LINE FOLLOWER USING CURIOSITY NANO PIC16F15244

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***Abstract*-- In this project, a simple line follower robot was proposed using a PIC16F15244 (Curiosity Nano), which must follow a path without leaving it in the shortest possible time. Initially, different truth tables and conditions for the robot were made. Later, the schematic diagram was made to have a base of what to do. Once having this, the programming code was carried out in C language to later verify the robot operation. https://github.com/Diegollmll/LineFollower_C**

Keywords: Robot, Line Follower, C language, Programming Code, Github.

I. INTRODUCTION

The purpose of this project is to develop a simulation of a line follower that uses a PIC16F15244, a TB6612FNG driver, 3 digital sensors and 2 gear motors with the following characteristics:

- The robot's topology is differential: a motor at each end and a support wheel. In this way, if both motors advance, the robot advances, if both motors rotate in the opposite direction, the robot goes back, if one motor turns in the opposite direction to the other motor, a turn obtained on the robot's center of mass.
- The direction of rotation of the motors is carried out by means of an H bridge, with the TB6612FNG driver, which has two logic inputs for each motor to define the action of the motor: stopped, turning clockwise, turning counterclockwise. [It is suggested to read the datasheet to make its respective connection in Proteus].
- The sensor strip generates a 3-bit digital word, where 0 indicates a white reading and 1 indicates a black reading. On the strip the sensors are located in such a way that "on the line" only the sensor in the center detects the line and the ends make a reading of 0. The width of the line is normally 20 mm, and the distance between the sensors is about 20mm.
- The microcontroller has 3 digital inputs corresponding to the sensors and 7 outputs (Digital outputs and sources).

Microcontroller programming must be done in MPLABX with C language.

The robot must:

- Advance when is on the line
- Turn when moving less than 20mm from the line.
- Turn when moving more than 20mm from the line
- Stop when all sensors detect Black color

II. METHODOLOGY

The first thing that was done was to read the conditions and specifications that the line follower should have to get the following truth table with its basic combinations **Table 1.**

S0	S1	S2	Result
1	1	1	Stopped
1	X	0	Left turn
0	X	1	Left turn
0	1	0	Advance
0	0	0	Stopped

Table 1. Truth table from follower line

The advantage of this truth table is seen in the so-called "Doesn't matter." Because in this way we have a wide choice of sizes with respect to the sensors.

In the same way, it was necessary to look at the datasheet of Driver TB6612FNG to know its operation and its respective truth table, because the gearmotors are connected to this driver.

For the robot to move forward, the 2 motors rotate in the same sense, for the robot to make a turnthe, the motors should be rotating in the opposite directions at the same time and to stop the robot, the 2 motors will stop.

To achieve this correct operation, the following table of the TB6612FNG is used:

Input				Output		
IN1	IN2	PWM	STBY	OUT1	OUT2	Mode
H	H	H/L	H	L	L	Short brake
L	H	H	H	L	H	CCW
		L	H	L	L	Short brake
H	L	H	H	H	L	CW
		L	H	L	L	Short brake
L	L	H	H	OFF (High impedance)		Stop
H/L	H/L	H/L	L	OFF (High impedance)		Standby

Table 2. TB6612FNG Operation

Now having the conditions of the Line Follower Robot as of the Driver TB6612FNG, it proceeds to work on the code based on said schematic diagram.

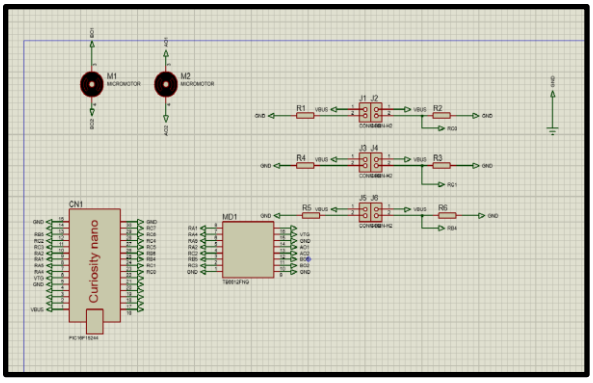
In the C code, when one of the combinations in table 1 is fulfilled, it sends an 8-bit word to the output **Fig1.**

```
void main(void)
{
    PIN_MANAGER_Initialize();
    OSCILLATOR_Initialize();
    TMR2_Initialize();
    PWM3_Initialize();


    if(RC1== 0 && RC0== 1 && RB4==0 ){



        RA5=0;
        RA2=1;
        RC2=1;
        RB5=0;
        RB7=0;
        PWM3_LoadDutyValue(dutyCycle25);
```

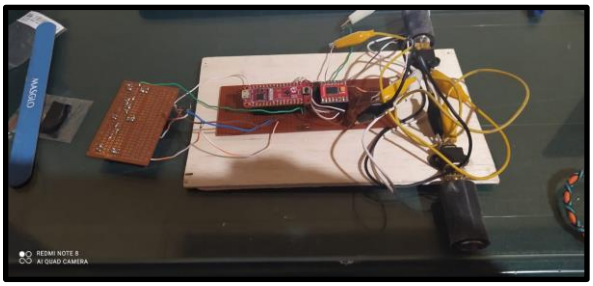
Fig1. Initialization and sensor reading.

III. RESULTS

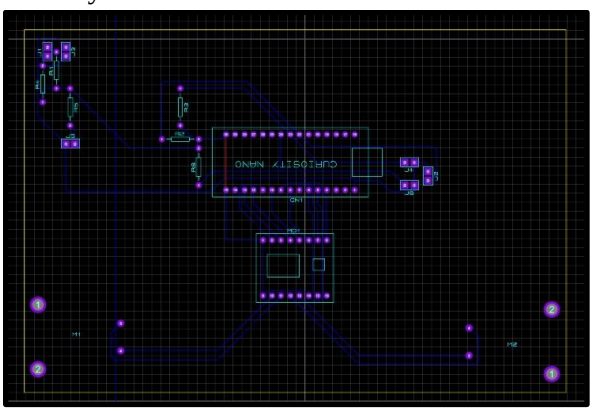
The following final circuit (Schematic) was obtained in Proteus:



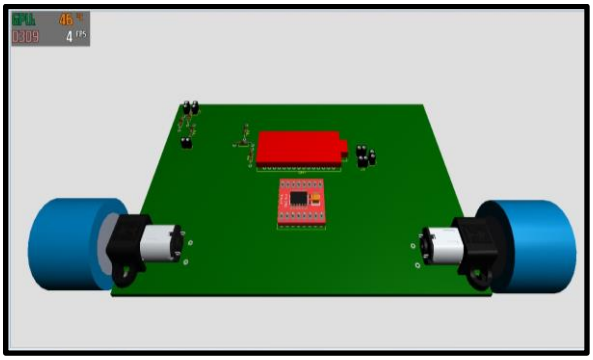
Final circuit:



PCB layout:



3D Visualizer from the PCB:



IV. CONCLUSIONS

- The tb6612fng driver is one of the most used modules for its ease of controlling DC motors and stepper motors.
- commenting during the development of the programming code will help to be more efficient and in the same way it will be known what has been done in each row of the code.
- The PIC16F15244 Curiosity Nano was an excellent microcontroller to carry out the line follower robot, there were even several pins that were not used.
- Care must be taken with lipo batteries because they are quite delicate.

V. REFERENCES

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