

# Module-06: Speed control of DC Motor - Part B

Circuit Submission: 01-Nov-2021\*

Report Submission: 08-Nov-2021

In Module-05 you have used an open loop strategy to lower the speed of the bot as it nears the obstacles. You might have already observed that this strategy does not help you achieve complete control on the speed of the motors. Hence, in this module, you need to design feedback controllers to control the speed of the motors.

Given two 12V, 60 rpm DC motors, your task is to design two controllers to control the speed of the motor. The first controller needs to be a proportional controller and the second one a PID controller. (You are not required to use the ultra-sonic sensor in this module)

Instruction/Hints: (1) Since you are designing feedback controllers, you need to measure the speed of the motor. This information can be decoded from the encoder present in the DC motor modules you are using in TinkerCad. In practice, a speed-sensor module is used to read the speed of the motors.

(2) The reference speed value, i.e., the desired speed of the motors should be given as input by the user. Once the desired speed is specified, the designed controller need to automatically bring the motors to the desired speed.

Answer the following:

1. Draw the block diagram corresponding to each of the objectives.
2. What is the  $K_p$  value used in the designed P controller? Could the proportional controller achieve the task of controlling the speed of the motor?
3. Write down your observations when  $K_p$  value is increased and decreased. Justify your observations. Can these observations be related to the poles of the system?
4. What are  $K_p$ ,  $K_i$  and  $K_d$  values used in the designed PID controller. How did you arrive at these values?
5. Explain how did you implement differentiation and integration in your code. (Do not write down the code as your answer)

---

\*For feedback from TAs submit by 11:59 P.M. 28-Oct-2021 (Thursday)