```
#include<Servo.h>
#include<math.h>

///pins for ultrasonic
int trigPin=13;
int echoPin=12;

long duration, velocity ;
long distance,oldDistance=0;            //  to calculate  the velocity    v=distance-
oldDistance


long x,y;                          //  calculate  Coordinates  (x,y )
double xRad,yRad;                     // convert servo position from degree to  radain


///leds
int redLed=9;
int yellowLed=10;
int greenLed=11;
int buzzer=8;              //  to make alarm

// servo
Servo myservo;           // create servo object to control a servo
                         // a maximum of eight servo objects can be created

int servoPosition=0;        // variable to store the servo position
int servoPin=7;



///// car motion     to control the direction

int dir1 = 2;
int dir2 = 4;


void setup(){

    Serial.begin(9600);                 ///  initialize  the serial  communication

/// ultrasonic

    pinMode(trigPin,OUTPUT);
    pinMode(echoPin,INPUT);


/// leds

        pinMode(redLed,OUTPUT);
        pinMode(yellowLed,OUTPUT);
        pinMode(greenLed,OUTPUT);
        pinMode(buzzer,OUTPUT);

/// car
  pinMode(dir1,OUTPUT);
  pinMode(dir2,OUTPUT);
```

```
    myservo.attach(servoPin);                        // attaches the servo on pin 9 to the
servo object
}

}



void loop(){

    delay(2000);     // wait 2 seconds  until srart

     // start  servo  motion

  for(servoPosition=0;servoPosition<180;servoPosition+=1){


      //digitalWrite(trigPin,LOW);
      //delayMicroseconds(2);

      digitalWrite(trigPin,HIGH);
      delayMicroseconds(10);                        //wait 10 microseconds
      digitalWrite(trigPin,LOW);

      duration = pulseIn (echoPin ,HIGH)  ;    // the duration that  signal take
to   return again to the ultrasonic

      distance = duration/58;                    ///  to obtain the distance


  ///  calculte ths  velocity

      velocity=(distance-oldDistance)/.2;     /// .2 is the time of the loop
      oldDistance=distance;




    if (distance <= 100 && distance!=0){

      servoPosition--;              // to keep the servo track the object


     ///  calculate the X and Y  of object

     xRad=(servoPosition*3.14)/180;   // convert servo position from degree to
radain
     yRad=(servoPosition*3.14)/180;

      x=distance*cos(xRad);
      y=distance*sin(yRad);



  //// print

      Serial.print(" the    distance   is : ");
      Serial.print(distance);
```

```
        Serial.print("\n");

        Serial.print(" the servoPosition is : ");
        Serial.print(servoPosition);
        Serial.print("\n");

        Serial.print(" the   velocity  is : ");
        Serial.print(velocity);
        Serial.print("\n");

        Serial.print(" the distance in  X: ");
        Serial.print(x);
        Serial.print("\n");

        Serial.print(" the distance  in Y: ");
        Serial.print(y);
        Serial.print("\n");


    }


//// the object  out of the range  of sensor
  else if (distance>100 || distance==0)
        {
  Serial.print(" the    distance   is : ");
        Serial.print(distance);
        Serial.print("\n");

     Serial.print(" the    velocity  is : ");
        Serial.print(velocity);
        Serial.print("\n");

        Serial.print("NO objects ");
        Serial.print("\n");
}



            staysafe();    //  keep object in yellow region



if (distance<=30 && distance!=0)
        red();       // to switch on  the red LED

else if (distance>30&& distance <=60)
        yellow();    // to switch on  the yellow LED

else
        green();       // to switch on  the green  LED


////  servo motion

        myservo.write(servoPosition);
        delay(200);
```

```
////////////////////////////////////////////////////////////////////////////////////////
////////////////////////////////////////////////////////////////////////////////////////

    delay(2000);        // wait 2 seconds until servo  move  in onther direction


 for(servoPosition=180;servoPosition>=0;servoPosition-=1){   ///   move 180 degre


        //digitalWrite(trigPin,LOW);
        //delayMicroseconds(2);

        digitalWrite(trigPin,HIGH);
        delayMicroseconds(10);
        digitalWrite(trigPin,LOW);


        duration = pulseIn (echoPin ,HIGH)  ;

        distance = duration/58;

 ///  calculte ths  velocity

        velocity=(distance-oldDistance)/.2;     /// .2 is the time of the loop
        oldDistance=distance;



   if (distance <= 100 && distance!=0){


         servoPosition++;

     ///  calculate the X and Y  of object

      xRad=(servoPosition*3.14)/180;
      yRad=(servoPosition*3.14)/180;

        x=distance*cos(xRad);
        y=distance*sin(yRad);

/// print
        Serial.print(" the    distance   is : ");
        Serial.print(distance);
        Serial.print("\n");

        Serial.print(" the servoPosition is : ");
        Serial.print(servoPosition);
        Serial.print("\n");

        Serial.print(" the    velocity  is : ");
        Serial.print(velocity);
        Serial.print("\n");

        Serial.print(" the distance in  X: ");
        Serial.print(x);
        Serial.print("\n");

        Serial.print(" the distance  in Y: ");
```

```
        Serial.print(y);
        Serial.print("\n");


    }


//// the object  out of the range  of sensor

  else if (distance>100|| distance==0){
        Serial.print(" the    distance   is : ");
        Serial.print(distance);
        Serial.print("\n");

        Serial.print("NO objects ");
        Serial.print("\n");
  }


  staysafe();              //  keep object in yellow region


if (distance<=30 && distance!=0)
        red();

else if (distance>30&& distance <=60)
        yellow();

else
        green();

////  servo motion

        myservo.write(servoPosition);
        delay(200);



        }


//delay(5000);
}




/////////////////////////////////////
functions  /////////////////////////////////////

   // to switch on  the red LED

void red(){

        digitalWrite(redLed,HIGH);
        digitalWrite(yellowLed,LOW);
        digitalWrite(greenLed,LOW);
        digitalWrite(buzzer,HIGH);

}

   // to switch on  the yellow LED
```

```
void yellow(){

        digitalWrite(redLed,LOW);
        digitalWrite(yellowLed,HIGH);
        digitalWrite(greenLed,LOW);
        //digitalWrite(buzzer,HIGH);
        // delay(700);
        digitalWrite(buzzer,LOW);

}

   // to switch on  the green LED

void green(){

        digitalWrite(redLed,LOW);
        digitalWrite(yellowLed,LOW);
        digitalWrite(greenLed,HIGH);
        digitalWrite(buzzer,LOW);

}



/// object  close to me   -ve velocity >>  move back

/// object  move away from me     >>   +ve velocity  >> moveforward

void staysafe(){

if(distance<30 && velocity < 0)    ///the object close  to the car
        move_back();

else if (distance<30 && velocity > 0)     ///the object   far from  the car
        move_forward();


else if (distance>60 && distance<100 && velocity > 0)      ///the object   far from
the car
         move_forward();

else if (distance>60 && distance<100 && velocity < 0)       ///the object close  to
the car
        move_back();

//  the object  in safe  region
else if (distance>=30 && distance<=60)
        stop_motion();

else if (distance==0 || distance> 100)
        stop_motion();

else
        stop_motion();

}

///  to move the  car  in back direction
void move_back(){
```

```
        digitalWrite(dir1,HIGH);
        digitalWrite(dir2,LOW);
}

///  to move the  car  in forward direction
void move_forward(){

        digitalWrite(dir2,HIGH);
        digitalWrite(dir1,LOW);
}

//  stop  the car
void stop_motion(){

        digitalWrite(dir2,LOW);
        digitalWrite(dir1,LOW);

}
```