

Program Arduino

```
#include "MPU6050.h"
MPU6050 accelgyro;
int16_t ax, ay, az;
int16_t gx, gy, gz;
#define Gry_offset 0
#define Gyr_Gain 0.00763358
#define Angle_offset -1.5
#define RMotor_offset 0
#define LMotor_offset 0
#define pi 3.14159
long data;
int x, y;
float kp, ki, kd;
float r_angle, f_angle, omega;
float LOutput,ROutput;
unsigned long preTime = 0;
unsigned long lastTime;
float Input, Output;
float errSum, dErr, error, lastErr;
int timeChange;
int pin = 4;
int TN2=12;
int ENA=10;
int TN4=13;
int ENB=11;
void setup()
{
  Wire.begin();
  Serial.begin(115200);
  accelgyro.initialize();
  pinMode(TN2,OUTPUT);
  pinMode(TN4,OUTPUT);
  pinMode(ENA,OUTPUT);
  pinMode(ENB,OUTPUT);
  pinMode(pin, OUTPUT);
  dot();
  dot();
  dot();
  delay(100);
}
void loop()
{
  filter();
  if (abs(f_angle)<35)
  {
    myPID();
    PWMControl();
    digitalWrite(pin, LOW);
  }
  else
  {
    analogWrite(ENA, 0);
    analogWrite(ENB, 0);
    digitalWrite(pin, HIGH);
    delay(50);
    digitalWrite(pin, LOW);
  }
}
```

```

delay(1000);
  for(int i = 0; i < 1; i++)
  {
    filter();
  }
if(abs(f_angle) < 45)
{
  for(int i = 0; i <= 1; i++)
  {
    omega = r_angle = f_angle = 0;
    filter();
    Output = error = errSum = dErr = 0;
    myPID();
  }
}
}

void filter()
{
  accelgyro.getMotion6(&ax, &ay, &az,
&gx, &gy, &gz);

  r_angle = (atan2(ay, az) * 180 / pi +
Angle_offset);

  omega = Gyr_Gain * (gx + Gry_offset);

  //Serial.print(" omega=");
Serial.print(omega);

  unsigned long now = millis();
  float dt = (now - preTime) / 1000.0;
  preTime = now;

  float K = 0.8;
  float A = K / (K + dt);

```

```

  f_angle = A * (f_angle + omega * dt) + (1 -
A) * r_angle;

  // Serial.print("
f_angle=");Serial.print(f_angle);
}

void dot()
{
  digitalWrite(pin, HIGH);
  delay(50);
  digitalWrite(pin, LOW);
  delay(30);
}

void myPID()
{
  kp = 46; //Serial.print("
kp=");Serial.print(kp);

  kd = 680; // Serial.print("
kd=");Serial.print(kd);

  ki = 0.15; //Serial.print("
ki=");Serial.print(ki);

  unsigned long now = millis();
  timeChange = (now - lastTime);
  lastErr = error;
  lastTime = now;

  Input = f_angle;
  error = Input;
  errSum += error * timeChange;
  dErr = (error - lastErr) / timeChange;

  Output = kp * error + ki * errSum + kd *
dErr;

  LOutput = Output;
  ROutput = Output;

```

```
    Serial.print(" error");Serial.print(error);
    Serial.print("
output");Serial.print(Output);
    Serial.print(" now");Serial.println(now);
}
void PWMControl()
{
    if(LOutput > 0)
    {
        digitalWrite(TN2, LOW);
    }
    else
    {
        digitalWrite(TN2, HIGH);
    }
    if(ROutput > 0)
    {
        digitalWrite(TN4, LOW);
    }
    else
    {
        digitalWrite(TN4, HIGH);
    }
    analogWrite(ENA, min(255,
abs(LOutput) + LMotor_offset));
    analogWrite(ENB, min(255,
abs(ROutput) + RMotor_offset));
}
```