

# COMP9032 Experiment 4

Oct, 2019

## 1. Objective

In this lab, you will study how to detect the speed of motor.

## 2. Description

The DC motor on the AVR Microcontroller Board is DC voltage driven. The motor is attached to a disc and the disc has four holes.

The speed of the motor is measured in revolutions per second (rps). To determine the motor speed, we use the shaft encoder. The encoder uses the infrared light emitter and detector that are each placed on the different side of the disc. When a hole of the disc is situated between the emitter and the detector, the light can pass through the hole and turn on the detector; otherwise, the light is blocked and the detector is off.

Examine the motor and shaft encoder on the AVR Microcontroller Board. Can you identify the emitter and the detector? The emitter is active high (i.e  $OpE=1$ ) and the detector is active low (namely,  $OpO$  will go low when it can see the light). For the further circuit information, please refer to the "I/O Connection Diagram" available on the References page of the course website.

Power up the AVR Microcontroller board and connect the pin named as POT (potentiometer) to the MOT pin on the lab board. As you turn the POT, the speed of the motor changes accordingly.

You can measure the motor speed by counting the number of holes the shaft encoder detects per second and the motor speed is the value divided by 4.

## 3. Task (15 marks, due week 9)

Write an AVR assembly language program that measures the speed of the motor (based on the number of holes that are detected by the shaft encoder) and displays the speed on LCD. The motor speed can be adjusted by the POT (potentiometer).

Assemble your program using AVR Studio, and run it on the AVR Microcontroller Board. Demonstrate your working program to the laboratory tutor.