



# Tarefa - 02

Software Embarcado

Aluno: Bernardo da Eira Duarte

Professor: Francisco Sant'Anna

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# Introdução

- Componentes
  - Micro Servo Motor 9g SG90
  - Sensor de Luminosidade LDR 5mm
  - Display 7 Segmentos 1 Dígito Vermelho
  - Joystick Arduino 3 Eixos



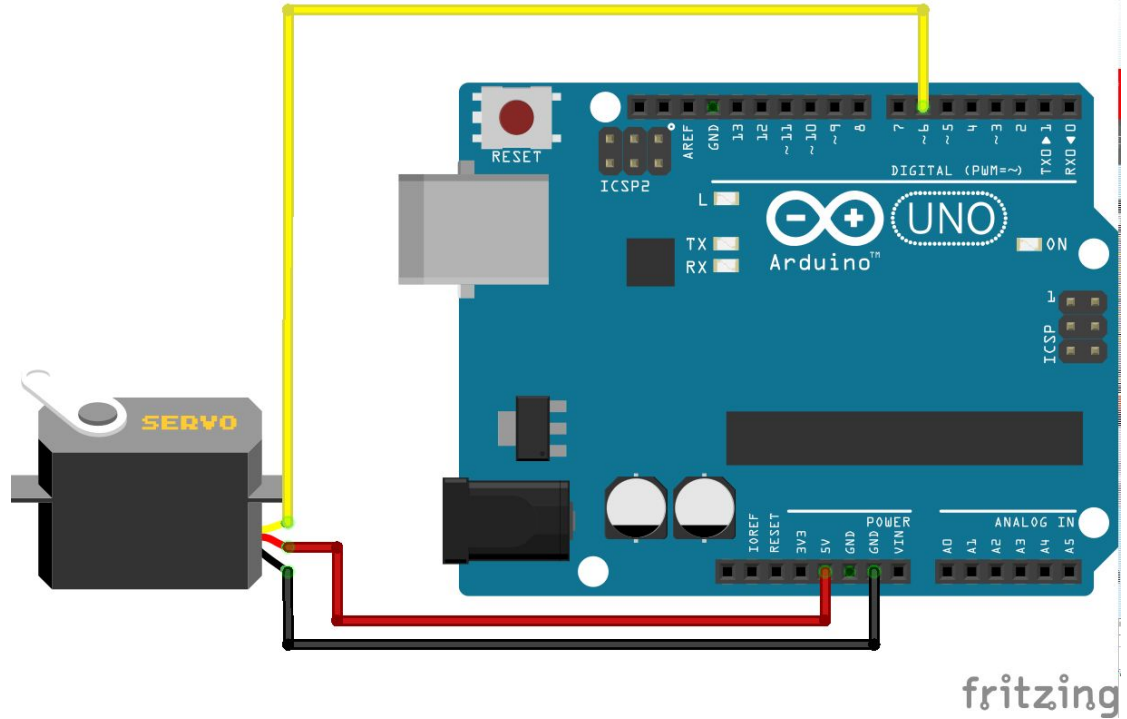
# Micro Servo Motor 9g SG90

```
#include <Servo.h>

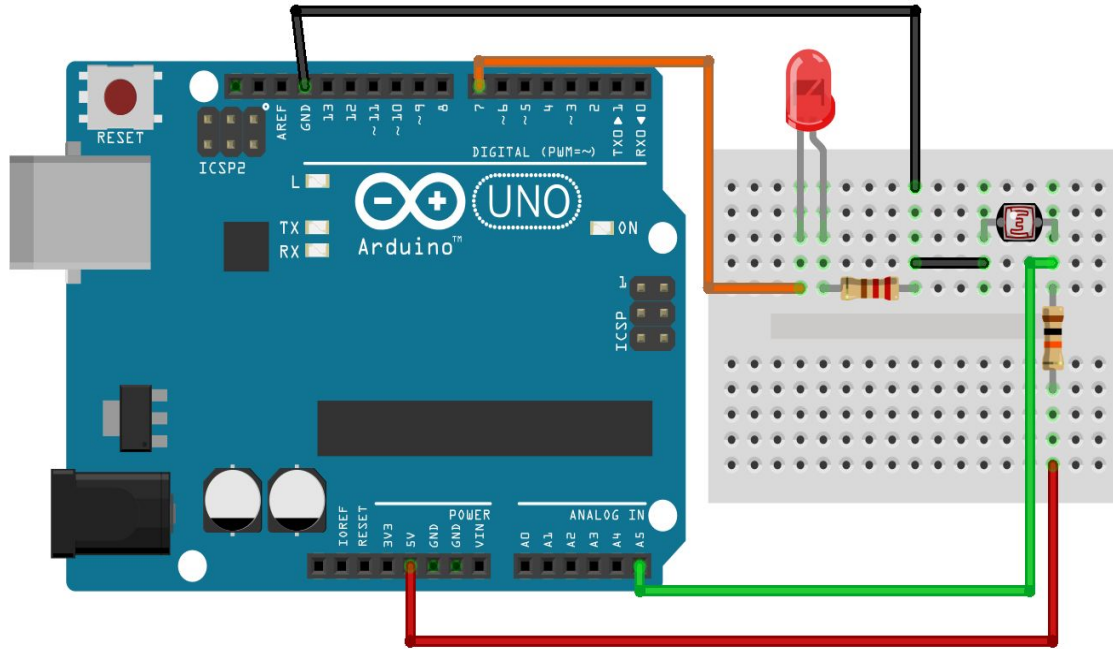
const int SERVO = 6;
Servo s;
int pos;

void setup ()
{
  s.attach(SERVO);
  Serial.begin(9600);
  s.write(0);
}

void loop()
{
  for(pos = -180; pos <= 180; pos++) {
    s.write(abs(pos));
    delay(15);
  }
  delay(1000);
}
```



# Sensor de Luminosidade LDR 5mm



```
const int pinoLed = 7;  
const int pinoLDR = A5;
```

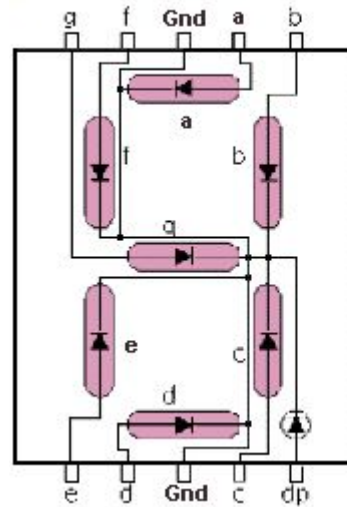
```
void setup(){  
  pinMode(pinoLed, OUTPUT);  
  pinMode(pinoLDR, INPUT);  
}
```

```
void loop(){  
  unsigned int ldr = analogRead(pinoLDR);  
  if(ldr > 600) {  
    digitalWrite(pinoLed, HIGH);  
  }  
  else {  
    digitalWrite(pinoLed, LOW);  
  }  
}
```

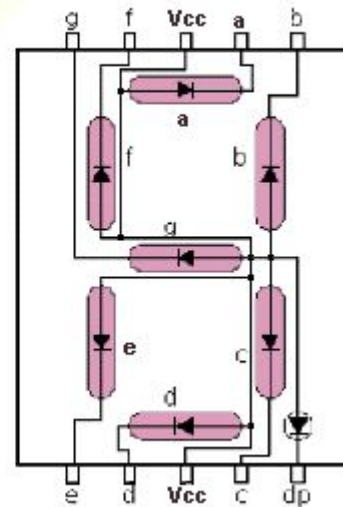
fritzing }

# Display 7 Segmentos 1 Dígito Vermelho

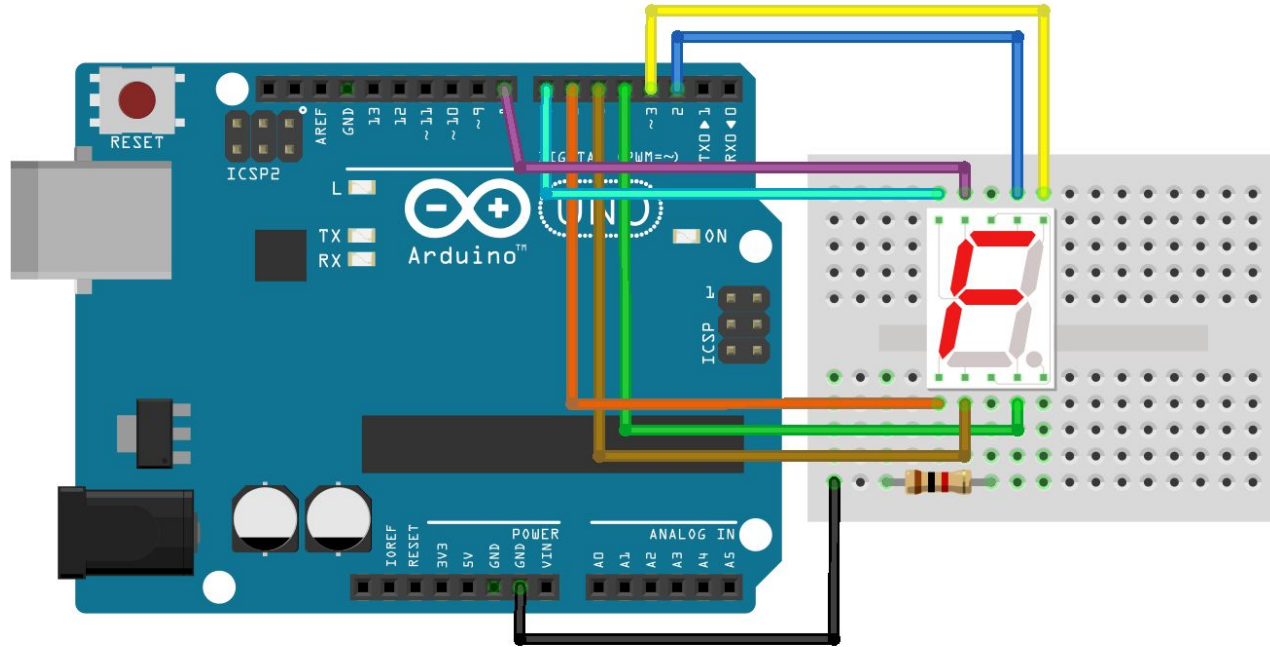
Common Cathode



Common Anode

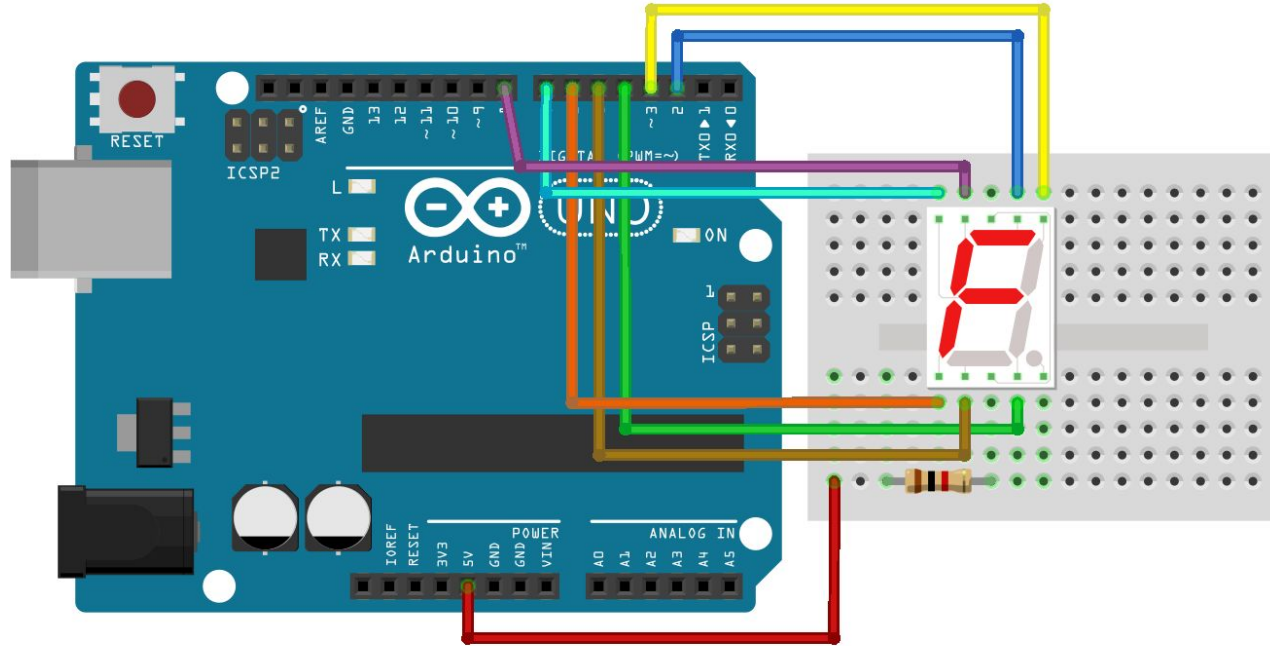


# Display 7 Segmentos 1 Dígito Vermelho (Catodo)



fritzing

# Display 7 Segmentos 1 Dígito Vermelho (Anodo)



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# Display 7 Segmentos 1

## Dígito Vermelho

```
typedef enum {  
    BLANK,  
    ZERO = A|B|C|D|E|F,  
    ONE = B|C,  
    TWO = A|B|D|E|G,  
    THREE = A|B|C|D|G,  
    FOUR = B|C|F|G,  
    FIVE = A|C|D|F|G,  
    SIX = A|C|D|E|F|G,  
    SEVEN = A|B|C,  
    EIGHT = A|B|C|D|E|F|G,  
    NINE = A|B|C|D|F|G  
} Digit;  
  
typedef enum {  
    A = 0x01,  
    B = 0x02,  
    C = 0x04,  
    D = 0x08,  
    E = 0x10,  
    F = 0x20,  
    G = 0x40  
} SevSeg;
```

```
Digit intToDigit(int i) {  
    switch(i) {  
        case 0: return ZERO;  
        case 1: return ONE;  
        case 2: return TWO;  
        case 3: return THREE;  
        case 4: return FOUR;  
        case 5: return FIVE;  
        case 6: return SIX;  
        case 7: return SEVEN;  
        case 8: return EIGHT;  
        case 9: return NINE;  
        default: return BLANK;  
    }  
}  
  
void sevsegDisplay(Digit digit) {  
    digitalWrite(sevsegPins[0], !(A & digit));  
    digitalWrite(sevsegPins[1], !(B & digit));  
    digitalWrite(sevsegPins[2], !(C & digit));  
    digitalWrite(sevsegPins[3], !(D & digit));  
    digitalWrite(sevsegPins[4], !(E & digit));  
    digitalWrite(sevsegPins[5], !(F & digit));  
    digitalWrite(sevsegPins[6], !(G & digit));  
}
```

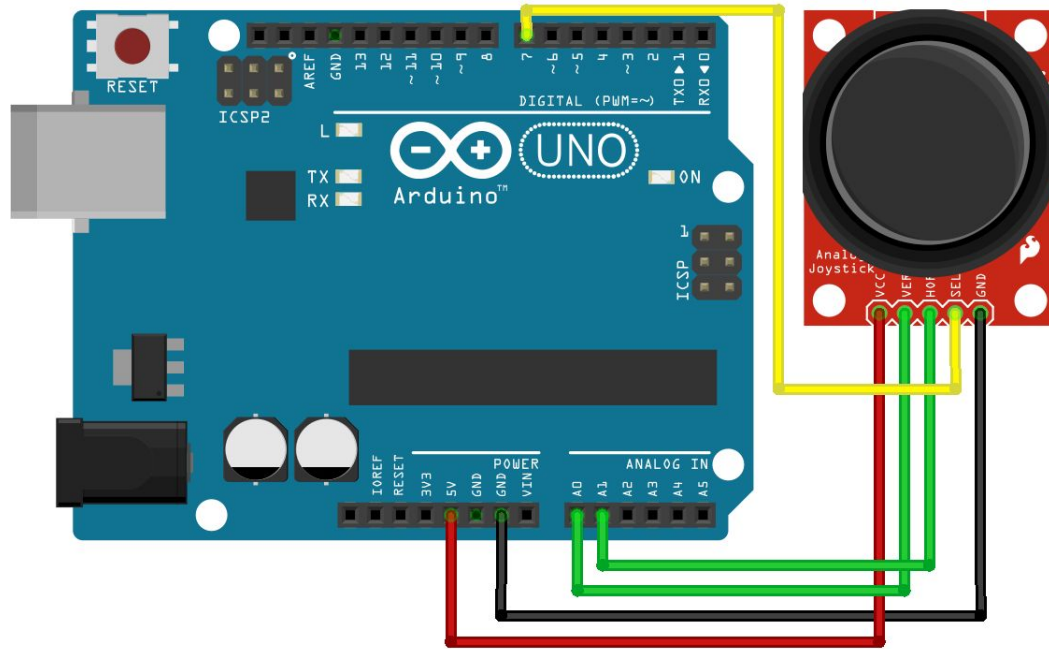
# Display 7 Segmentos 1 Dígito Vermelho

```
int const sevsegPins[] = {
    2, 3, 4, 5, 6, 7, 8
};
int num;

void setup() {
    for (int i = 0; i < 7; ++i) {
        pinMode(sevsegPins[i], OUTPUT);
    }
    num = 0;
}

void loop() {
    num = (num + 1) % 10;
    sevsegDisplay(intToDigit(num++));
    delay(1000);
}
```

# Joystick Arduino 3 Eixos



fritzing

```
int eixo_X = A0;
int eixo_Y = A1;
int botao = 7;

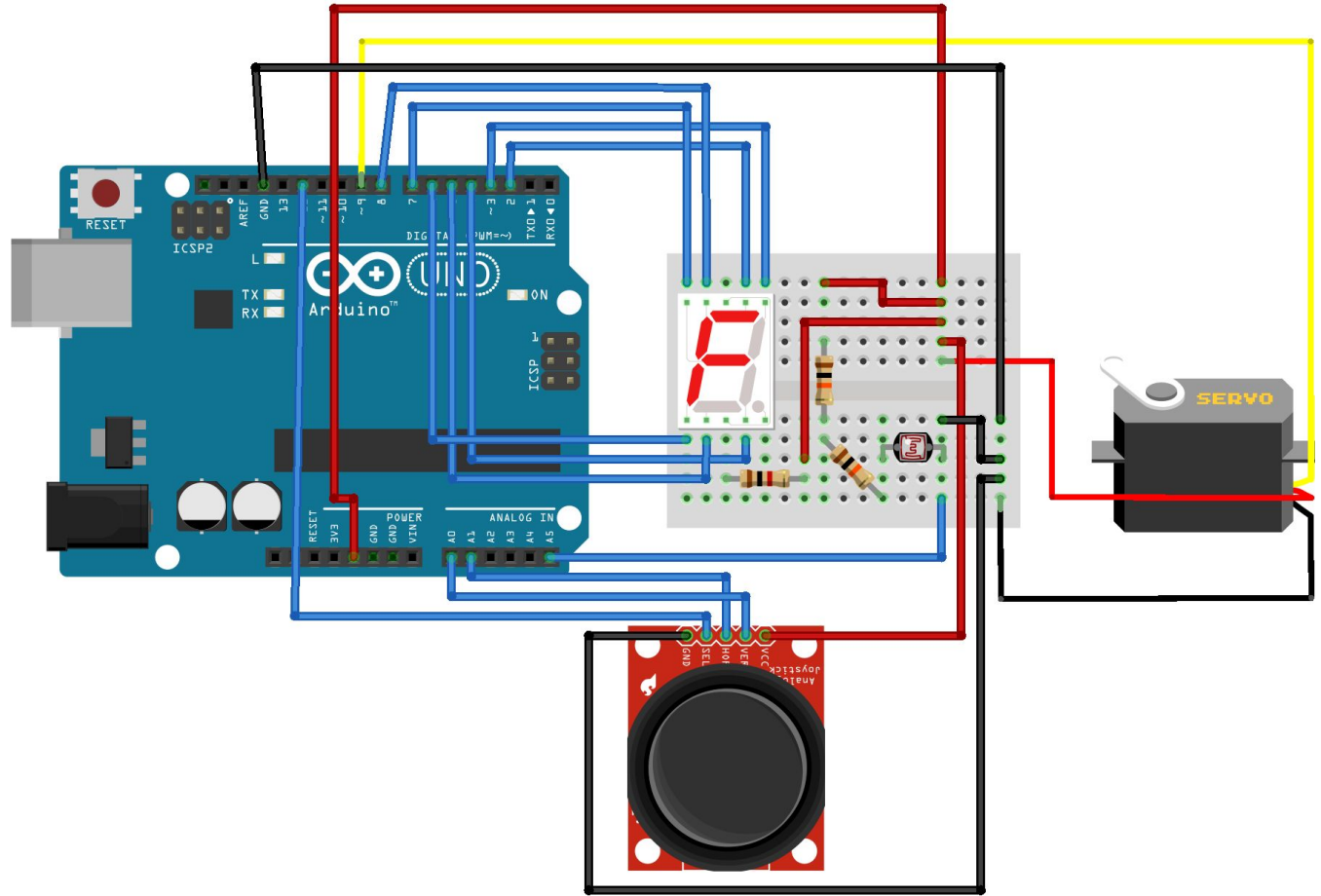
void setup(){
  pinMode (botao, INPUT_PULLUP);
  Serial.begin (9600);
}

void loop(){
  int x = analogRead(eixo_X);
  int y = analogRead(eixo_Y);
  int btn = digitalRead(botao);
  if(x == 0){
    Serial.println("PARA CIMA");
  }
  if(x == 1023){
    Serial.println("PARA BAIXO");
  }
  if(y == 0){
    Serial.println("DIREITA");
  }
  if(y == 1023){
    Serial.println("ESQUERDA");
  }
  if(btn == LOW){
    Serial.println("BOTAO PRESSIONADO");
  }
  delay(500);
}
```

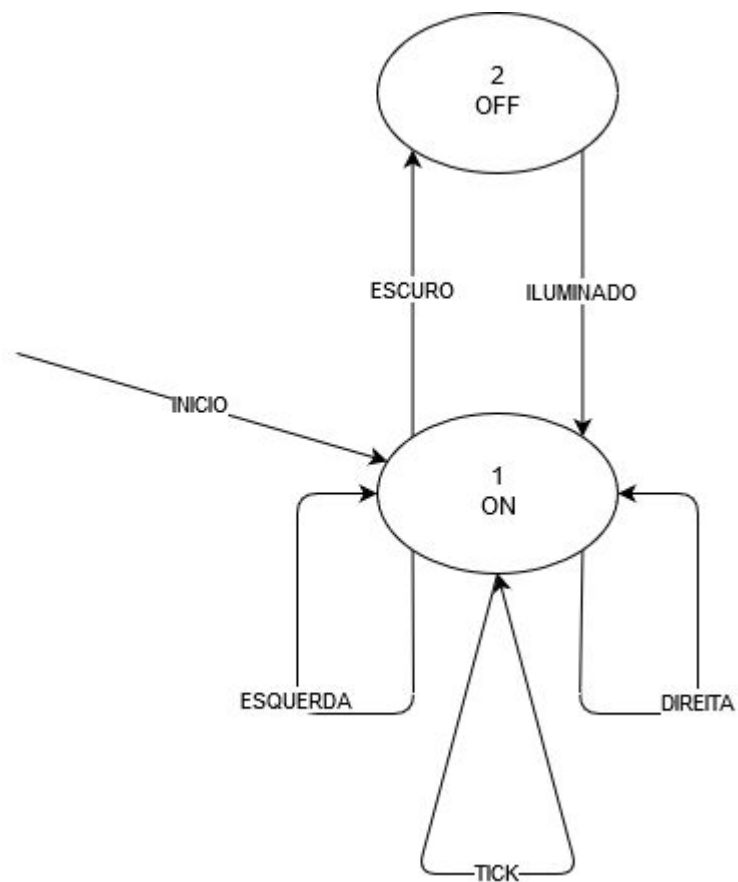
# Projeto

Regulador de velocidade de um ~~ventilador~~ abanador através de um joystick, aumentando a velocidade ao direcioná-lo para direita e reduzindo para esquerda, permitindo desligar o equipamento ao reduzir a iluminação no sensor de luminosidade, disponibilizando a informação da velocidade atual num display de 7 segmentos e com velocidades variando de 0 até 9, onde 0 significa parado.

# Circuitos



# FSM



# Código

```
short STATE;  
unsigned long T0;  
short current_speed;  
unsigned long joystick_moved_at;  
short current_pos;
```

```
void state_1(unsigned long now, int spd, unsigned long moved_at, short pos) {
```

```
    T0 = now;
```

```
    current_speed = spd;
```

```
    sevsegDisplay(intToDigit(current_speed));
```

```
    joystick_moved_at = moved_at;
```

```
    current_pos = pos;
```

```
    s.write(abs(current_pos));
```

```
    STATE = 1;
```

```
}
```

```
void state_2() {
```

```
    sevsegDisplay(BLANK);
```

```
    STATE = 2;
```

```
}
```

```
void setup() {
```

```
    pinMode(ldrPin, INPUT);
```

```
    s.attach(servoPin);
```

```
    for (int i = 0; i < 7; ++i) {
```

```
        pinMode(sevsegPins[i], OUTPUT);
```

```
    }
```

```
    pinMode(joystickButtonPin, INPUT_PULLUP);
```

```
    unsigned long now = millis();
```

```
    state_1(now, 0, now, 0);
```

```
}
```

# Código

```
void loop() {
  int ldrValue = analogRead(ldrPin);
  short x = analogRead(joystickXPin);
  short y = analogRead(joystickYPin);
  int btn = digitalRead(joystickButtonPin);
  unsigned long now = millis();

  switch(STATE) {
    case 1: {
      if (ldrValue >= 900) {
        state_2();
      }
      else if (now - T0 > 30) {
        short new_pos = current_pos + current_speed;
        if (new_pos > 180) new_pos = -180;
        state_1(now, current_speed, joystick_moved_at, new_pos);
      }
      else if (y < 40 && now - joystick_moved_at > 400) {
        int new_speed = (current_speed + 1) % 10;
        state_1(T0, new_speed, now, current_pos);
      }
      else if (y > 1000 && now - joystick_moved_at > 400) {
        int new_speed = (current_speed > 0) ? current_speed - 1 : 9;
        state_1(T0, new_speed, now, current_pos);
      }
      break;
    }
    case 2: {
      if (ldrValue < 900) {
        state_1(now, current_speed, joystick_moved_at, current_pos);
      }
      break;
    }
  }
}
```



# Referências

1. <https://www.filipeflop.com/produto/micro-servo-9g-sg90-towerpro/>
2. <https://www.filipeflop.com/produto/sensor-de-luminosidade-ldr-5mm/>
3. <https://www.filipeflop.com/produto/display-7-segmentos-1-digito-vermelho/>
4. <https://www.filipeflop.com/produto/joystick-arduino-3-eixos/>