Embedded Systems Design - Mobile Robot Research Platform

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Contents

1. *Task Brief*

The task involves creating an autonomous robot that follows a black line course on a white background. There are three tracks to complete:

1. Simple loop track with left and right turns
2. Figure of 8 track
3. Crossings, tight corners and close parallel tracks

Full marks only require the first. The final two are for competition purposes only, and involve a race focusing on the fastest successful completion of the tracks.

The following is the basic function we must achieve:

Build an embedded controller that can navigate a predefined path on the floor marked as a black line on a white background.

The following are the advanced functions desired:

- Show visual indication of the robot's movements
- Show visual indication of the robot's speed
- Illuminate the track in darkness
- White lights on the front when powered
- Red brake lights on the rear for stopping or when not moving
- White lights on rear for reversing
- Yellow flashing indicators when cornering

2. *Approach*

The following section is split into various subsections after decomposing the problem.

2.1 Line Sensing

We are required to detect a black line on a white background. The width of the line is not known. There will also be a figure of 8 line, and crossings, tight corners and close parallel tracks. This section involves identifying possible methods for detecting the line, and differentiating the different junctions.

2.1.1 IR Detector

An IR (infra-red) LED and photodiode combination may be used to distinguish between black and white lines (**adafruit**).