#define leftCenterSensor A3

#define leftNearSensor A4

#define leftFarSensor A5

#define rightCenterSensor A2

#define rightNearSensor A1

#define rightFarSensor A0

#define leapTime 200

#define leftMotor1 9

#define leftMotor2 8

#define rightMotor1 7

#define rightMotor2 6

#define led 13

int leftCenterReading;

int leftNearReading;

int leftFarReading;

int rightCenterReading;

int rightNearReading;

int rightFarReading;

int leftNudge;

int replaystage;

int rightNudge;

char path[30] = {};

int pathLength;

int readLength;

void setup(){

 pinMode(leftCenterSensor, INPUT);

 pinMode(leftNearSensor, INPUT);

 pinMode(leftFarSensor, INPUT);

 pinMode(rightCenterSensor, INPUT);

 pinMode(rightNearSensor, INPUT);

 pinMode(rightFarSensor, INPUT);

 pinMode(leftMotor1, OUTPUT);

 pinMode(leftMotor2, OUTPUT);

 pinMode(rightMotor1, OUTPUT);

 pinMode(rightMotor2, OUTPUT);

 pinMode(led, OUTPUT);

 //Serial.begin(115200);

 digitalWrite(led, HIGH);

 delay(1000);

}

void loop(){

 readSensors();

 if(leftFarReading<200 && rightFarReading<200 &&

 (leftCenterReading>200 || rightCenterReading>200) ){

 straight();

 }

 else{

 leftHandWall();

 }

}

void readSensors(){

 leftCenterReading = analogRead(leftCenterSensor);

 leftNearReading = analogRead(leftNearSensor);

 leftFarReading = analogRead(leftFarSensor);

 rightCenterReading = analogRead(rightCenterSensor);

 rightNearReading = analogRead(rightNearSensor);

 rightFarReading = analogRead(rightFarSensor);

// serial printing below for debugging purposes

// Serial.print("leftCenterReading: ");

// Serial.println(leftCenterReading);

// Serial.print("leftNearReading: ");

// Serial.println(leftNearReading);

// Serial.print("leftFarReading: ");

// Serial.println(leftFarReading);

// Serial.print("rightCenterReading: ");

// Serial.println(rightCenterReading);

// Serial.print("rightNearReading: ");

// Serial.println(rightNearReading);

// Serial.print("rightFarReading: ");

// Serial.println(rightFarReading);

// delay(200);

}

void leftHandWall(){

 if( leftFarReading>200 && rightFarReading>200){

 digitalWrite(leftMotor1, HIGH);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, HIGH);

 digitalWrite(rightMotor2, LOW);

 delay(leapTime);

 readSensors();

 if(leftFarReading>200 || rightFarReading>200){

 done();

 }

 if(leftFarReading<200 && rightFarReading<200){

 turnLeft();

 }

 }

 if(leftFarReading>200){ // if you can turn left then turn left

 digitalWrite(leftMotor1, HIGH);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, HIGH);

 digitalWrite(rightMotor2, LOW);

 delay(leapTime);

 readSensors();

 if(leftFarReading<200 && rightFarReading<200){

 turnLeft();

 }

 else{

 done();

 }

 }

 if(rightFarReading>200){

 digitalWrite(leftMotor1, HIGH);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, HIGH);

 digitalWrite(rightMotor2, LOW);

 delay(30);

 readSensors();

 if(leftFarReading>200){

 delay(leapTime-30);

 readSensors();

 if(rightFarReading>200 && leftFarReading>200){

 done();

 }

 else{

 turnLeft();

 return;

 }

 }

 delay(leapTime-30);

 readSensors();

 if(leftFarReading<200 && leftCenterReading<200 &&

 rightCenterReading<200 && rightFarReading<200){

 turnRight();

 return;

 }

 path[pathLength]='S';

 // Serial.println("s");

 pathLength++;

 //Serial.print("Path length: ");

 //Serial.println(pathLength);

 if(path[pathLength-2]=='B'){

 //Serial.println("shortening path");

 shortPath();

 }

 straight();

 }

 readSensors();

 if(leftFarReading<200 && leftCenterReading<200 && rightCenterReading<200

 && rightFarReading<200 && leftNearReading<200 && rightNearReading<200){

 turnAround();

 }

}

void done(){

 digitalWrite(leftMotor1, LOW);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, LOW);

 digitalWrite(rightMotor2, LOW);

 replaystage=1;

 path[pathLength]='D';

 pathLength++;

 while(analogRead(leftFarSensor)>200){

 digitalWrite(led, LOW);

 delay(150);

 digitalWrite(led, HIGH);

 delay(150);

 }

 delay(500);

 replay();

}

void turnLeft(){

 while(analogRead(rightCenterSensor)>200||analogRead(leftCenterSensor)>200){

 digitalWrite(leftMotor1, LOW);

 digitalWrite(leftMotor2, HIGH);

 digitalWrite(rightMotor1, HIGH);

 digitalWrite(rightMotor2, LOW);

 delay(2);

 digitalWrite(leftMotor1, LOW);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, LOW);

 digitalWrite(rightMotor2, LOW);

 delay(1);

 }

 while(analogRead(rightCenterSensor)<200){

 digitalWrite(leftMotor1, LOW);

 digitalWrite(leftMotor2, HIGH);

 digitalWrite(rightMotor1, HIGH);

 digitalWrite(rightMotor2, LOW);

 delay(2);

 digitalWrite(leftMotor1, LOW);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, LOW);

 digitalWrite(rightMotor2, LOW);

 delay(1);

 }

 if(replaystage==0){

 path[pathLength]='L';

 //Serial.println("l");

 pathLength++;

 //Serial.print("Path length: ");

 //Serial.println(pathLength);

 if(path[pathLength-2]=='B'){

 //Serial.println("shortening path");

 shortPath();

 }

 }

}

void turnRight(){

 while(analogRead(rightCenterSensor)>200){

 digitalWrite(leftMotor1, HIGH);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, LOW);

 digitalWrite(rightMotor2, HIGH);

 delay(2);

 digitalWrite(leftMotor1, LOW);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, LOW);

 digitalWrite(rightMotor2, LOW);

 delay(1);

 }

 while(analogRead(rightCenterSensor)<200){

 digitalWrite(leftMotor1, HIGH);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, LOW);

 digitalWrite(rightMotor2, HIGH);

 delay(2);

 digitalWrite(leftMotor1, LOW);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, LOW);

 digitalWrite(rightMotor2, LOW);

 delay(1);

 }

 while(analogRead(leftCenterSensor)<200){

 digitalWrite(leftMotor1, HIGH);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, LOW);

 digitalWrite(rightMotor2, HIGH);

 delay(2);

 digitalWrite(leftMotor1, LOW);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, LOW);

 digitalWrite(rightMotor2, LOW);

 delay(1);

 }

 if(replaystage==0){

 path[pathLength]='R';

 Serial.println("r");

 pathLength++;

 Serial.print("Path length: ");

 Serial.println(pathLength);

 if(path[pathLength-2]=='B'){

 Serial.println("shortening path");

 shortPath();

 }

 }

}

void straight(){

 if( analogRead(leftCenterSensor)<200){

 digitalWrite(leftMotor1, HIGH);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, HIGH);

 digitalWrite(rightMotor2, LOW);

 delay(1);

 digitalWrite(leftMotor1, HIGH);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, LOW);

 digitalWrite(rightMotor2, LOW);

 delay(5);

 return;

 }

 if(analogRead(rightCenterSensor)<200){

 digitalWrite(leftMotor1, HIGH);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, HIGH);

 digitalWrite(rightMotor2, LOW);

 delay(1);

 digitalWrite(leftMotor1, LOW);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, HIGH);

 digitalWrite(rightMotor2, LOW);

 delay(5);

 return;

 }

 digitalWrite(leftMotor1, HIGH);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, HIGH);

 digitalWrite(rightMotor2, LOW);

 delay(4);

 digitalWrite(leftMotor1, LOW);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, LOW);

 digitalWrite(rightMotor2, LOW);

 delay(1);

}

void turnAround(){

 digitalWrite(leftMotor1, HIGH);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, HIGH);

 digitalWrite(rightMotor2, LOW);

 delay(150);

 while(analogRead(leftCenterSensor)<200){

 digitalWrite(leftMotor1, LOW);

 digitalWrite(leftMotor2, HIGH);

 digitalWrite(rightMotor1, HIGH);

 digitalWrite(rightMotor2, LOW);

 delay(2);

 digitalWrite(leftMotor1, LOW);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, LOW);

 digitalWrite(rightMotor2, LOW);

 delay(1);

 }

 path[pathLength]='B';

 pathLength++;

 straight();

 //Serial.println("b");

 //Serial.print("Path length: ");

 //Serial.println(pathLength);

}

void shortPath(){

 int shortDone=0;

 if(path[pathLength-3]=='L' && path[pathLength-1]=='R'){

 pathLength-=3;

 path[pathLength]='B';

 //Serial.println("test1");

 shortDone=1;

 }

 if(path[pathLength-3]=='L' && path[pathLength-1]=='S' && shortDone==0){

 pathLength-=3;

 path[pathLength]='R';

 //Serial.println("test2");

 shortDone=1;

 }

 if(path[pathLength-3]=='R' && path[pathLength-1]=='L' && shortDone==0){

 pathLength-=3;

 path[pathLength]='B';

 //Serial.println("test3");

 shortDone=1;

 }

 if(path[pathLength-3]=='S' && path[pathLength-1]=='L' && shortDone==0){

 pathLength-=3;

 path[pathLength]='R';

 //Serial.println("test4");

 shortDone=1;

 }

 if(path[pathLength-3]=='S' && path[pathLength-1]=='S' && shortDone==0){

 pathLength-=3;

 path[pathLength]='B';

 //Serial.println("test5");

 shortDone=1;

 }

 if(path[pathLength-3]=='L' && path[pathLength-1]=='L' && shortDone==0){

 pathLength-=3;

 path[pathLength]='S';

 //Serial.println("test6");

 shortDone=1;

 }

 path[pathLength+1]='D';

 path[pathLength+2]='D';

 pathLength++;

 //Serial.print("Path length: ");

 //Serial.println(pathLength);

 //printPath();

}

void printPath(){

 Serial.println("+++++++++++++++++");

 int x;

 while(x<=pathLength){

 Serial.println(path[x]);

 x++;

 }

 Serial.println("+++++++++++++++++");

}

void replay(){

 readSensors();

 if(leftFarReading<200 && rightFarReading<200){

 straight();

 }

 else{

 if(path[readLength]=='D'){

 digitalWrite(leftMotor1, HIGH);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, HIGH);

 digitalWrite(rightMotor2, LOW);

 delay(100);

 digitalWrite(leftMotor1, LOW);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, LOW);

 digitalWrite(rightMotor2, LOW);

 endMotion();

 }

 if(path[readLength]=='L'){

 digitalWrite(leftMotor1, HIGH);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, HIGH);

 digitalWrite(rightMotor2, LOW);

 delay(leapTime);

 turnLeft();

 }

 if(path[readLength]=='R'){

 digitalWrite(leftMotor1, HIGH);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, HIGH);

 digitalWrite(rightMotor2, LOW);

 delay(leapTime);

 turnRight();

 }

 if(path[readLength]=='S'){

 digitalWrite(leftMotor1, HIGH);

 digitalWrite(leftMotor2, LOW);

 digitalWrite(rightMotor1, HIGH);

 digitalWrite(rightMotor2, LOW);

 delay(leapTime);

 straight();

 }

 readLength++;

 }

 replay();

}

void endMotion(){

 digitalWrite(led, LOW);

 delay(500);

 digitalWrite(led, HIGH);

 delay(200);

 digitalWrite(led, LOW);

 delay(200);

 digitalWrite(led, HIGH);

 delay(500);

 endMotion();

}

