LULEÅ TEKNISKA UNIVERSITET **Lab** **PM**
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E7012E Mechatronics Lab 1
Design of Line Sensor Array

Purpose

- To gain training in design and simulation of electronic circuits
- To gain training in electronic measurements
- To gain experience in using a comparator
- To gain experience of an optical transceiver
- To gain fundamental knowledge in building and customizing a line detecting sensor that would be utilized in the final course project

Preparations

Make all needed calculations, designs and simulations **before** the lab exercise. The lab supervisor will check your design and simulations.

Hints

This lab exercise will deal with the design and calibration of a line detecting sensor. Such a sensor can be utilized to measure where a line over a light background is located by using multiple sensors, depending on the width of the line to be found and the curvature characteristics. It should be note that the LM339 comparator is **not** of a push-pull design and a pull-up resistor is **needed** on the output.

Design Specifications

- Design an optical transceiver that reacts to the light intensity reflected by a surface of different color (white/black) which runs on 5V
- The sensor should have settable sensitivity
- The sensor should be a comparator based where +5V indicates that the line has been detected and 0V in case no line has been detected at a distance of 5 – 10 mm
- The sensor should have noise rejection (Hint: hysteresis)

Tasks

Task 1: Design a comparator circuit that compares the input voltage with a set voltage using the LM339 Comparator. The set voltage should be variable via a potentiometer. **Note:** Do not forget to add decoupling to the comparators voltage rails!

Task 2: Add noise rejection to Task 1. The hysteresis chosen is _____ V. Motivate why!

Task 3: Build Task 1 and Task 2. Did everything work as expected? Motivate!

Task 4: Design the light sensing sensor of the optical transceiver using the ITR20001 part. The voltages out from the sensor are: _____ V for a detected line and _____ V otherwise.

Task 5: Combine Task 1, 2, 4 to produce the finished optical transceiver and show the working system to the lab assistant.