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ELEN 123, Mechatronics

Laboratory #4: Platform Build and Motor Drivers

***Experiment 1****:*

It was asked to write the following functions in Arduino:

Forward()

Reverse()

Brake()

Coast()

TurnLeft()

TurnRight()

PivotLeft()

PivotRight()

*// connect motor controller pins to Arduino digital pins*

*// motor one*

*int enA = 10;*

*int in1 = 9;*

*int in2 = 8;*

*// motor two*

*int enB = 5;*

*int in3 = 7;*

*int in4 = 6;*

*void setup() {*

*// put your setup code here, to run once:*

*pinMode(enA, OUTPUT);*

*pinMode(enB, OUTPUT);*

*pinMode(in1, OUTPUT);*

*pinMode(in2, OUTPUT);*

*pinMode(in3, OUTPUT);*

*pinMode(in4, OUTPUT);*

*}*

*void loop() {*

*// put your main code here, to run repeatedly:*

*Forward();*

*Brake();*

*Reverse();*

*Brake();*

*}*

*void Forward(){*

*digitalWrite(in1, HIGH);*

*digitalWrite(in2, LOW);*

*analogWrite(enA, 150);*

*digitalWrite(in3, HIGH);*

*digitalWrite(in4, LOW);*

*analogWrite(enB, 150);*

*delay(200);*

*}*

*void Reverse(){*

*digitalWrite(in1, LOW);*

*digitalWrite(in2, HIGH);*

*analogWrite(enA, 150);*

*digitalWrite(in3, LOW);*

*digitalWrite(in4, HIGH);*

*analogWrite(enB, 150);*

*delay(200);*

*}*

*void Brake() {*

*digitalWrite(in1, LOW);*

*digitalWrite(in2, LOW);*

*analogWrite(enA, 150);*

*digitalWrite(in3, LOW);*

*digitalWrite(in4, LOW);*

*analogWrite(enB, 150);*

*delay(200);*

*}*

*void Coast() {*

*analogWrite(enA, 0);*

*analogWrite(enB, 0);*

*}*

*void TurnLeft(){*

*digitalWrite(in1, HIGH);*

*digitalWrite(in2, LOW);*

*analogWrite(enA, 75);*

*digitalWrite(in3, HIGH);*

*digitalWrite(in4, LOW);*

*analogWrite(enB, 150);*

*delay(200);*

*}*

*void TurnRight() {*

*digitalWrite(in1, HIGH);*

*digitalWrite(in2, LOW);*

*analogWrite(enA, 150);*

*digitalWrite(in3, HIGH);*

*digitalWrite(in4, LOW);*

*analogWrite(enB, 50);*

*delay(200);*

*}*

*void PivotLeft() {*

*digitalWrite(in1, HIGH);*

*digitalWrite(in2, LOW);*

*analogWrite(enA, 0);*

*digitalWrite(in3, HIGH);*

*digitalWrite(in4, LOW);*

*analogWrite(enB, 150);*

*delay(200);*

*}*

*void PivotRight(){*

*digitalWrite(in1, HIGH);*

*digitalWrite(in2, LOW);*

*analogWrite(enA, 150);*

*digitalWrite(in3, HIGH);*

*digitalWrite(in4, LOW);*

*analogWrite(enB, 0);*

*delay(200);*

*}*

***Experiment 2:***

It was asked to add the additional routines:

cmForward (int x)

cmReverse (int x)

These are as follows:

*//Lab 4 Experiment 2*

*//write cmForward and cmReverse*

*// connect motor controller pins to Arduino digital pins*

*// motor one*

*int enA = 10;*

*int in1 = 9;*

*int in2 = 8;*

*// motor two*

*int enB = 5;*

*int in3 = 7;*

*int in4 = 6;*

*//Distance to travel*

*int x = 10;*

*volatile double dist = 0.0;*

*//Encoder*

*long count = 0;*

*int encA = 3;*

*int encB = 20;*

*//led*

*#define BASESPEED 45*

*#define DTIME 1000*

*void setup() {*

*Serial.begin(9600);*

*// put your setup code here, to run once:*

*pinMode(enA, OUTPUT);*

*pinMode(enB, OUTPUT);*

*pinMode(in1, OUTPUT);*

*pinMode(in2, OUTPUT);*

*pinMode(in3, OUTPUT);*

*pinMode(in4, OUTPUT);*

*pinMode(encA, INPUT);*

*pinMode(encB, INPUT);*

*attachInterrupt(digitalPinToInterrupt(encA), angle, CHANGE);*

*cmForward(x);*

*cmReverse(x);*

*}*

*void loop() {*

*// put your main code here, to run repeatedly:*

*//Serial.println(count);*

*}*

*void rdelay(int dt) {*

*int ct, pt;*

*pt = millis();*

*ct = pt;*

*while (ct - pt < dt) {*

*ct = millis();*

*}*

*}*

*void Forward() {*

*digitalWrite(in1, HIGH);*

*digitalWrite(in2, LOW);*

*analogWrite(enA, BASESPEED);*

*digitalWrite(in3, HIGH);*

*digitalWrite(in4, LOW);*

*analogWrite(enB, BASESPEED);*

*rdelay(DTIME);*

*}*

*void Reverse() {*

*digitalWrite(in1, LOW);*

*digitalWrite(in2, HIGH);*

*analogWrite(enA, BASESPEED);*

*digitalWrite(in3, LOW);*

*digitalWrite(in4, HIGH);*

*analogWrite(enB, BASESPEED);*

*rdelay(DTIME);*

*}*

*void Brake() {*

*digitalWrite(in1, LOW);*

*digitalWrite(in2, LOW);*

*analogWrite(enA, BASESPEED);*

*digitalWrite(in3, LOW);*

*digitalWrite(in4, LOW);*

*analogWrite(enB, BASESPEED);*

*rdelay(DTIME);*

*}*

*void Coast() {*

*analogWrite(enA, 0);*

*analogWrite(enB, 0);*

*rdelay(DTIME);*

*}*

*void TurnLeft() {*

*digitalWrite(in1, HIGH);*

*digitalWrite(in2, LOW);*

*analogWrite(enA, .5 \* BASESPEED);*

*digitalWrite(in3, HIGH);*

*digitalWrite(in4, LOW);*

*analogWrite(enB, BASESPEED);*

*rdelay(DTIME);*

*}*

*void TurnRight() {*

*digitalWrite(in1, HIGH);*

*digitalWrite(in2, LOW);*

*analogWrite(enA, BASESPEED);*

*digitalWrite(in3, HIGH);*

*digitalWrite(in4, LOW);*

*analogWrite(enB, .5 \* BASESPEED);*

*rdelay(DTIME);*

*}*

*void PivotLeft() {*

*digitalWrite(in1, HIGH);*

*digitalWrite(in2, LOW);*

*analogWrite(enA, 0);*

*digitalWrite(in3, HIGH);*

*digitalWrite(in4, LOW);*

*analogWrite(enB, BASESPEED);*

*rdelay(DTIME);*

*}*

*void PivotRight() {*

*digitalWrite(in1, HIGH);*

*digitalWrite(in2, LOW);*

*analogWrite(enA, BASESPEED);*

*digitalWrite(in3, HIGH);*

*digitalWrite(in4, LOW);*

*analogWrite(enB, 0);*

*rdelay(DTIME);*

*}*

*void cmForward(int x) {*

*rdelay(DTIME);*

*dist = 0;*

*Forward();*

*while (dist < x) {*

*dist = (1.65)\*(3/2)\*count\*(PI/180);*

*Serial.println(dist);*

*}*

*Brake();*

*}*

*void cmReverse(int x) {*

*rdelay(DTIME);*

*dist = 0;*

*Reverse();*

*while (dist > x) {*

*dist = (1.65)\*(3/2)\*count\*(PI/180);*

*Serial.println(dist);*

*}*

*Brake();*

*}*

*void angle() {*

*//Serial.println(digitalRead(encB));*

*if (digitalRead(encB) == digitalRead(encA))*

*count++;*

*else*

*count--;*

*}*

***Experiment 3:***

It was asked to write the following functions:

cmForward\_nonblock (int x)

cmReverse\_nonblock (int x)

The Arduino program is as follows:

*void cmForward\_nonblock(int x){*

*while (dist < x){*

*Forward();*

*if(sw == 1){*

*Serial.print(count\*(PI/180)\*3);*

*Serial.println("centimeters traveled");*

*dist = count\*(PI/180)\*3;*

*sw = 0;*

*}*

*if (ledState == LOW)*

*ledState = HIGH;*

*else*

*ledState = LOW;*

*digitalWrite(LEDpin, ledState);*

*}*

*Brake();*

*}*

*void cmReverse\_nonblock(int x){*

*while (dist < x){*

*Reverse();*

*if(sw == 1){*

*Serial.print(count\*(PI/180)\*3);*

*Serial.println("centimeters traveled");*

*dist = count\*(PI/180)\*3;*

*sw = 0;*

*}*

*if (ledState == LOW)*

*ledState = HIGH;*

*else*

*ledState = LOW;*

*digitalWrite(LEDpin, ledState);*

*}*

*Brake();*

*}*

***Experiment 4:***

We were asked to write a function to perform a K-turn that results in the robot pointing 180 degrees away from its previous position. The following code performs this action***:***