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// "Virtual Pendulum in Processing"
// You would have gotten an easy and simple inverted robot already.
// Five lines should be added to your robot's sketch in Arduino.
// Then runing this Processing sketch in your PC,you see a Virtual Pendulum following your robot in real time.
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PrintWriter output;  //1
import processing.serial.*;  //2
Serial myPort;  //3

int obs;  //4
byte dataDim = 5;  //5  <-- Replace right hand side value '5' with "10" in Step 9.
int [] data = new int[ dataDim ];  //6
int x, y;  //7
float dhx, dhy;  //8
long wx, wy, hx, hy;  //9
long power, theta, omega, speed;  //10

int winW = 800;  //11
int winH = winW * 9 / 16;  //12
int flrH = winH * 4 / 9;  //13
int bdyL = flrH * 4 / 5;  //14
int hdR = flrH / 20;  //15
int whlR = flrH * 3 / 40;
int untL = winW / 80;

int kWX= 200;
int kHdX = 45;
int adjHdX = bdyL * 5 / 4;  //20
int kHdY = 25;

void setup(){  //22
  size(winW, winH);
  myPort=new Serial(this,"COM14",115200);  //24  <-- Replace number of COM port with your Arduino's.
  myPort.bufferUntil('¥n');  //25
  output = createWriter("log.csv");
}  //27

void draw(){  //28
  background(255);
  textAlign(LEFT);  //30
  fill(#BDB76B);
  textSize(30);
  text( "Obs.= No.",  10,  40,  0);
  text( obs,  160,  40,  0);
  fill(220);  //35
  rect(-10, flrH + whlR,  winW + 20, winH - flrH);
  fill(100);
  rect( winW / 5, flrH + whlR + untL*3,  winW * 3 / 5, winH - (flrH + whlR + untL*3*2));
  stroke(200);
  line( winW / 2, flrH + whlR + untL*4,  winW / 2, winH - untL*4);  //40
  stroke(0);
  fill(255);
  rect( winW / 2, flrH + whlR + untL*5,  speed * winW / 800, untL*2 );
  rect( winW / 2, flrH + whlR + untL*9,  omega * winW / 800, untL*2 );
  rect( winW / 2, flrH + whlR + untL*13,  theta * winW / 800, untL*2 );  //45
  fill(160);
  rect( winW / 2, flrH + whlR + untL*17,  power * winW / 800, untL*2 );
  fill(0);
  textSize(untL*2);
  text("Speed", untL*8, flrH + whlR + untL*7);  //50
  text("Omega", untL*8, flrH + whlR + untL*11);
  text("Theta", untL*8, flrH + whlR + untL*15);
  text("Power", untL*8, flrH + whlR + untL*19);

  wx = ( (x/kWX)*winW/800 + winW/2 ) - int( ((x/kWX)*winW/800+winW/2) / winW ) * winW;
  if( (x/kWX)*winW/800 + winW/2 < 0 ) { wx = wx + winW; }  //55
  hx = ( (x/kWX)*winW/800 + int(dhx*adjHdX) + winW/2 ) - int( ((x/kWX)*winW/800+int(dhx*adjHdX)+winW/2) / winW ) * winW;
  if( (x/kWX)*winW/800 + int(dhx*adjHdX) + winW/2 < 0 ) { hx = hx + winW; }

  line(wx+dhx*adjHdX, y+flrH-bdyL*dhy,  wx, y+flrH);
  line(hx, y+flrH-bdyL*dhy,  hx-dhx*adjHdX, y+flrH);
  fill(0);  //60
  ellipse(wx, y+flrH, whlR*2,whlR*2);
  fill(200);
  ellipse(hx, y+flrH-bdyL*dhy, hdR*2,hdR*2);
}  //64

void serialEvent(Serial myPort) {  //65
  String myString = myPort.readStringUntil('¥n');
  myString = trim(myString);
  int arduino[] = int(split(myString, ','));
  if (arduino.length == dataDim) {
    for ( int i = 0; i < dataDim; i++ ) { data[i] = arduino[i]; }  //70
    obs++;
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    x = x + data[3];
    y = 0;
    dhx = sin( radians( (data[1] + data[4]*0)/kHdX ) );
    dhy = cos( radians( (data[1] + data[4]*0)/kHdY ) );  //75
    power = ( data[1] + data[2] + data[3] + data[4] ) * 100 / 255;
    theta = ( data[1] + data[4]*0 ) * 100 / 255;
    omega = ( data[2] ) * 100 / 255;
    speed = ( data[3] ) * 100 / 255;
  }  //80

  output.print( data[0] ); output.print(", "); output.print( data[1] ); output.print(", "); output.print( data[2] ); output.print(", ");  //81
  output.print( data[3] ); output.print(", "); output.println( data[4] );  //82  <-- Remove this line in Step 9.
//Restore these three lines below, after removing line 82 in Step9.
//  output.print( data[3] ); output.print(", "); output.print( data[4] ); output.print(", "); output.print( data[5] ); output.print(", ");
//  output.print( data[6] ); output.print(", "); output.print( data[7] ); output.print(", "); output.print( data[8] ); output.print(", ");
//  output.println( data[9] );
}  //83

void keyPressed() {  //84
  output.flush();  //85
  output.close();
  exit();
}  //88
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