Line Follower using Lego Mindstorms Education Set

B. Mahesh, R. Nalla, S. Mahajan

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1 Introduction

A line follower is a basic robot that is programmed to follow a path. The path may usually be black on a white surface or white on a black surface. The main task in a line follower is to follow the path as closely as possible without veering off it. The path may include turns as well as intersections which make the task more challenging.

This document pertains to a black line follower. The basic body and sensors have been sourced from the Lego Mindstorms Education Set which also contains the programmable NXT brick.

2 Robot Setup

The components used are listed below -

- NXT brick

- Motor x 2

- Light Sensor x 2

3 Approach

The block diagram detailing our approach for the line follower is as follows -
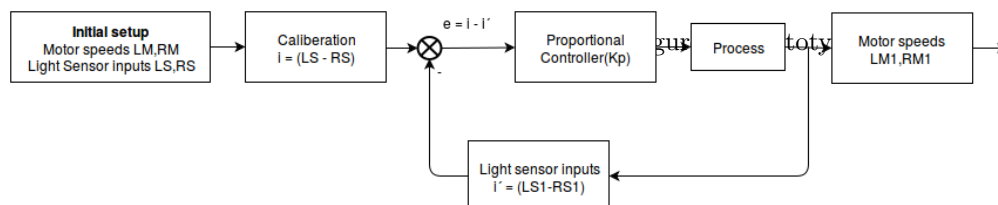

Figure 2: Block Diagram

The basic principle is to use two light sensors are pointed toward the floor so that they measure the intensity of light reflected by a small area directly below them. The sensors are positioned in such a way as to detect the white just outside the black line. The target is to keep the center of the robot on the center of the line. When either of the two sensors detects black, it implies that the robot has entered the black line on that side and must adjust it's direction to re-center with respect to the track. For e.g., if the light sensor on the right detects black, it implies that the robot has travelled to the left of the center and must move towards the right.

Since the robot uses two sensors, they may behave differently than each other even if both are pointed at the same surface. To minimise the effect of this limitation, the robot is calibrated before it begins the actual task. In this, the difference between the two sensors' readings for the intensity on the white outside the black line is measured and used to compensate for the effect in all further calculations.

4   Division of Tasks

The two major modules in the project are -

1. Core classes for the robot

2. Closed loop P controller

Accordingly, the distribution of tasks between the team members is as follows -

- Architecture design - Bhargavi, Ravali and Shweta

- Coding, Core classes - Ravali

- Coding, Controller - Bhargavi

- Integration of coding modules and documentation - Shweta