controlling the servo motor

void setup()
{
  pinMode(trigPin, OUTPUT); // Sets the trigPin as an Output
  pinMode(echoPin, INPUT); // Sets the echoPin as an Input
  pinMode(pirSensor, INPUT);
  pinMode(relayInput, OUTPUT);
  Serial.begin(9600);
  myServo.attach(12); // Defines on which pin is the servo motor attached
}
```

Step 2: Loop method



```
void loop()
{

  int sensorValue = digitalRead(pirSensor);
  if (sensorValue == 1)
  {
    digitalWrite(relayInput, LOW);
  }
  // rotates the servo motor from 15 to 165 degrees
  for(int i=15;i<=165;i++)
  {
    myServo.write(i);
    delay(30);
    distance = calculateDistance();// Calls a function for calculating the distance measured by the Ultrasonic sensor for each degree

    Serial.print(i); // Sends the current degree into the Serial Port
    Serial.print(","); // Sends addition character right next to the previous value needed later in the Processing IDE for indexing
    Serial.print(distance); // Sends the distance value into the Serial Port
    Serial.print("."); // Sends addition character right next to the previous value needed later in the Processing IDE for indexing
  }

  // Repeats the previous lines from 165 to 15 degrees
  for(int i=165;i>15;i--)
  {
    myServo.write(i);
    delay(30);
    distance = calculateDistance();
    Serial.print(i);
    Serial.print(",");
    Serial.print(distance);
    Serial.print(".");
  }
}
```

Step 3: Calculation method



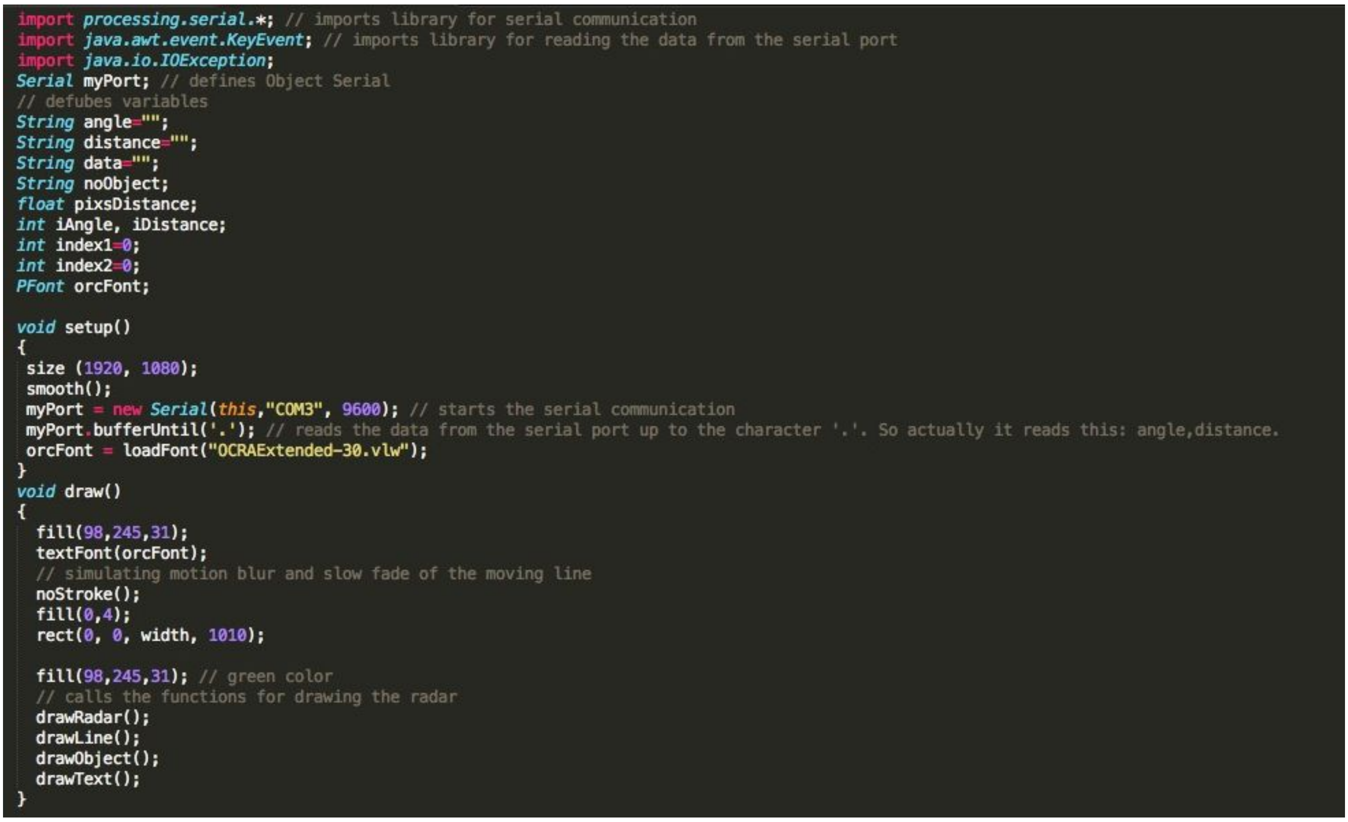
```
// Function for calculating the distance measured by the Ultrasonic sensor
int calculateDistance()
{

  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  // Sets the trigPin on HIGH state for 10 micro seconds
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  duration = pulseIn(echoPin, HIGH); // Reads the echoPin, returns the sound wave travel time in microseconds
  distance= duration*0.034/2;
  return distance;
}
```

Radar View:

To view as Radar, User requires to download "**Processing** ". Thus, google it to get "**processing** "

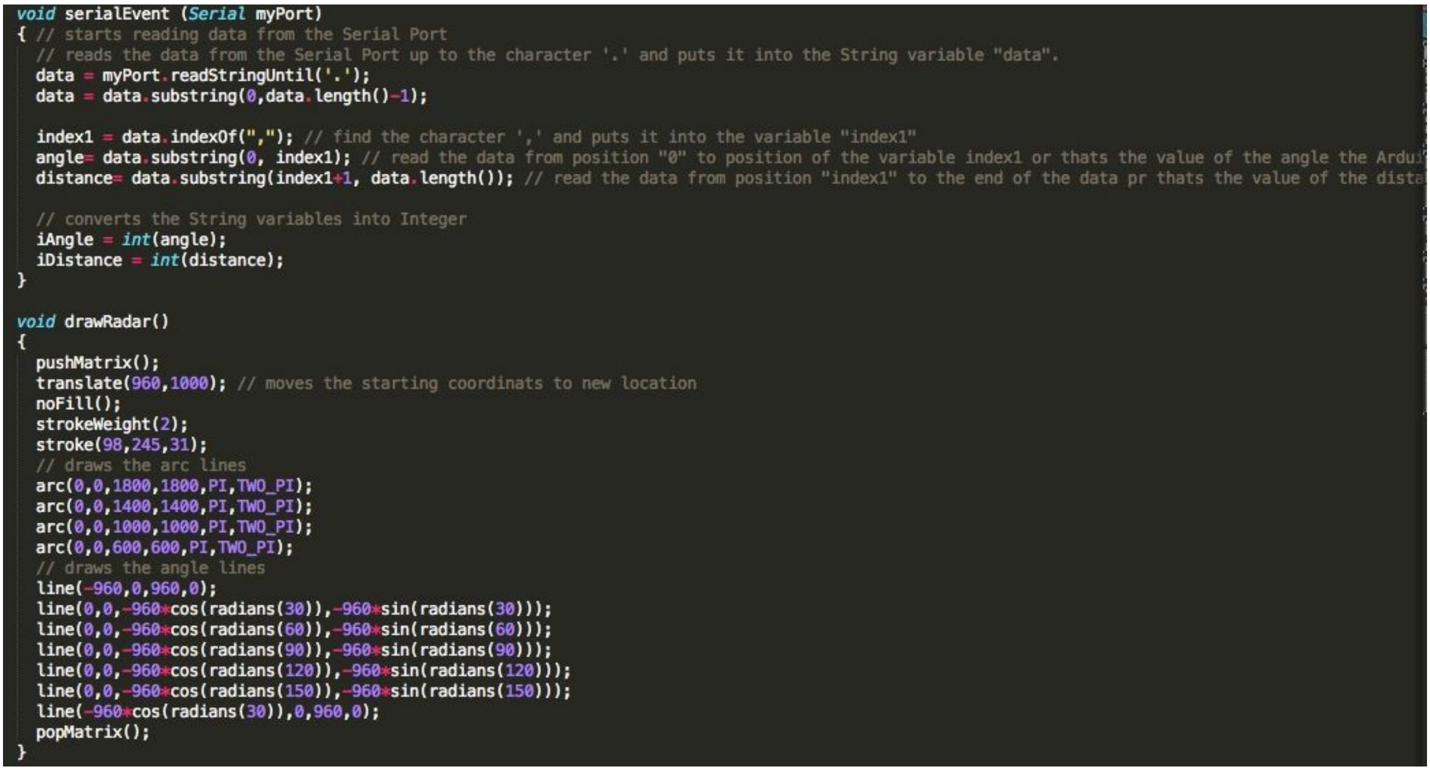
Add the following java codes into Processing

Part 1:



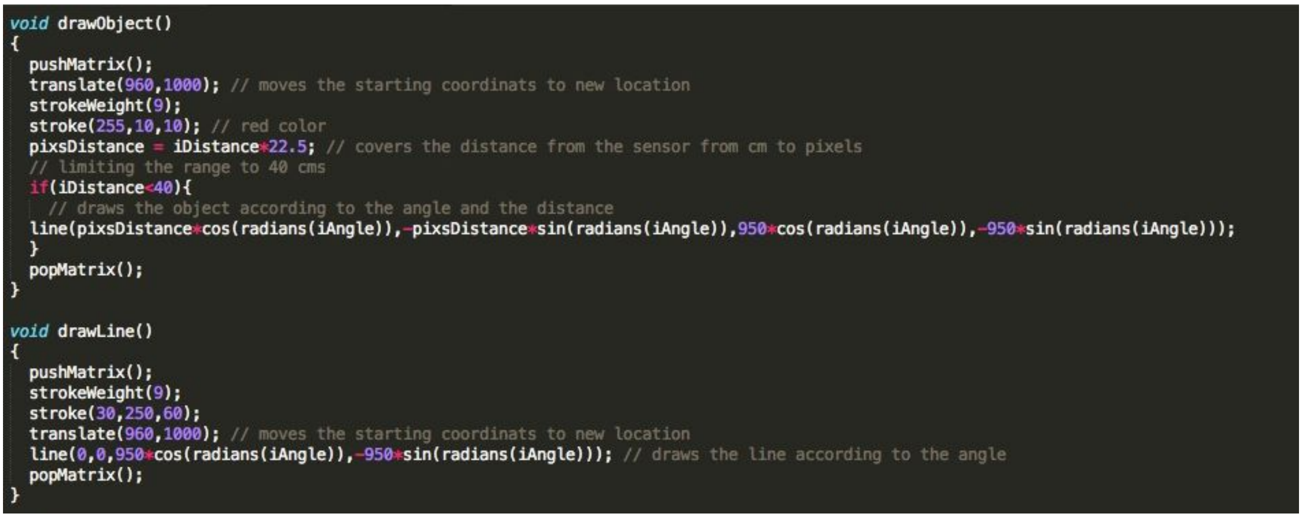
```
import processing.serial.*; // imports library for serial communication
import java.awt.event.KeyEvent; // imports library for reading the data from the serial port
import java.io.IOException;
Serial myPort; // defines Object Serial
// defubes variables
String angle="";
String distance="";
String data="";
String noObject;
float pixsDistance;
int iAngle, iDistance;
int index1=0;
int index2=0;
PFont orcFont;

void setup()
{
 size (1920, 1080);
 smooth();
 myPort = new Serial(this,"COM3", 9600); // starts the serial communication
 myPort.bufferUntil('.'); // reads the data from the serial port up to the character '.'. So actually it reads this: angle,distance.
 orcFont = loadFont("OCRAExtended-30.vlw");
}
void draw()
{
  fill(98,245,31);
  textFont(orcFont);
  // simulating motion blur and slow fade of the moving line
  noStroke();
  fill(0,4);
  rect(0, 0, width, 1010);

  fill(98,245,31); // green color
  // calls the functions for drawing the radar
  drawRadar();
  drawLine();
  drawObject();
  drawText();
}
```

Part 2:



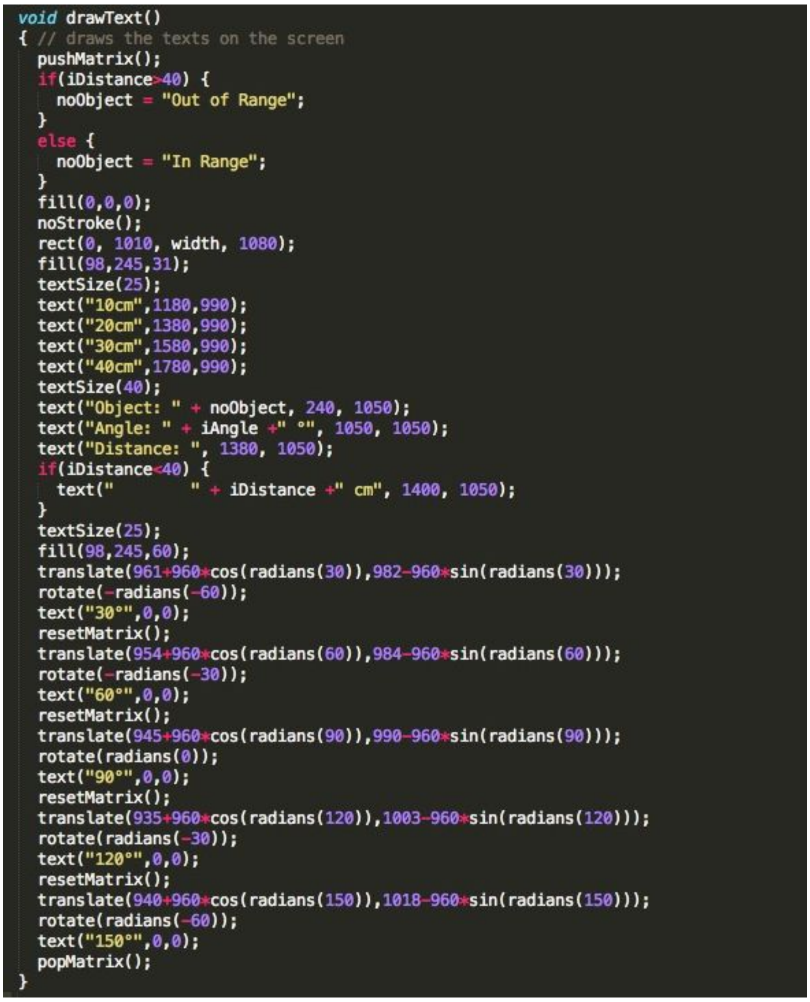
```
void serialEvent (Serial myPort)
{ // starts reading data from the Serial Port
  // reads the data from the Serial Port up to the character '.' and puts it into the String variable "data".
  data = myPort.readStringUntil('.');
  data = data.substring(0,data.length()-1);

  index1 = data.indexOf(","); // find the character ',' and puts it into the variable "index1"
  angle= data.substring(0, index1); // read the data from position "0" to position of the variable index1 or thats the value of the angle the Ardui
  distance= data.substring(index1+1, data.length()); // read the data from position "index1" to the end of the data pr thats the value of the dista

  // converts the String variables into Integer
  iAngle = int(angle);
  iDistance = int(distance);
}

void drawRadar()
{
  pushMatrix();
  translate(960,1000); // moves the starting coordinats to new location
  noFill();
  strokeWeight(2);
  stroke(98,245,31);
  // draws the arc lines
  arc(0,0,1800,1800,PI,TWO_PI);
  arc(0,0,1400,1400,PI,TWO_PI);
  arc(0,0,1000,1000,PI,TWO_PI);
  arc(0,0,600,600,PI,TWO_PI);
  // draws the angle lines
  line(-960,0,960,0);
  line(0,0,-960*cos(radians(30)),-960*sin(radians(30)));
  line(0,0,-960*cos(radians(60)),-960*sin(radians(60)));
  line(0,0,-960*cos(radians(90)),-960*sin(radians(90)));
  line(0,0,-960*cos(radians(120)),-960*sin(radians(120)));
  line(0,0,-960*cos(radians(150)),-960*sin(radians(150)));
  line(-960*cos(radians(30)),0,960,0);
  popMatrix();
}
```

Part 3:



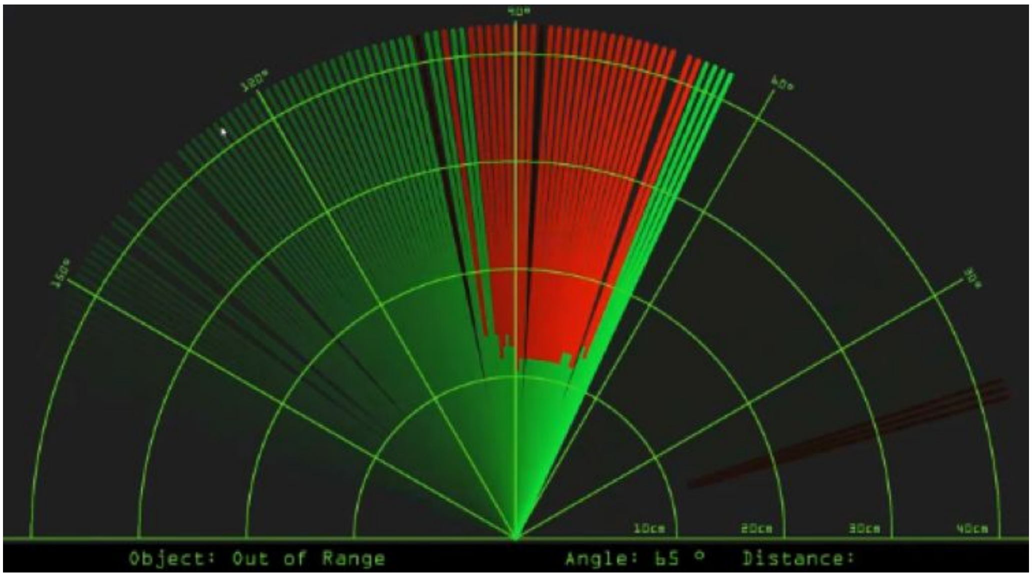
```
void drawObject()
{
  pushMatrix();
  translate(960,1000); // moves the starting coordinats to new location
  strokeWeight(9);
  stroke(255,10,10); // red color
  pixsDistance = iDistance*22.5; // covers the distance from the sensor from cm to pixels
  // limiting the range to 40 cms
  if(iDistance<40){
    // draws the object according to the angle and the distance
  line(pixsDistance*cos(radians(iAngle)),-pixsDistance*sin(radians(iAngle)),950*cos(radians(iAngle)),-950*sin(radians(iAngle)));
  }
  popMatrix();
}

void drawLine()
{
  pushMatrix();
  strokeWeight(9);
  stroke(30,250,60);
  translate(960,1000); // moves the starting coordinats to new location
  line(0,0,950*cos(radians(iAngle)),-950*sin(radians(iAngle))); // draws the line according to the angle
  popMatrix();
}
```

Part 4:



```
void drawText()
{ // draws the texts on the screen
  pushMatrix();
  if(iDistance>40) {
    noObject = "Out of Range";
  }
  else {
    noObject = "In Range";
  }
  fill(0,0,0);
  noStroke();
  rect(0, 1010, width, 1080);
  fill(98,245,31);
  textSize(25);
  text("10cm",1180,990);
  text("20cm",1380,990);
  text("30cm",1580,990);
  text("40cm",1780,990);
  textSize(40);
  text("Object: " + noObject, 240, 1050);
  text("Angle: " + iAngle +" °", 1050, 1050);
  text("Distance: ", 1380, 1050);
  if(iDistance<40) {
    text("        " + iDistance +" cm", 1400, 1050);
  }
  textSize(25);
  fill(98,245,60);
  translate(961+960*cos(radians(30)),982-960*sin(radians(30)));
  rotate(-radians(-60));
  text("30°",0,0);
  resetMatrix();
  translate(954+960*cos(radians(60)),984-960*sin(radians(60)));
  rotate(-radians(-30));
  text("60°",0,0);
  resetMatrix();
  translate(945+960*cos(radians(90)),990-960*sin(radians(90)));
  rotate(radians(0));
  text("90°",0,0);
  resetMatrix();
  translate(935+960*cos(radians(120)),1003-960*sin(radians(120)));
  rotate(radians(-30));
  text("120°",0,0);
  resetMatrix();
  translate(940+960*cos(radians(150)),1018-960*sin(radians(150)));
  rotate(radians(-60));
  text("150°",0,0);
  popMatrix();
}
```

Sample Output



Object: Out of Range   Angle: 65 °   Distance: