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/*From left to right, connect to D3,A1-A3 ,D10*/
#define LFSensor_0 A0 //OLD D3
#define LFSensor_1 A1
#define LFSensor_2 A2
#define LFSensor_3 A3
#define LFSensor_4 A4 //OLD D10

#define FAST_SPEED 255
#define MID_SPEED 230
#define SLOW_SPEED 150 //back speed
#define speedPinR 9 // RIGHT PWM pin connect MODEL-X ENA
#define RightMotorDirPin1 12 //Right Motor direction pin 1 to MODEL-X IN1
#define RightMotorDirPin2 11 //Right Motor direction pin 2 to MODEL-X IN2
#define speedPinL 6 // Left PWM pin connect MODEL-X ENB
#define LeftMotorDirPin1 7 //Left Motor direction pin 1 to MODEL-X IN3
#define LeftMotorDirPin2 8 //Left Motor direction pin 1 to MODEL-X IN4

/*motor control*/
void go_Advance(void) //Forward
{
    digitalWrite(RightMotorDirPin1, HIGH);
    digitalWrite(RightMotorDirPin2, LOW);
    digitalWrite(LeftMotorDirPin1, HIGH);
    digitalWrite(LeftMotorDirPin2, LOW);
    analogWrite(speedPinL, 255);
    analogWrite(speedPinR, 255);
}
void go_Left(int t=0) //Turn left
{
    digitalWrite(RightMotorDirPin1, HIGH);
    digitalWrite(RightMotorDirPin2, LOW);
    digitalWrite(LeftMotorDirPin1, LOW);
    digitalWrite(LeftMotorDirPin2, HIGH);
    analogWrite(speedPinL, 255);
    analogWrite(speedPinR, 255);
    delay(t);
}
void go_Right(int t=0) //Turn right
{
    digitalWrite(RightMotorDirPin1, LOW);
    digitalWrite(RightMotorDirPin2, HIGH);
    digitalWrite(LeftMotorDirPin1, HIGH);
    digitalWrite(LeftMotorDirPin2, LOW);
    analogWrite(speedPinL, 255);
    analogWrite(speedPinR, 255);
    delay(t);
}
void go_Back(int t=0) //Reverse
{
    digitalWrite(RightMotorDirPin1, LOW);
    digitalWrite(RightMotorDirPin2, HIGH);
    digitalWrite(LeftMotorDirPin1, LOW);
    digitalWrite(LeftMotorDirPin2, HIGH);
}

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    analogWrite(speedPinL,255);
    analogWrite(speedPinR,255);
    delay(t);
}
void stop_Stop() //Stop
{
    digitalWrite(RightMotorDirPin1, LOW);
    digitalWrite(RightMotorDirPin2,LOW);
    digitalWrite(LeftMotorDirPin1,LOW);
    digitalWrite(LeftMotorDirPin2,LOW);
}
/*set motor speed */
void set_Motorspeed(int speed_L,int speed_R)
{
    analogWrite(speedPinL,speed_L);
    analogWrite(speedPinR,speed_R);
}

void setup()
{

    pinMode(RightMotorDirPin1, OUTPUT);
    pinMode(RightMotorDirPin2, OUTPUT);
    pinMode(speedPinL, OUTPUT);

    pinMode(LeftMotorDirPin1, OUTPUT);
    pinMode(LeftMotorDirPin2, OUTPUT);
    pinMode(speedPinR, OUTPUT);
    stop_Stop();//stop move

    Serial.begin(9600); // initialize serial for debugging

}

boolean flag=false;
void loop()
{
    auto_tracking();
} //end of loop

char sensor[5];
/*read sensor value string, 1 stands for black, 0 stands for white, i.e 10000 means the first
sensor(from left) detect black line, other 4 sensors detected white ground */
String read_sensor_values()
{ int sensorvalue=32;
  sensor[0]= !digitalRead(LFSensor_0);

  sensor[1]=!digitalRead(LFSensor_1);

  sensor[2]=!digitalRead(LFSensor_2);

  sensor[3]=!digitalRead(LFSensor_3);

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sensor[4]=!digitalRead(LFSensor_4);
sensorvalue +=sensor[0]*16+sensor[1]*8+sensor[2]*4+sensor[3]*2+sensor[4];

String senstr= String(sensorvalue,BIN);
senstr=senstr.substring(1,6);

return senstr;
}

void auto_tracking(){
String sensorval= read_sensor_values();
Serial.println(sensorval);
if ( sensorval=="01111" || sensorval=="00111" || sensorval=="00011" || sensorval=="00001")
{
//The black line is in the left of the car, need left turn
go_Left(); //Turn left
set_Motorspeed(255,255);
}
if (sensorval=="01011" || sensorval=="10111" || sensorval=="10011" || sensorval=="01101" ||
sensorval=="00101")
{
go_Advance(); //Turn slight left
set_Motorspeed(0,180);
}
if ( sensorval=="11110" || sensorval=="11100" || sensorval=="11000" || sensorval=="10000")
{ //The black line is on the right of the car, need right turn
go_Right(); //Turn right
set_Motorspeed(255,255);
}
if ( sensorval=="11101" || sensorval=="11010" || sensorval=="11001" || sensorval=="10010"
|| sensorval=="10100" || sensorval=="10110")
{
go_Advance(); //Turn slight right
set_Motorspeed(180,0);
}

if(sensorval=="11011"){
go_Advance();
set_Motorspeed(180, 180);
}

if (sensorval=="11111"){
go_Back(); //The car front touch stop line, need stop
set_Motorspeed(150,150);
}
}

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