Department of Electronic and Telecommunication Engineering, University of Moratuwa

EN2532 Robot Design and Competition
Laboratory Sheet-Practical No: 1

Indexes:	210069F,210174X,210258J,210542B	Date:	07 / 10 / 2023
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1. What does PWM stand for?

Pulse Width Modulation

2. Main parameters to consider generating a PWM?

Frequency
Duty cycle
Resolution

3. Describe the importance of selecting the PWM Frequency

The PWM frequency influences the motor sound and the power transistor's switching speed. The human ear can hear 20Hz - 20000Hz range and typically frequencies above 16kHz is not audible. So, it should be selected to be greater than 16kHz. As the motor actually turns on and off at the PWM frequency, if that frequency is above the human audible range (at least above 16kHz), humming sounds generated can be reduced.

4. What will happen when we change the PWM Duty cycle?

The speed of the motor changes proportionally to the duty cycle of the PWM signal.

5. What are the two type encoders?

Relative encoders, Absolute encoders

6. Why closed loop designs are heavily used in motor controlling

Because it gives the ability to regulate the motor parameters such as motor speed, torque and direction of rotation etc. by enabling some sort of intelligence in the system to enhance the system stability.

7. List down the modules(sensors) which can be used to get following feedbacks from a DC motor
    a. Rotation speed

Encoders, Stroboscopes, Tachometers

    b. Direction of rotation

Encoders (with two outputs with phase offset)

    c. Torque

Strain-Gauge sensors

8. If the PWM frequency is 5khz and duty cycle resolution is 10bit. Sketch the PWM signal when duty cycle value is set to 511 in a specific micro controller.