NSS COLLEGE OF ENGINEERING

PALAKKAD, KERALA, INDIA

SUBJECT CODE : ECT206

MICROCONTROLLER

PROJECT REPORT

GROUP 2

NAME	ROLL NO(REG.NO)
AKHILA A	21(NSS22EC021)
AKSHAYA KRISHNA R	24 (NSS22EC023)
ARUNKRISHNA P U	42 (NSS22EC042)
ARYA K J	43 (NSS22EC043)
GOWTHAM K	51 (NSS22EC052)
HAFSA Y	52 (NSS22EC053)
JISHIDHA J	57 (NSS22EC058)
KIRAN S M	65 (NSS22EC066)

CLASS: S4 ECE-A

STAFF IN CHARGE:

CONTENTS

LINE FOLLOWING ROBOT

AIM

The aim of this project is to design and implement an autonomous line following robot using an 8051 microcontroller. The robot will be capable of detecting and tracking a line often a white surface. These robots are widely used in various applications, from industrial automation to educational programming.

OBJECTIVE

The primary objective of this project was to design a robot capable of navigating predefined paths marked by black lines on a white surface. The robot utilizes a combination of sensors, actuators, and control algorithms to achieve autonomous navigation.

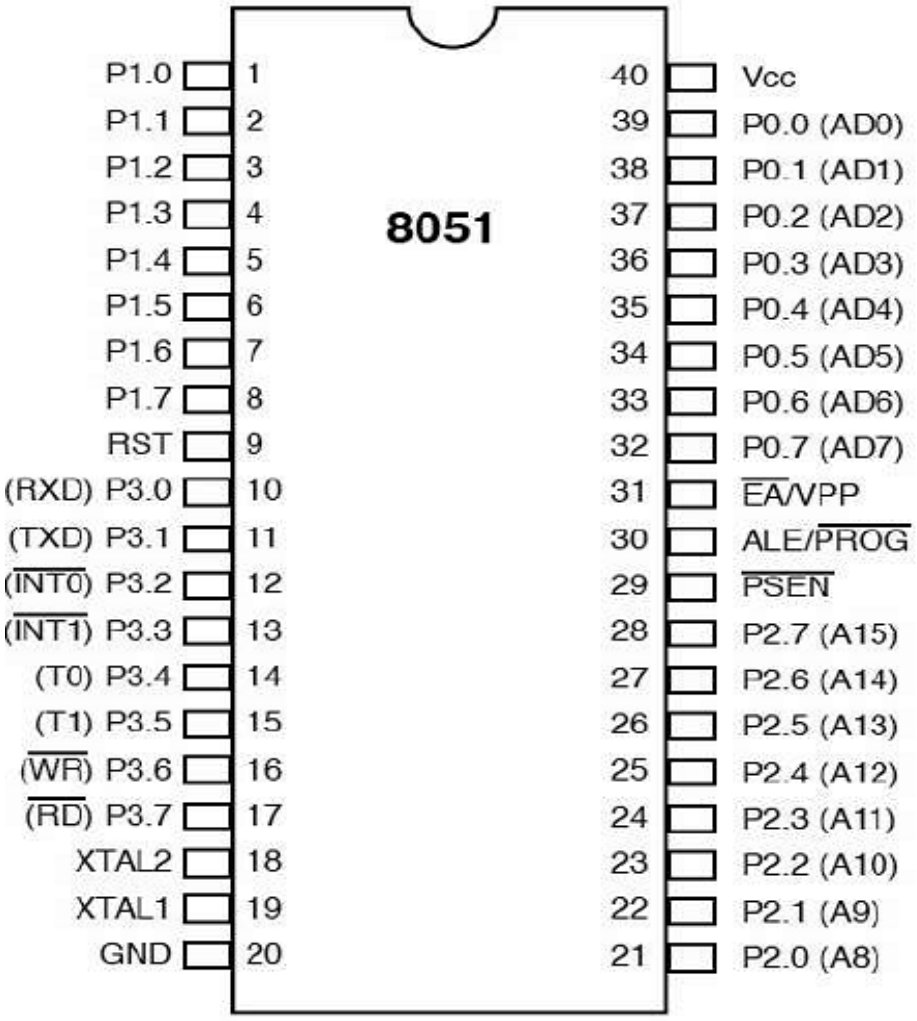
The design process involved selecting appropriate components, including motors, sensors, microcontrollers, and power systems, to ensure efficient performance. The hardware setup consists of infrared sensors for line detection, motors for propulsion, and a microcontroller for processing sensor data and executing control commands. It ensures the robot can handle curves, intersections, and other challenging track features without losing track of the line. Integrating all hardware and software components seamlessly to create a cohesive and functional line follower system.

COMPONENTS

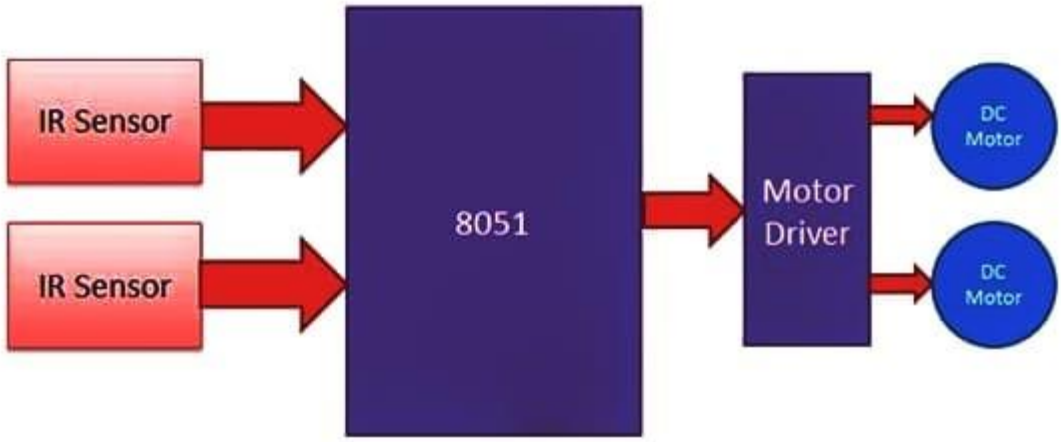
- Breadboard
- 8051 Microcontroller (AT89C51)
- 10 kΩ Resistors
- 10 μF Capacitor
- 33 pF Capacitor
- Push Button
- 11.0592 MHz Crystal
- Motor driver Module(L293D)
- IR Sensors
- DC Motors

IC 8051 Overview

The 8051 microcontroller is a popular 8-bit microcontroller architecture developed by Intel in the early 1980s. Since then, it has become one of the most widely used microcontroller families due to its versatility, simplicity, and robustness. Here's an overview of the 8051 microcontroller.



BLOCK DIAGRAM



WORKING PRINCIPLE

- ***IR sensor***: IR sensors emit infrared light, which is invisible to the human eye. These sensors can detect when infrared light hits an object and is reflected back to the sensor. In the case of a line following robot, the IR sensor would be used to detect the presence of a line, typically black, on a lighter surface.
- ***Motor driver***: A motor driver is an integrated circuit that controls the speed and direction of a motor. The motor driver in this diagram likely receives signals from the microcontroller and uses them to regulate the power going to the motor.
- ***DC motor***: The motor, powered by the motor driver, would propel the robot forward. By turning one wheel faster than the other, the robot would be able to steer itself to follow the line.
- ***Microcontroller***: The microcontroller is the brains of the robot. It reads the signal coming from the IR sensor and determines how to control the motor driver based on that signal.

PROCESS

- ***Power Up***: When the robot is powered on, the crystal starts oscillating, providing a stable clock signal to the microcontroller. The microcontroller itself begins executing the program that has been loaded into its memory.

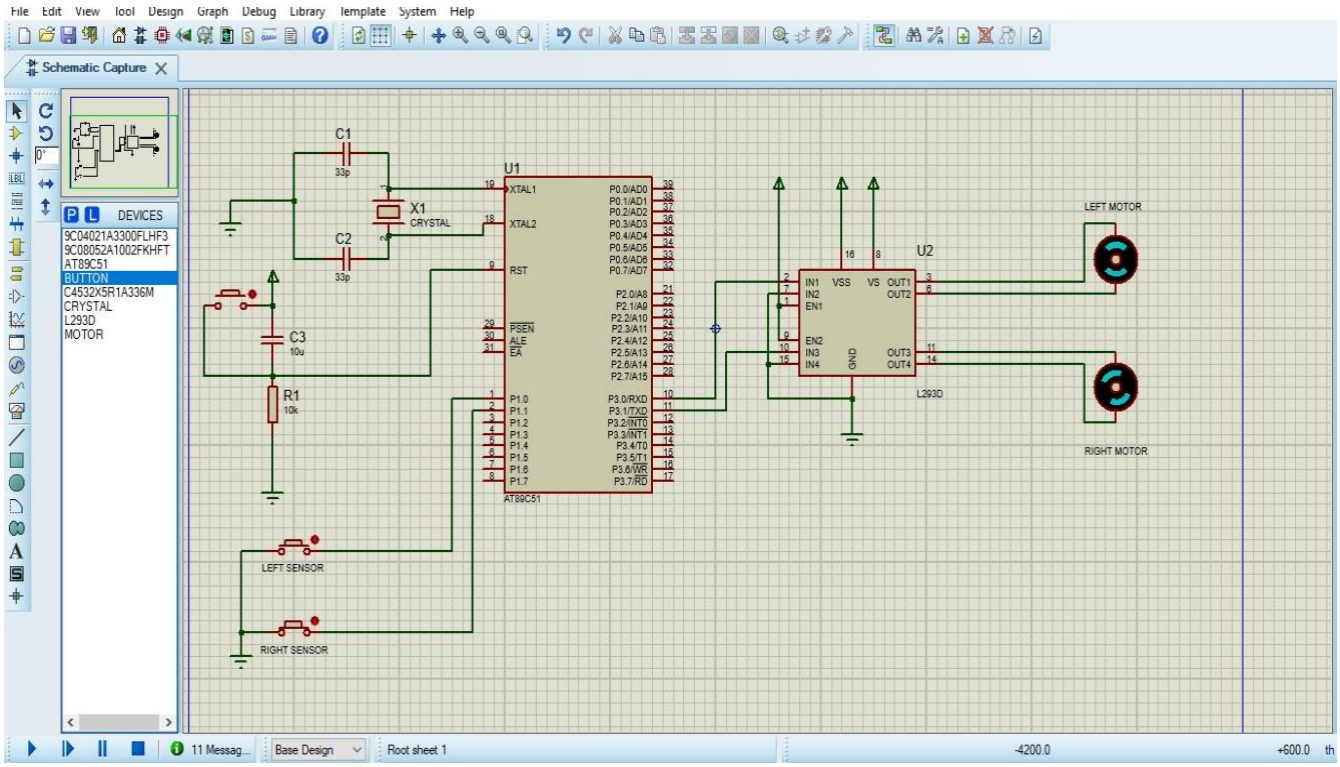
- ***Sensor Data Acquisition***: The microcontroller reads the sensor data through its input pins. This data might be a binary signal indicating the presence or absence of a line for IR sensors, a voltage level for ultrasonic sensors, or a simple on/off signal for bump sensors.

- ***Decision Making***: Based on the sensor data and the program logic, the microcontroller makes decisions about how to control the robot's movement. This may involve calculations, comparisons, and logic instructions defined in the program.

- ***Motor Driver Action***: The L293D motor driver receives these signals and translates them into appropriate control signals for the DC motors. It controls the power delivered to each motor, adjusting its speed and direction accordingly.

- ***Movement***: The DC motors respond to the control signals from the motor driver, causing the robot to move in the desired direction and at the desired speed (or stop if necessary).

CIRCUIT DIAGRAM / SIMULATION



CODE

```
// black line follower robot
#include<reg51.h>
sbit IR_left=P1^0;
sbit IR_right=P1^1;
sbit L_motor=P3^0;
sbit R_motor=P3^1;
void main()
{
 L_motor=0;
 R_motor=0;
 //IR_left=0;
 //IR_right=0;
 while(1)
 {
        if(IR_left == 1 && IR_right == 0)
        {
                L_motor=1;
                R_motor=0;
        }
        else if(IR_right == 1 && IR_left == 0)
        {
                L_motor=0;
                R_motor=1;
        }
   else if(IR_right == 0 && IR_left == 0)
   {
      L_motor=0;
                R_motor=0;
   }
        else
        {
                L_motor=1;
                R_motor=1;
                }
 }
}
```

APPLICATIONS

1.Education and Research: Line following robots are commonly used as educational tools in STEM (Science, Technology, Engineering and Mathematics).

2.Industrial Automation: It can be used in manufacturing plants for material handling, assembly line operation, and transporting goods between different stages of production.

3.Automated Guided Vehicles (AGVs): Used AGVs in various industries for material handling, transportation, and logistics applications within confined spaces like warehouses, hospitals, or factories.

4. Warehouse Management: In warehouses, these robots can be used for inventory management, picking and sorting items, and moving goods from one location to another.

5. Quality Control: They can be equipped with sensors to detect defects or inconsistencies in products on the production line, ensuring high-quality standards are maintained.

Conclusion

In conclusion, the development of our line-following robot utilizing the 8051 microcontroller has been a rewarding journey. Through meticulous design and programming, we have successfully created a versatile and efficient robot capable of autonomously navigating predefined paths. By leveraging the capabilities of the 8051 microcontroller, we have achieved precise control and responsiveness, allowing our robot to swiftly adapt to varying line patterns.

One of the key takeaways from this project is the importance of interdisciplinary collaboration. Combining knowledge from electronics, programming, and robotics, we were able to integrate sensors, resulting in a robust and reliable robot.

References

http://embedded-electronics.blogspot.in/2013/06/line-follower-robot-using-8051.html