ECE 491 Lab 8b

Velocity Sensing and Control – Hamamatsu

1. Introduction:

The purpose of this lab is to develop the velocity control system using sensing of the speed of the wheels relative to the motor chassis using quadrature encoder and a Hamamatsu sensors. However, you are welcome to use any other form of sensing to achieve velocity control, it is up to you.

2. Objective:

Your objective is to develop velocity sensor scheme that will allow you to accurately record the velocity of your car. We suggest you use the optical Hamamatsu sensor, but you can use whatever you'd like. See the suggested Fig. 1 below for velocity measuring configuration.
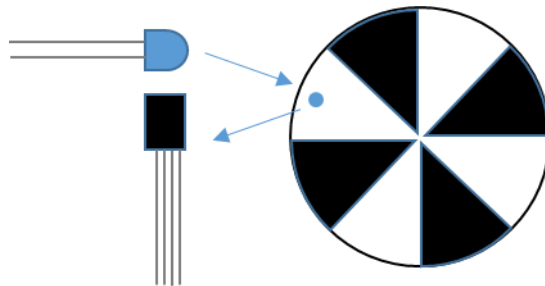

Figure 1: Suggested approach to velocity sensing using Hamamatsu.

You should connect an IR LED transmitter to the driver (cathode) output of the sensors, but test the wavelength first if you are using other than the S6809 device.
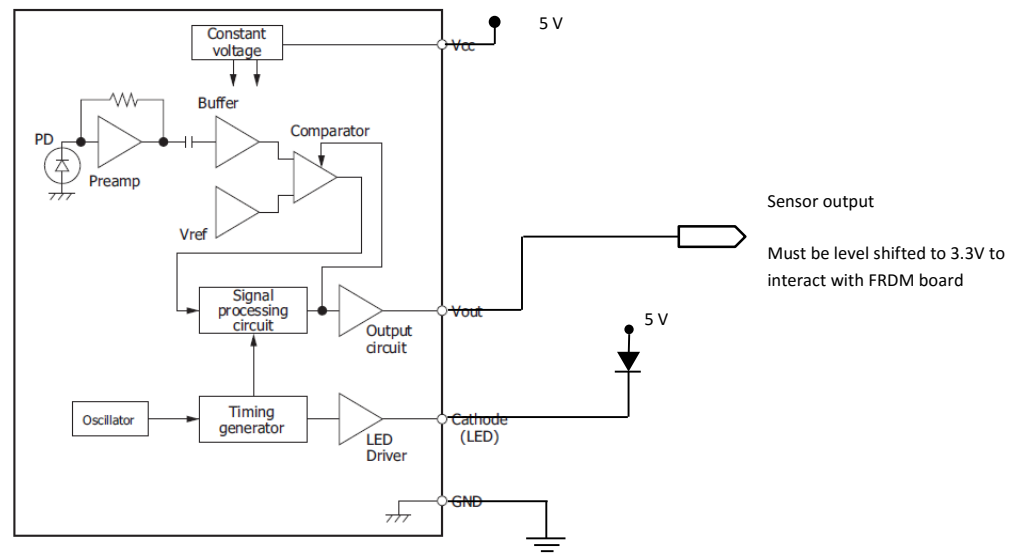
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Figure 2: Suggested connections to the Hamamatsu sensor.

The lab will consists of three components:

1. Test the Hamamatsu sensor by creating the optical bridge above and testing it on a black and white piece of paper.
2. Connect the Hamamatsu sensor to the FRDM board, and mount the sensor and encoder wheer on the wheel base. Remember to convert the output signal of the Hamamatsu to input levels of the board! Set velocity of the wheel base to some value using PWM, and show that you can read the velocity using the Hamamatsu.
3. Demonstrate close-loop velocity control by driving your car straight.

Checkout 1:

Demonstrate the functionality of the sensor using power supplies and oscilloscope or multimeter. Show drawings and calculations to TA.

Checkout 2:

Demonstrate the ability to read velocity of a rotating wheel by driving that wheel at two set speeds, and showing that your code accurately records the velocity of the wheel spinning (chassis elevated). Note that the velocity does not have to be scaled, enough to show relative velocity.

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Checkout 3:

Drive the car in straight line to demonstrate close-loop velocity control. Use the proportional control law we discussed in class.

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