COMP9032 Lab 4

Oct. 2024

1. Objective

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

2. Description

The DC motor on the AVR Microcontroller Board is DC (Direct Current) voltage driven. The motor is attached to a disc and the disc has four holes, as highlighted in the figure below.
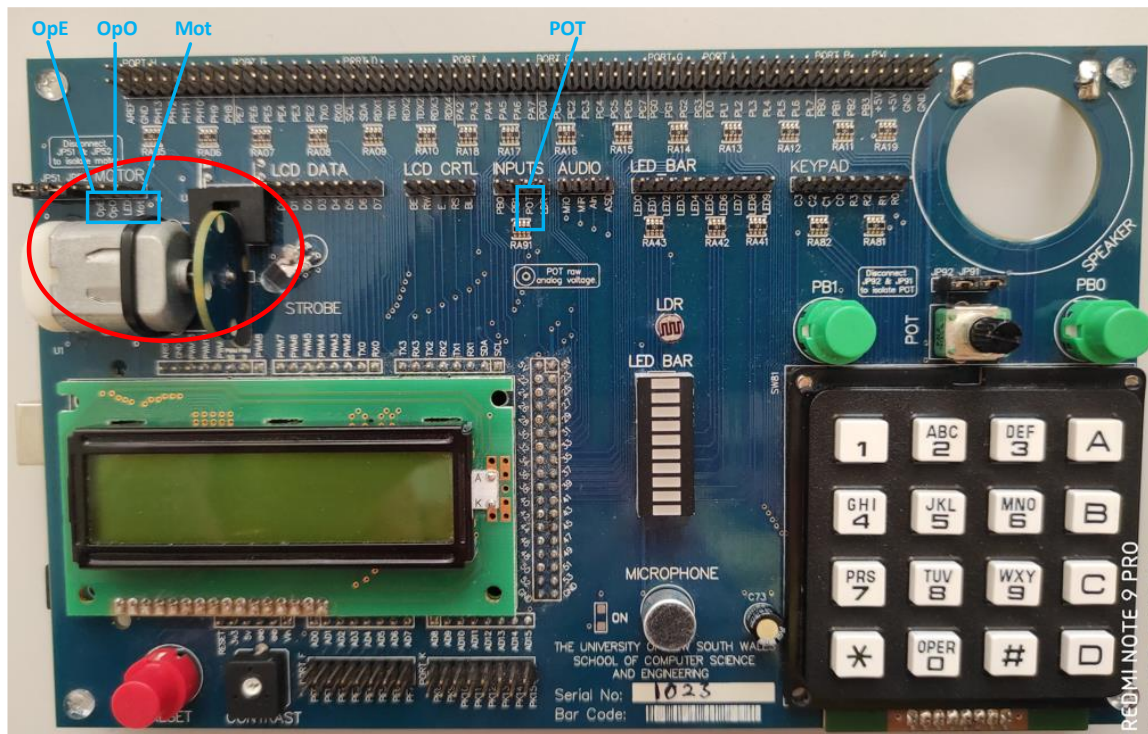

Figure: DC Motor on the Lab Board

The speed of the motor is measured in revolutions per second (rps). To determine the motor speed, we use a 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 in 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.

The emitter is active high (i.e, it emits light when **OpE=1**) and the detector is active low (i.e, **OpO** will go low when the detector can see the light). For further circuit information,

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 **POT** (output from the potentiometer) to the **Mot** pin (input to the motor) on the lab board. As you turn the potentiometer, the speed of the motor changes accordingly.

To measure the motor speed, you need to design to count the number of holes detected by the shaft encoder per second and the motor speed is this value divided by 4.

3. Task (20 marks, due **your lab session in Week 9**)

Write an AVR assembly program that measures the speed of the motor and displays the speed on the **LCD**. The motor speed can be adjusted by the **POT** (potentiometer) on the lab board.

Assemble your program using Micronchip Studio and run it on the AVR Microcontroller Board. Demonstrate your work to the lab tutor.

Assessment: The task will be accessed based on both **overall group work** and **individual presentation** during the demonstration which is split into

1) One member demonstrates your group work with the lab board.

2) Other members each explain part of your assembly code.

Your mark for this lab consists of 40% from the overall group work and 60% from your individual presentation. All participating members have the same group marks.

Note: There is wrong labelling on the board for port D. For INT0 connect to the pin labelled as RDX4 and for INT1 to RDX3. Labelling on the board is in reverse order for port D.

RDX4   RDX3   RDX2   ……………..
INT0   INT1   INT2   ……….…….