前期 第11回 実験報告（実験日：R6年7月1日）　名列番号：38　氏名：宮里 孝希

第11回　Arduinoマイコンのプログラミング

実験手順1

A graph with red lines

Description automatically generated

A graph with green and blue lines

Description automatically generated

#include <Arduino.h>

#include <MsTimer2.h>

class Motor {

public:

Motor(int pin, int inputPin) : pin(pin), inputPin(inputPin) {

pinMode(pin, OUTPUT);

pinMode(inputPin, INPUT);

}

void setVoltage(double voltage) {

refVel = voltage;

analogWrite(pin, 255 \* refVel / batteryLevel);

}

void interruptHandler() {

realVel = (analogRead(inputPin) \* batteryLevel) / 1024.0;

Serial.print(">realVel:");

Serial.println(realVel);

Serial.print(">ref:");

Serial.println(refVel);

}

private:

const int pin;

const int inputPin;

const int batteryLevel = 5;

double refVel = 1.0;

volatile double realVel = 0;

};

const int motorPin = 5;

const int motorVelPin = A0;

Motor motor(motorPin, motorVelPin);

void intrruptHandler() {

motor.interruptHandler();

}

void setup() {

Serial.begin(9600);

MsTimer2::set(20, intrruptHandler);

MsTimer2::start();

}

void loop() {

motor.setVoltage(0);

delay(1000);

motor.setVoltage(0.8);

delay(4000);

motor.setVoltage(1.2);

delay(5000);

}

実験手順2

A graph of a graph

Description automatically generated

#include <Arduino.h>

#include <MsTimer2.h>

class Motor {

public:

const int Period = 20;

Motor(int pin, int inputPin) : pin(pin), inputPin(inputPin) {

pinMode(pin, OUTPUT);

pinMode(inputPin, INPUT);

}

void setVoltage(double voltage) {

analogWrite(pin, 255 \* voltage / batteryLevel);

}

void interruptHandler() {

realVel = (analogRead(inputPin) \* batteryLevel) / 1024.0;

*// 前回の実験より*

const double K = 0.9421910;

const double T = 0.48;

*// 最大値が5V未満になるように調整*

const double p1 = -4.6;

const double p2 = -4.6;

const double Kp = -((p1 + p2) \* T + 1) / K;

const double Ki = p1 \* p2 \* T / K;

double error = refVel - realVel;

integral += error \* Ki \* Period / 1000;

command = constrain(Kp \* error + integral, 0, 5);

Serial.print(">realVel:");

Serial.println(realVel);

Serial.print(">ref:");

Serial.println(refVel);

Serial.print(">command:");

Serial.println(command);

setVoltage(command);

}

void piControl(double voltage) {

refVel = voltage;

}

private:

const int pin;

const int inputPin;

const int batteryLevel = 5;

double refVel = 1.0;

double command = 0;

volatile double realVel = 0;

volatile double integral = 0;

};

const int motorPin = 5;

const int motorVelPin = A0;

Motor motor(motorPin, motorVelPin);

void intrruptHandler() {

motor.interruptHandler();

}

void setup() {

Serial.begin(115200);

MsTimer2::set(motor.Period, intrruptHandler);

MsTimer2::start();

}

void loop() {

motor.piControl(0);

delay(1000);

motor.piControl(0.8);

delay(4000);

motor.piControl(1.6);

delay(5000);

}