EEE160 PROJECT

LINE-FOLLOWING ROBOT USING ESP32

Bulaybulay, Loren Mae A.

Arcasa, Chris Immanuel I.

Overview

This line-following robot is an autonomous device designed to follow a black line using infrared (IR) sensors and a PID-based control system. The robot features differential drive steering and real-time path correction capabilities.

Hardware Components

- Microcontroller: ESP32
- Sensors: Two IR sensors (left and right) for line detection
- Motors: Two DC motors with independent control
- Motor Driver: L298N
- Power Supply: Three 3.7V batteries

Core Functionality

Sensing Mechanism:

- Two IR sensors mounted at the front of the robot
- Each sensor outputs a digital signal (HIGH/LOW)
    - HIGH when detecting white or light-colored surface
    - LOW when detecting black line (or vice versa, depending on sensor type)

Motor Control Strategy:

1. Straight Line Motion
    - Both sensors on white: Both motors run at full base speed (230/255 PWM)
    - Robot moves straight ahead
2. Turn Detection and Response
    - Right sensor detects black: Right motor slows down to full stop
    - Left sensor detects black: Left motor slows down to full stop
    - Both sensors on black: Both motors stop

PID Control System

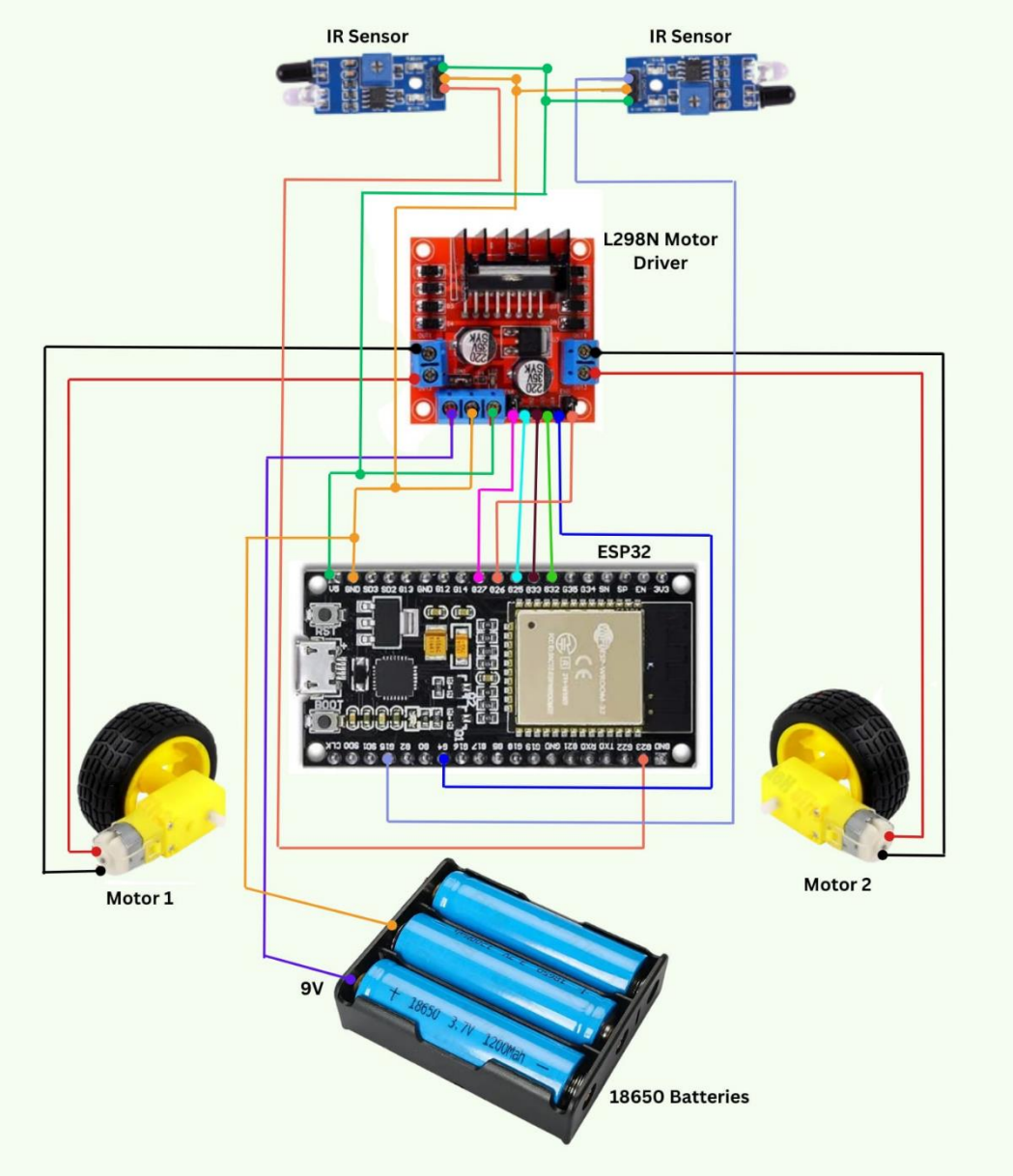
Parameters:

- Proportional Gain (Kp) = 30.0
- Integral Gain (Ki) = 2
- Derivative Gain (Kd) = 6

Function:

- Continuously monitors sensor input
- Calculates error from center line
- Adjusts motor speeds to maintain course

Circuit Diagram:



Block Diagram: