Robotics Lab Mini-Project

ECE 3331 | Robotics Project Laboratory | Spring Semester 2025

Project Description

To better prepare you for the main project, your group will be tasked with developing software and hardware for an autonomous, line-following rover.

Project Specification

The **line-following rover** must be a fully autonomous robotic system capable of f**ollowing a metallic track, detecting** excessive **current draw**, and displaying relevant information to a **seven-segment display**.

Engineering Requirements

All rovers must adhere to the following requirements. Failure to do so will result in a zero-point automatic demonstration score.

- Operations must be conducted fully autonomously.
- Operating logic must be performed by an Artix-7 FPGA (Basys3 Board)
- Power may be supplied only by a single 9.6V battery supplied by the stockroom.

Grading

Partial credit will be given for each criteria at the discretion of the instructor.

Weighted Breakdown

Criteria	Weight
Mission Success	25%
Line Following	25%
Overcurrent Detection	25%
Seven-Segment Display	25%

Mission Success

In one demonstration, the rover must **follow a line** while displaying relevant information to the **seven-segment display**. When stopped by an external factor, the rover must **cut all power** to motors indicating an **overcurrent was detected**.

Line Following

The rover must **follow a metallic track** located on the floor of Lab 007 using i**nductive proximity sensors** provided by the stockroom. When an **intersection** is reached, the rover must **drive straight through it**.

Overcurrent Detection

The rover must utilize the **sense pins** on the **H-bridge** from the soldering tutorial to detect when more than **1A of current** is being used and then **turn off all motors**. The overcurrent system may only reset if a button is pressed, power is reset, or a time exceeding 1 second has passed.

Seven-Segment Display

The Basys Board's **seven-segment display** must be programmed to use **more than one character** at a time to display relevant information from the system. You may get creative with the design, but you must **display the status of each IPS sensor** and whether you have detected overcurrent.