SONAR SEQURITY SYSTEM

DIY GROUP PROJECT #7

OVERVIEW

It is an Arduino based RADAR project which uses Ultrasonic sensor to detect any object in its range.

OBJECTIVE OF THE PROJECT

To build a cost efficient ARDUINO circuit which detects the objects along with their distance.

TEAM MEMBERS

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WORK DISTRIBUTION

SAGAR	THIRUVIGNESH	RAKESH	LAVANYA	VYSHNAVI
ORDERING COMPONENTS, COADING, VIDEO EDITING	VIRTUAL CIRCUIT DIAGRAM, COADING,	PHYSICAL ASSEMBLY VIDEO EDITING MAKING WEEK-WISE PRESENTATION	PHYSICAL ASSEMBLY FINAL PRESENTATION	DESIGN THE ALGORITHM OF CODE CODED THE CIRCUIT

COMPONENTS

1. **ARDUINO UNO**
2. **BREADBOARD**
3. **SERVOMOTOR**
4. **ULTRASONIC SENSOR**
5. **JUMPER WIRES**

TOTAL COST = 1300

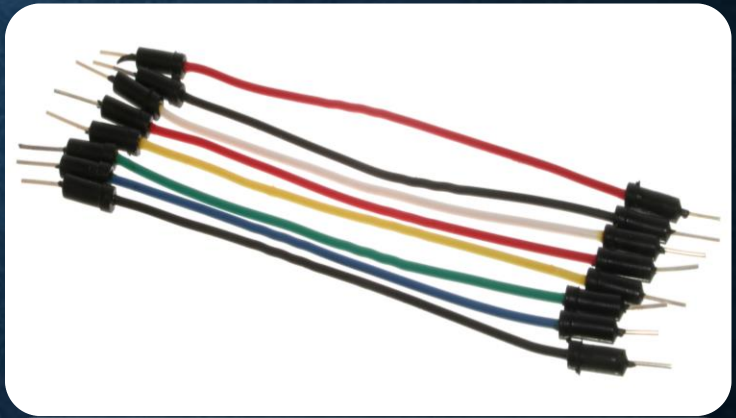
• COMPONENTS •

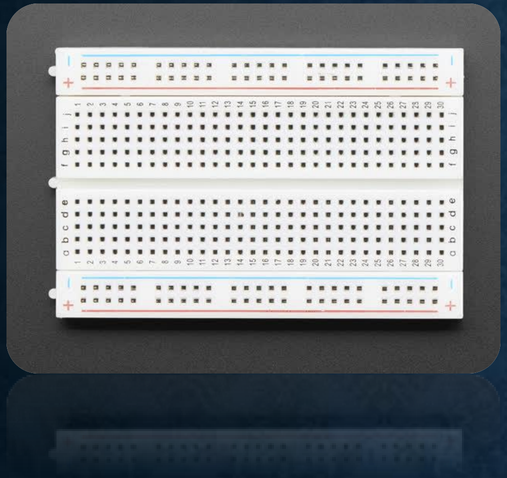
ARDUINO UNO is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online

A **SERVOMOTOR (OR SERVO MOTOR)** is **a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration**. It consists of a suitable motor coupled to a sensor for position feedback.

An **ULTRASONIC SENSOR** is **an instrument that measures the distance to an object using ultrasonic sound waves**. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity.

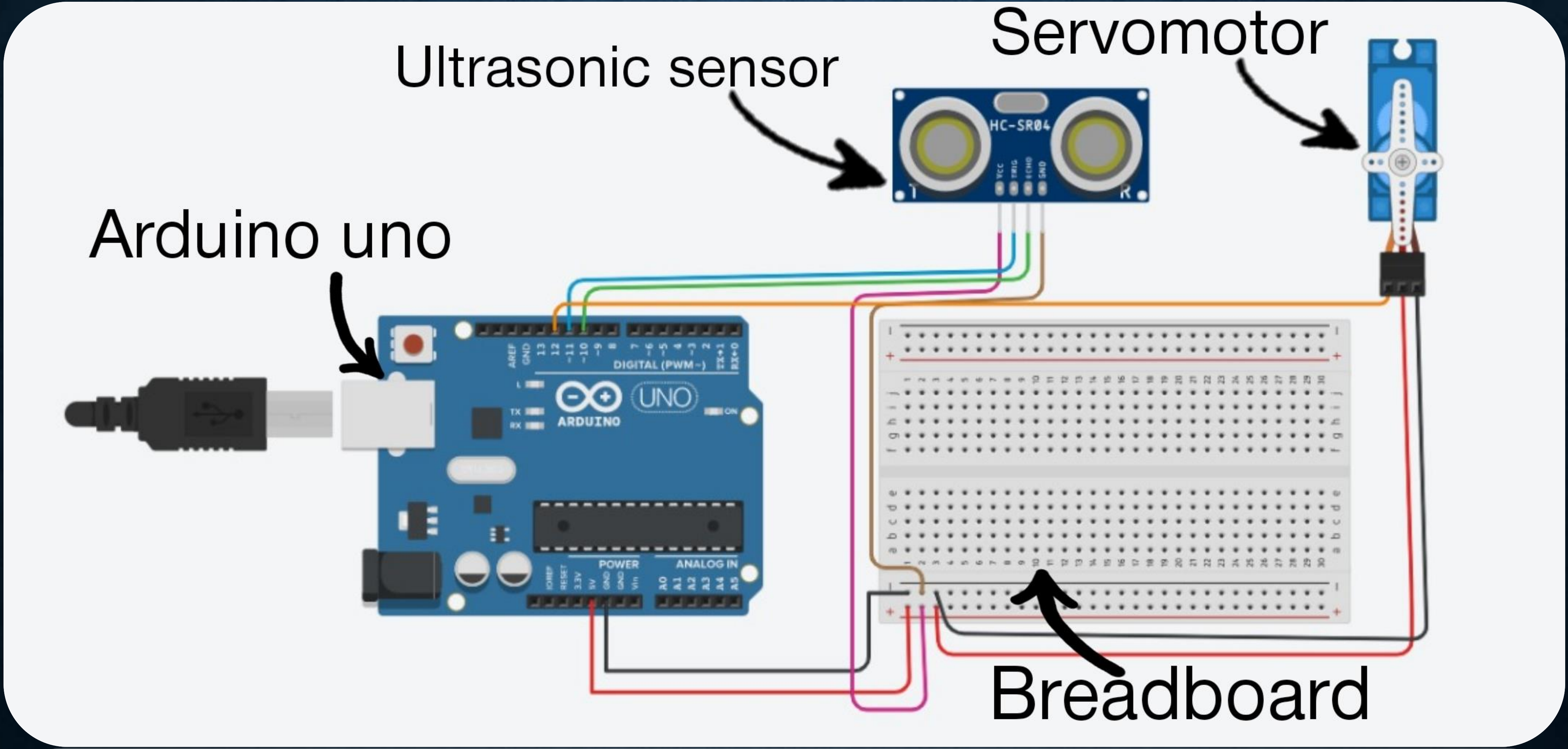
JUMPER WIRES are used **to connect two points in a circuit**. All Electronics stocks jumper wire in a variety of lengths and assortments. Frequently used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed.





A **breadboard** is **a solderless device for temporary prototype with electronics and test circuit designs**. Most electronic components in electronic circuits can be interconnected by inserting their leads or terminals into the holes and then making connections through wires where appropriate.

CIRCUIT DIAGRAM



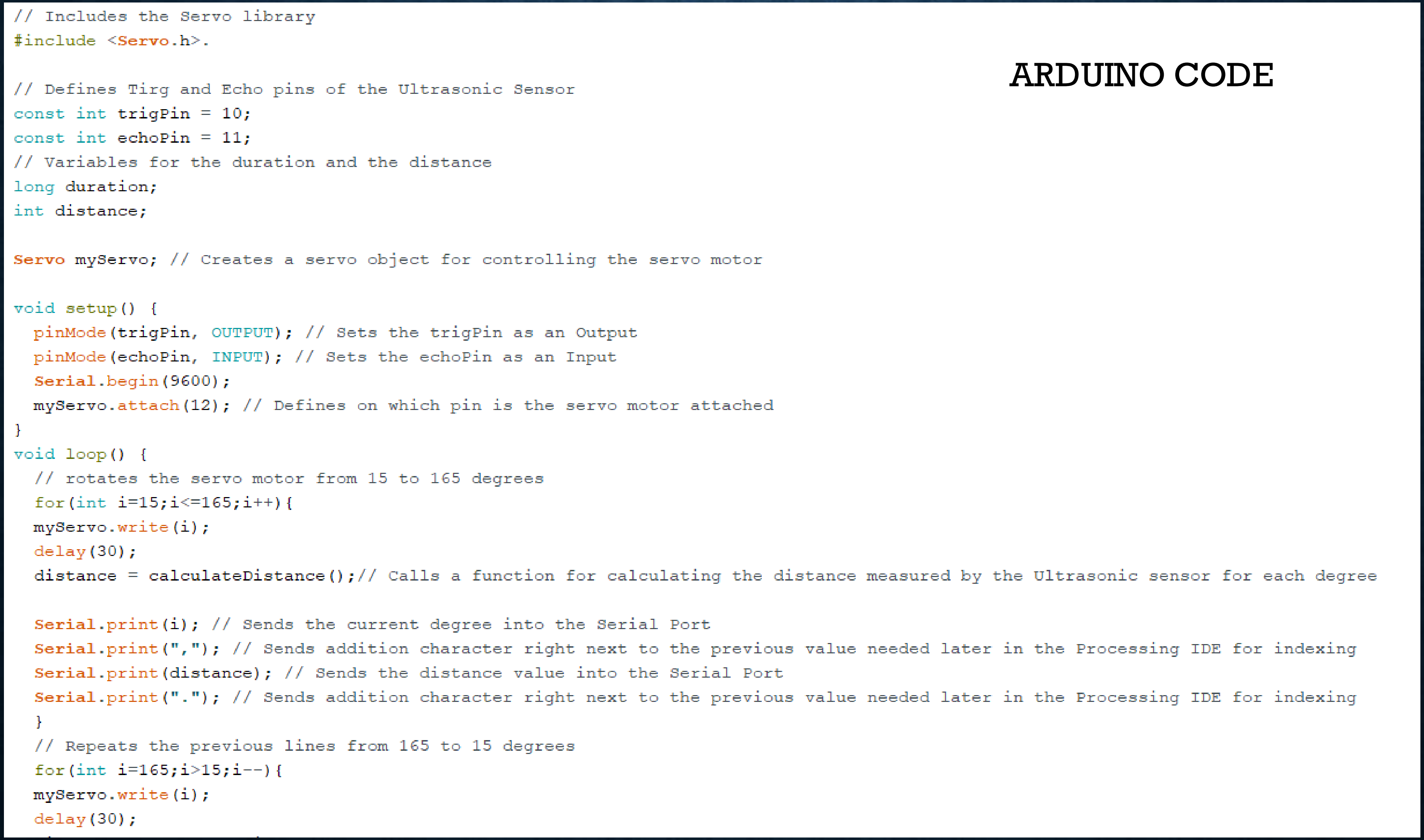
Ultrasonic sensor

Servomotor

Arduino uno

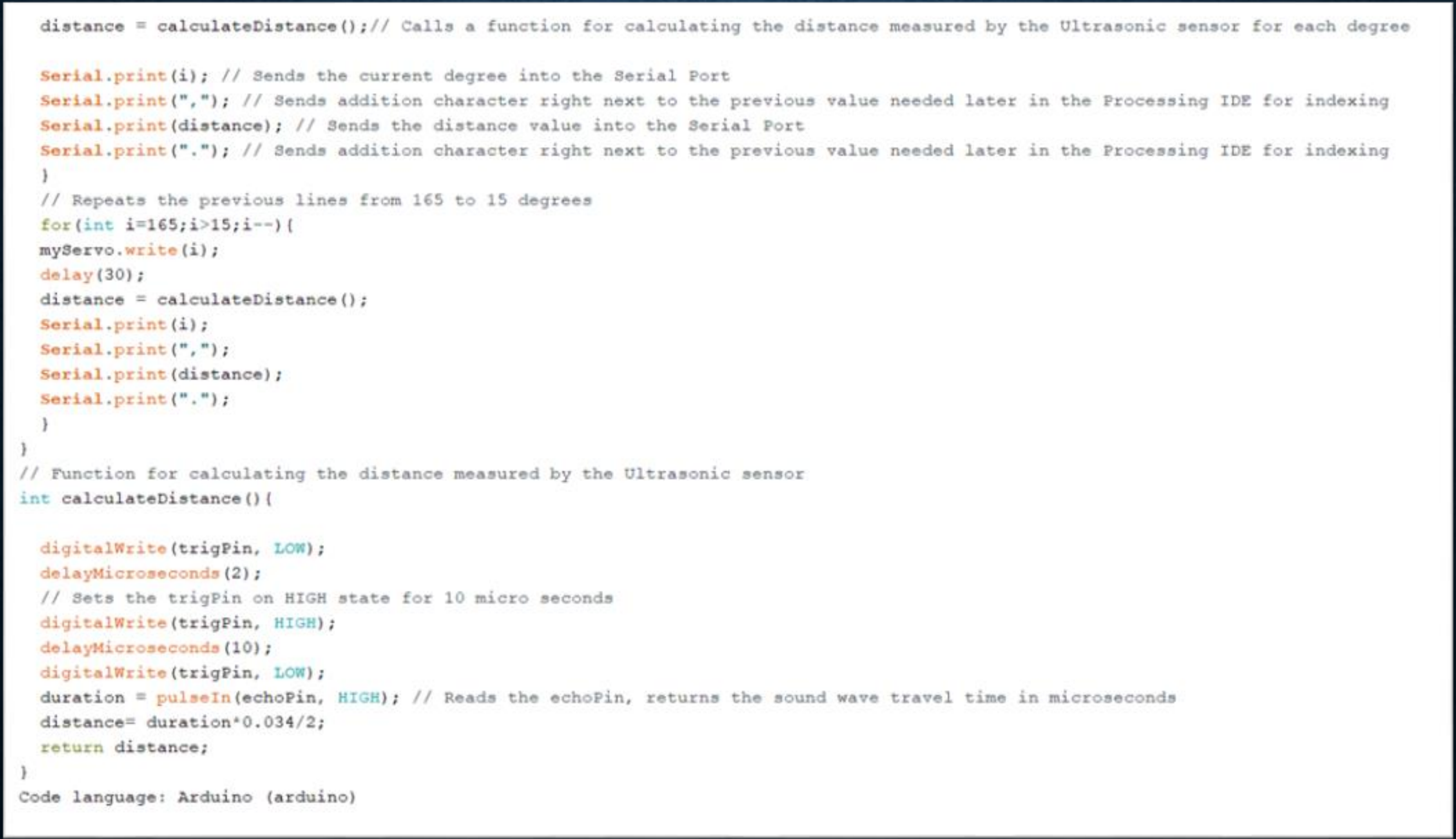
Breadboard

CODE



ARDUINO CODE

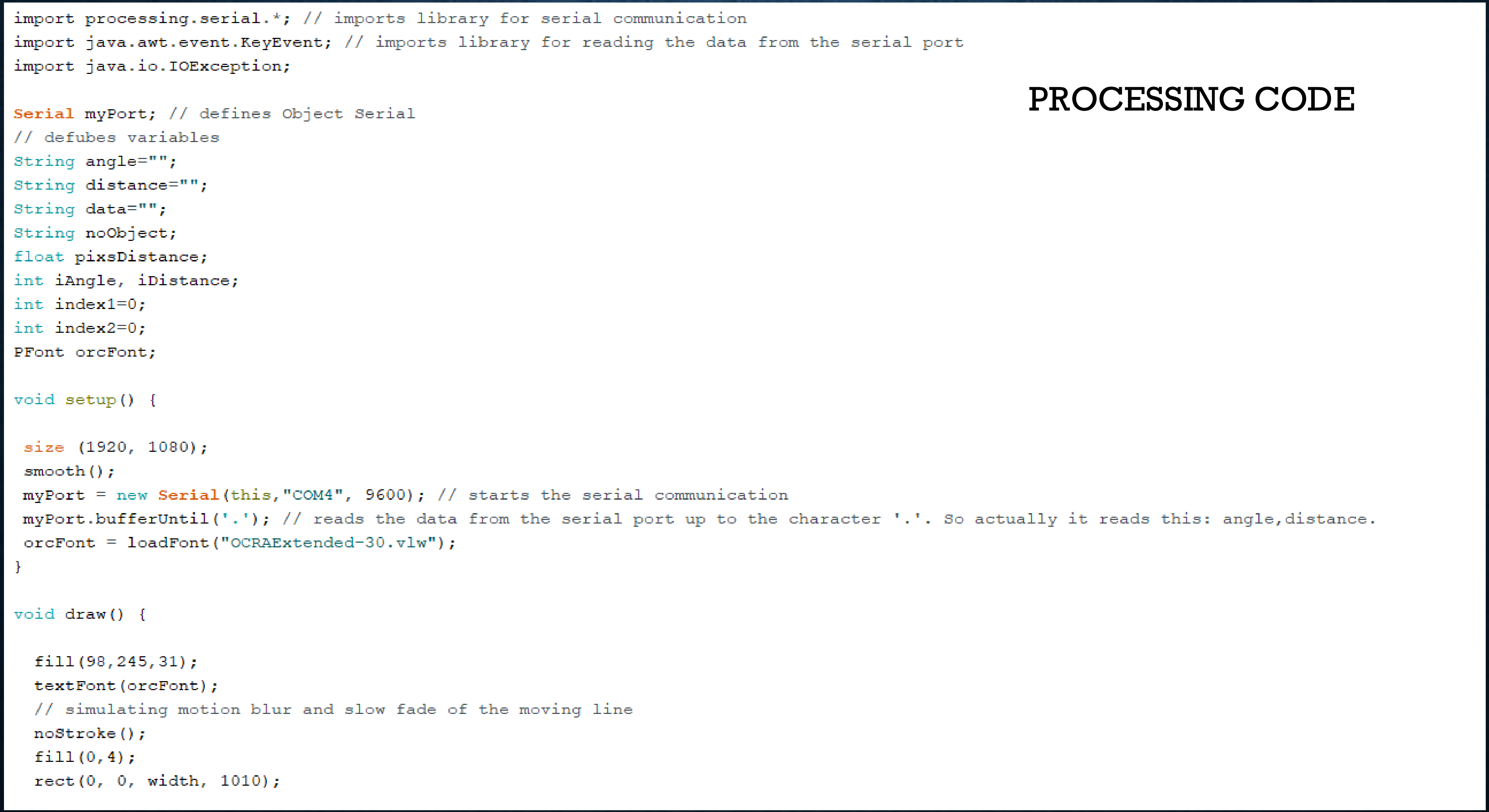
```
// Includes the Servo library
#include <Servo.h>.

// Defines Tirg and Echo pins of the Ultrasonic Sensor
const int trigPin = 10;
const int echoPin = 11;
// 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
  Serial.begin(9600);
  myServo.attach(12); // Defines on which pin is the servo motor attached
}
void loop() {
  // 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();// 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(".");
  }
}
// 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;
}
```

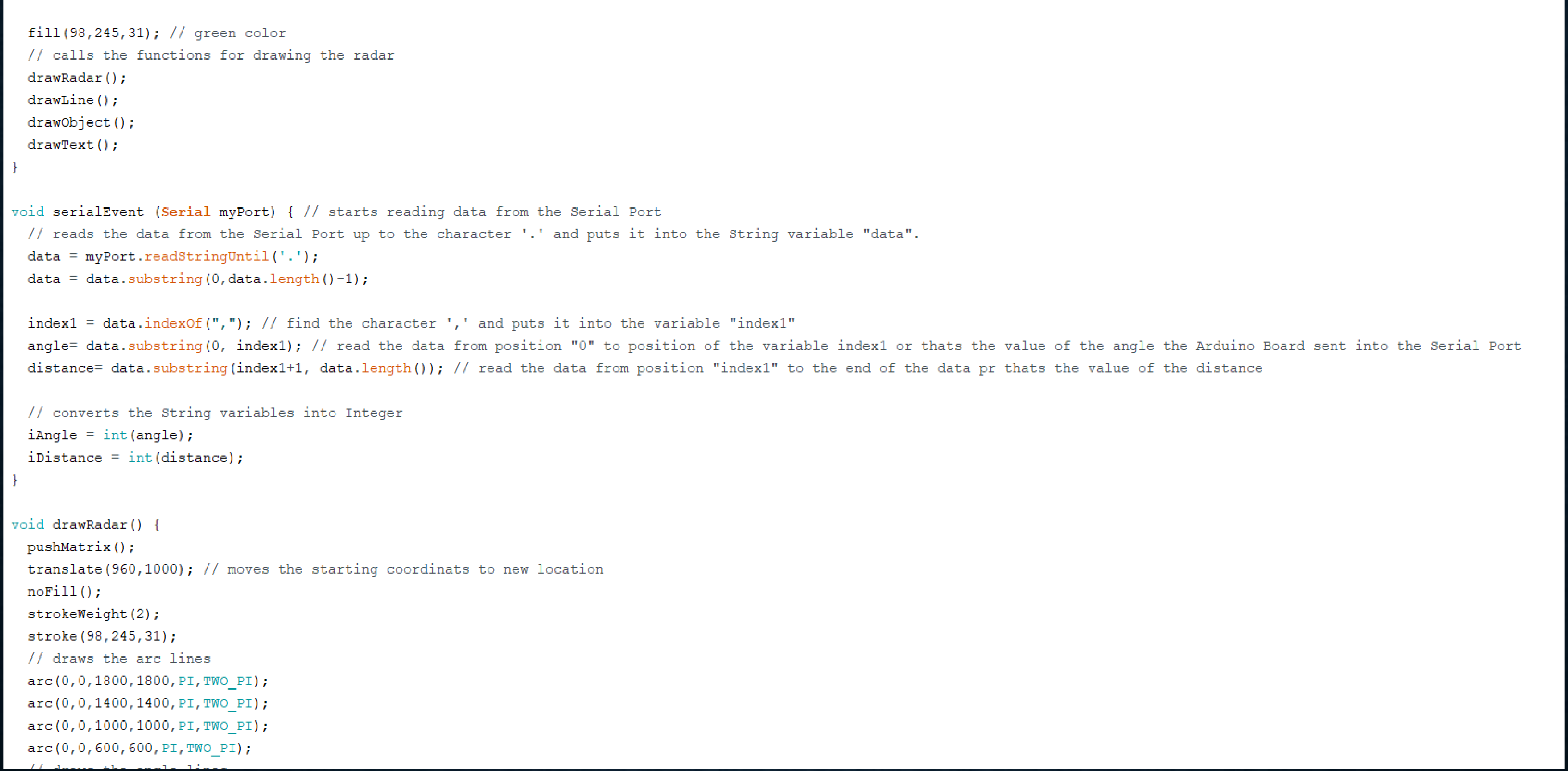
Code language: Arduino (arduino)

CODE

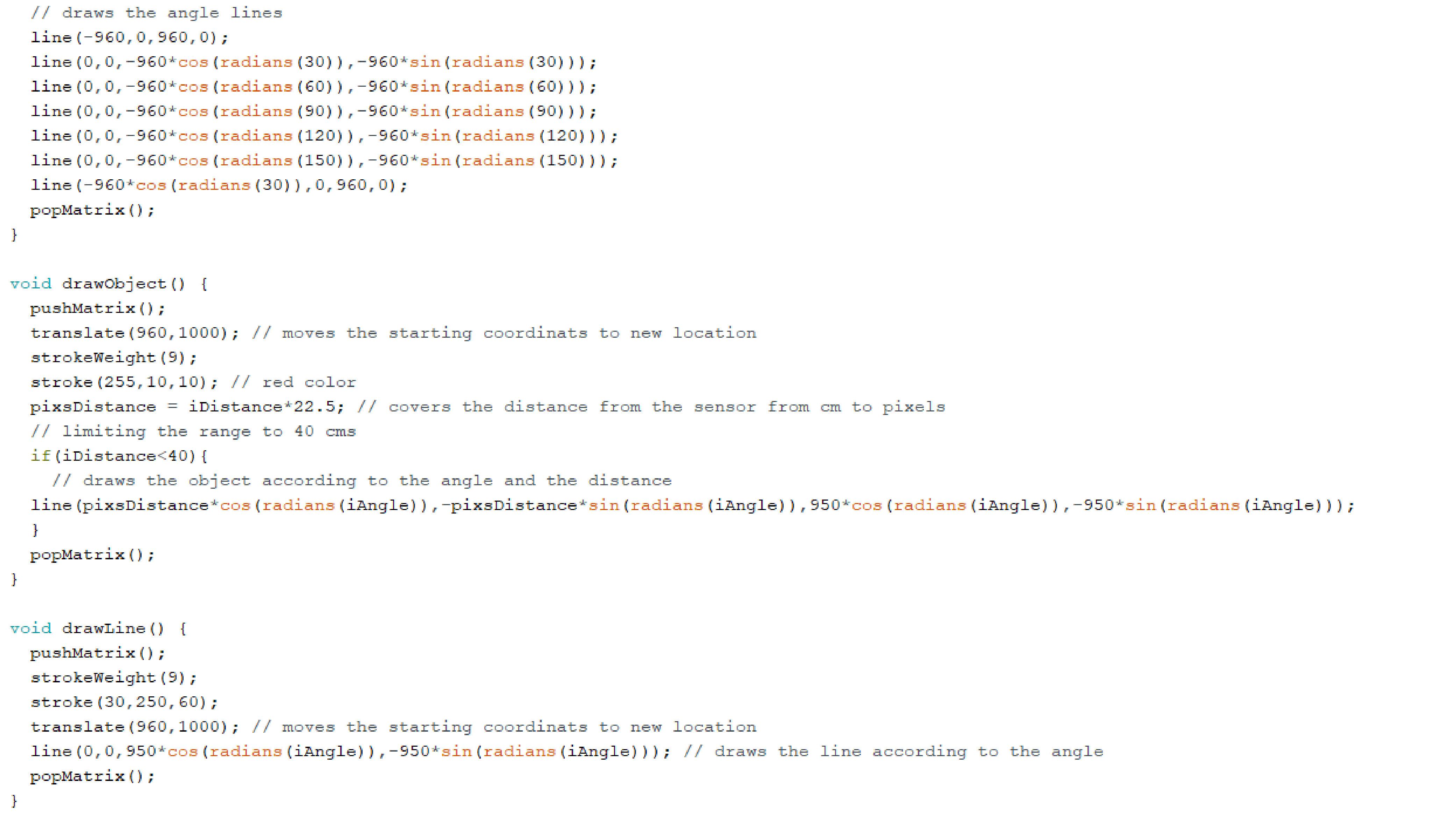


PROCESSING CODE

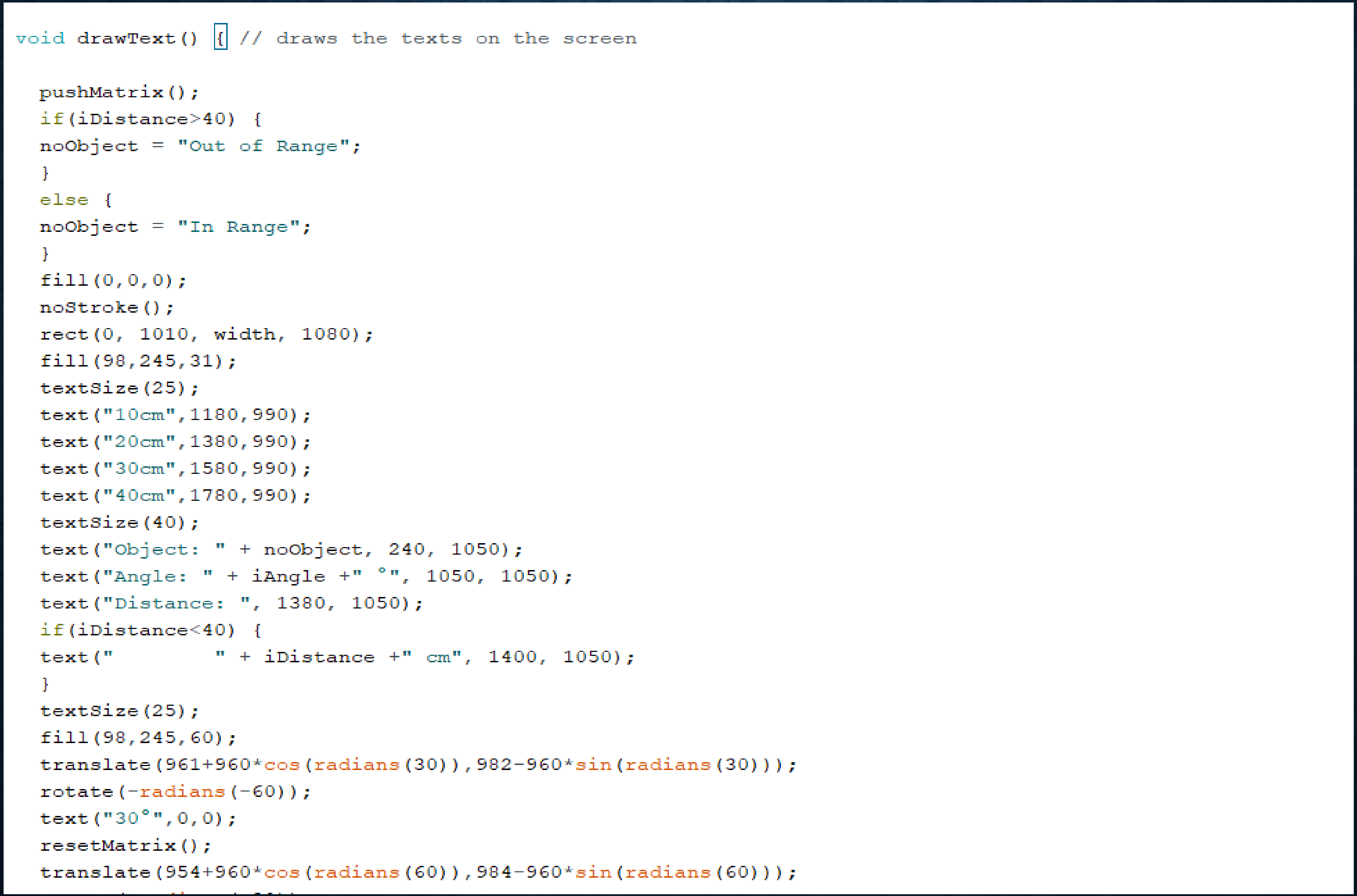
```
import processing.serial.*; // imports library for serial communication
import java.awt.event.KeyEvent; // imports library for reading the data from the serial port
import java.io.IOException;

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,"COM4", 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);
```



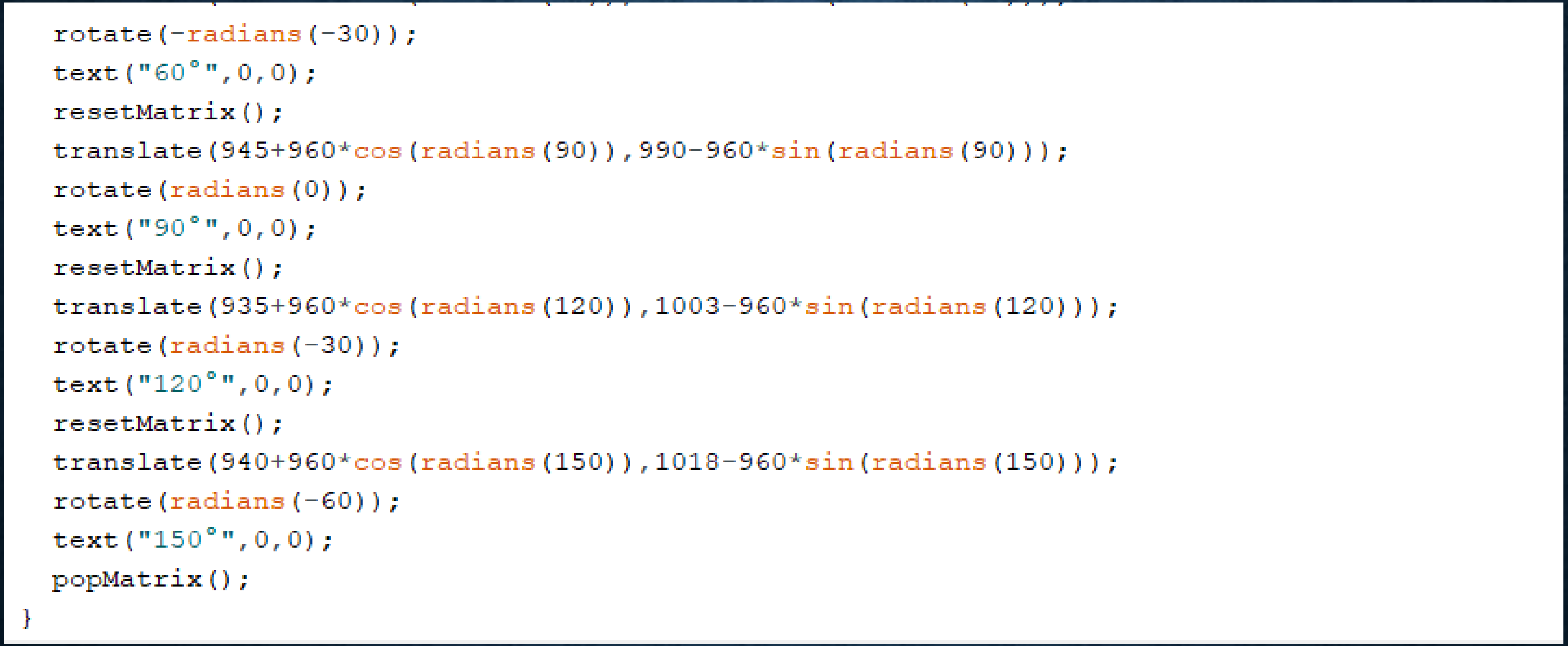
```
  fill(98,245,31); // green color
  // calls the functions for drawing the radar
  drawRadar();
  drawLine();
  drawObject();
  drawText();
}

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 Arduino Board sent into the Serial Port
  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 distance

  // 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
```



```
  // 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();
}

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();
}
```

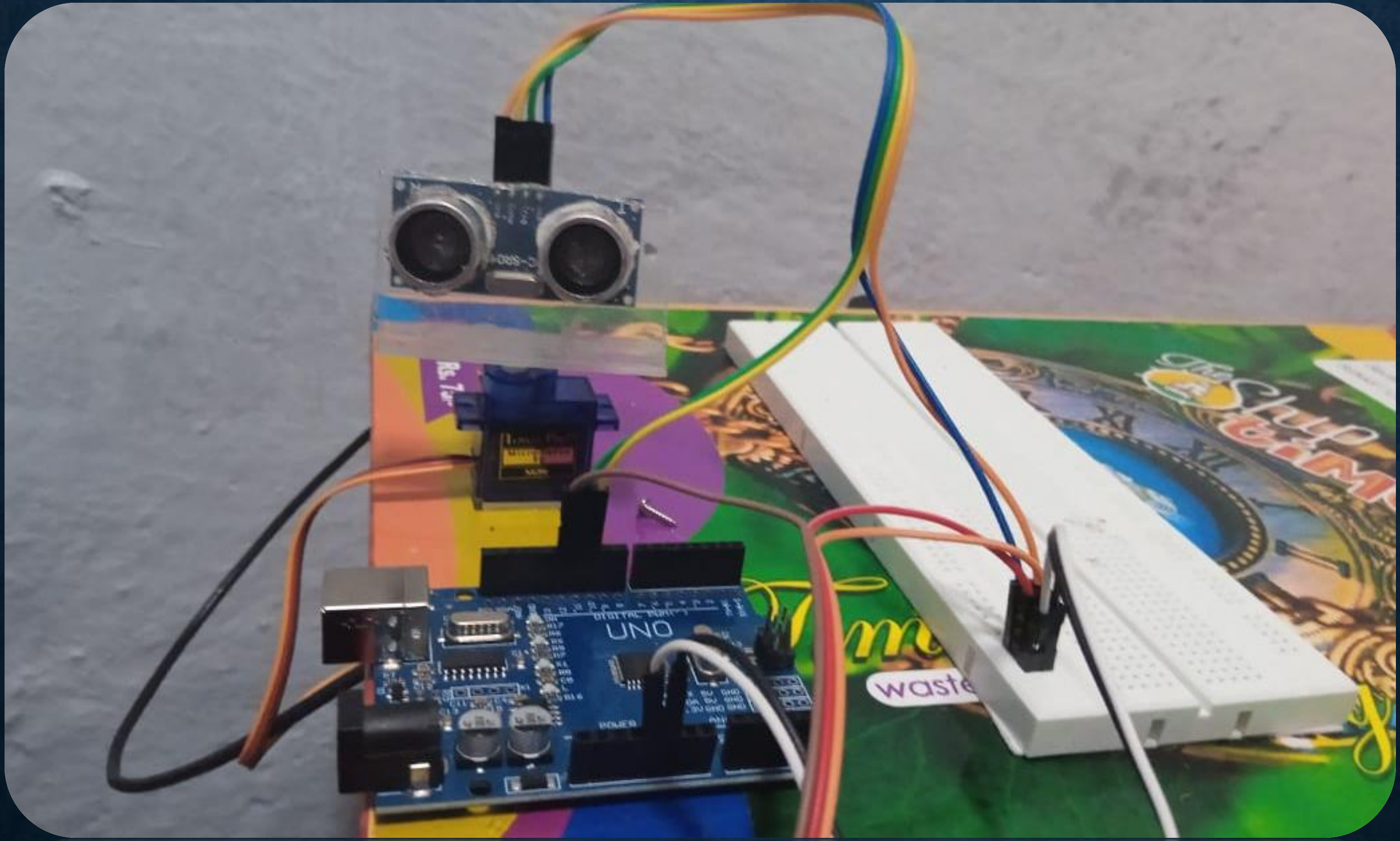


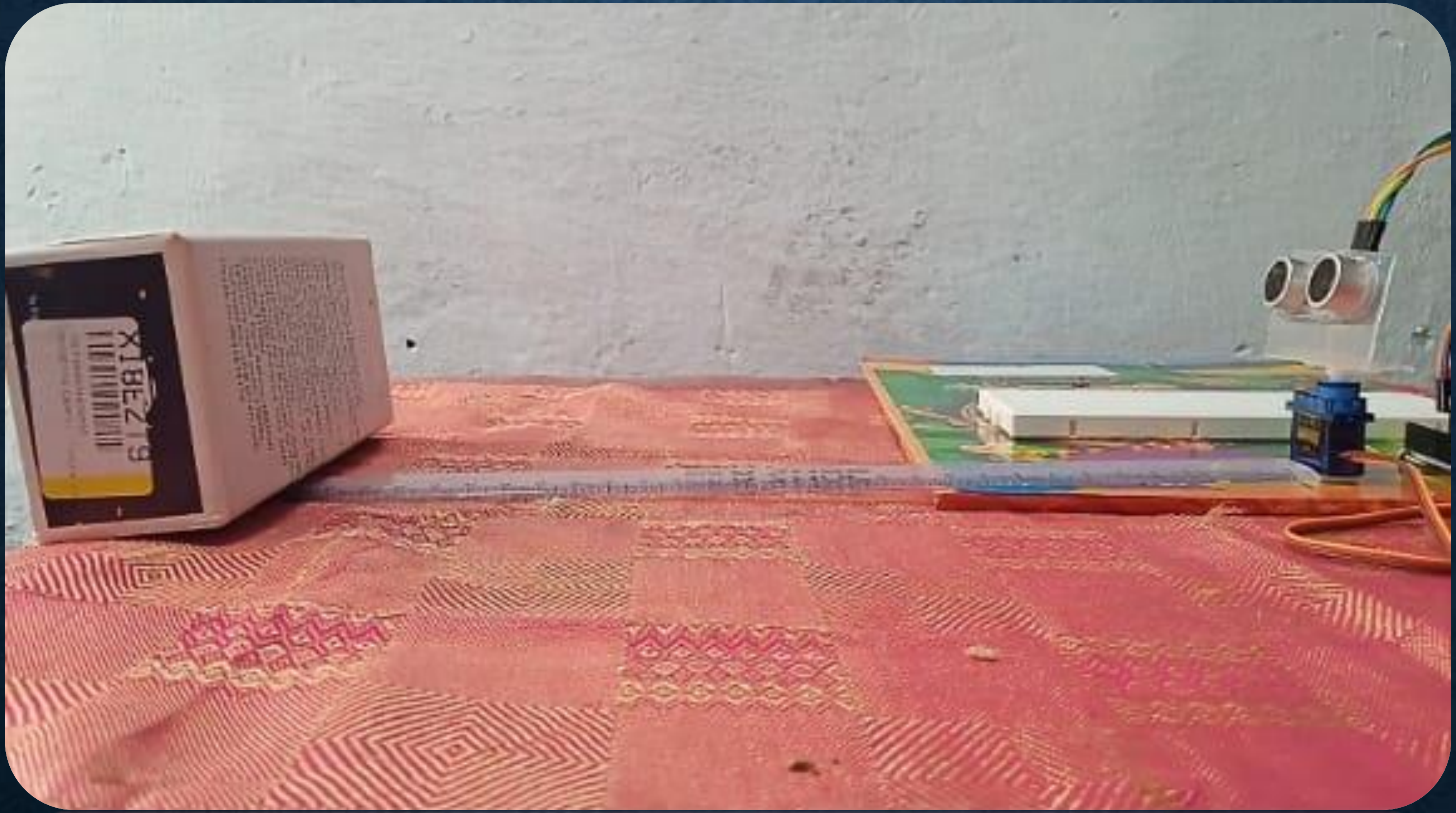
```
void drawText() { // draws the texts on the screen

  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();
}
```

PHYSICAL ASSEMBLY





●♦● THANK YOU ●♦●