

Task: Modeling of a Mechatronic System

To model a DC motor driven by a constant input signal that approximates a pulse-width modulated signal and look at the rotational angle at the motor output.

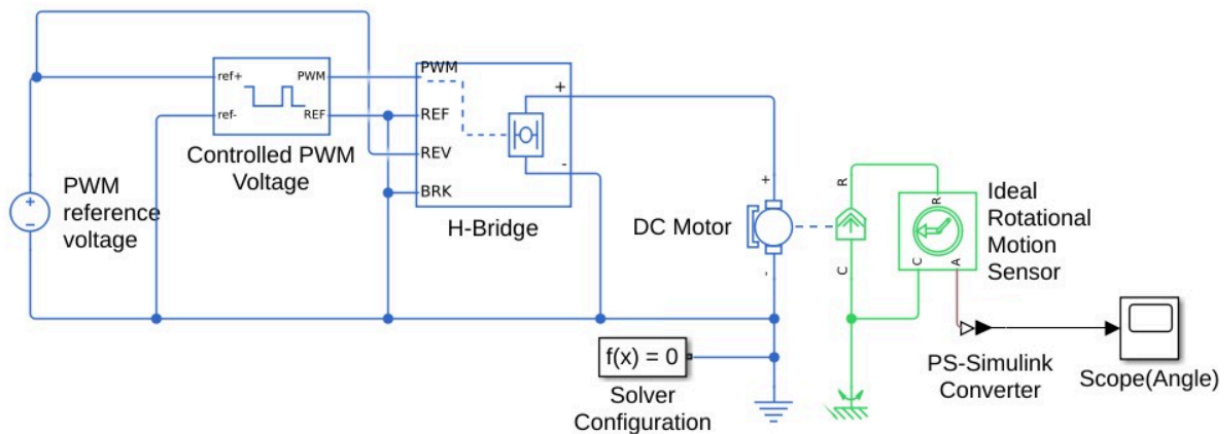
Objective of the Task

The objective of this task is to help students gain practical understanding of:

1. H Bridge motor driver working.
2. Designing of a system and flow of various components in a system.
3. Usage of Mathlab-Simulink software.

Instructions for Performing the Task

1. Only use a college domain email address to sign-in to matlab software**.
2. Create the system represented in the image.



3. Settings of Block Parameters.

Block Parameters: H-Bridge	Block Parameters: Controlled PWM Voltage																																														
H-Bridge Settings Description <table><thead><tr><th>NAME</th><th>VALUE</th></tr></thead><tbody><tr><td>Modeling option</td><td>No thermal port</td></tr><tr><td colspan="2">Simulation Mode & Load Assumptions</td></tr><tr><td>Simulation mode</td><td>Averaged</td></tr><tr><td>Load current characteristics</td><td>Smoothed</td></tr><tr><td>Power supply</td><td>Internal</td></tr><tr><td>Regenerative braking</td><td>Always enabled (suitable for linearization)</td></tr><tr><td colspan="2">Input Thresholds</td></tr><tr><td>Enable threshold voltage</td><td>2.5 V</td></tr><tr><td>PWM signal amplitude</td><td>5 V</td></tr><tr><td>Reverse threshold voltage</td><td>2.5 V</td></tr><tr><td>Braking threshold voltage</td><td>2.5 V</td></tr><tr><td colspan="2">Bridge Parameters</td></tr><tr><td>Output voltage amplitude</td><td>12 V</td></tr><tr><td>Total bridge on resistance</td><td>0.1 Ohm</td></tr><tr><td>Freewheeling diode on resistance</td><td>0.1 Ohm</td></tr></tbody></table>	NAME	VALUE	Modeling option	No thermal port	Simulation Mode & Load Assumptions		Simulation mode	Averaged	Load current characteristics	Smoothed	Power supply	Internal	Regenerative braking	Always enabled (suitable for linearization)	Input Thresholds		Enable threshold voltage	2.5 V	PWM signal amplitude	5 V	Reverse threshold voltage	2.5 V	Braking threshold voltage	2.5 V	Bridge Parameters		Output voltage amplitude	12 V	Total bridge on resistance	0.1 Ohm	Freewheeling diode on resistance	0.1 Ohm	Controlled PWM Voltage Settings Description <table><thead><tr><th>NAME</th><th>VALUE</th></tr></thead><tbody><tr><td>Modeling option</td><td>Electrical input ports</td></tr><tr><td colspan="2">PWM</td></tr><tr><td>PWM frequency</td><td>4000 Hz</td></tr><tr><td>Simulation mode</td><td>Averaged</td></tr><tr><td colspan="2">Input Scaling</td></tr><tr><td colspan="2">Output Voltage</td></tr></tbody></table>	NAME	VALUE	Modeling option	Electrical input ports	PWM		PWM frequency	4000 Hz	Simulation mode	Averaged	Input Scaling		Output Voltage	
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4. Connect the REV (Reverse) port of the H-Bridge alternately to the positive and negative terminals of the power supply to change the direction of motor rotation. Observe the clockwise and anticlockwise motion of the motor through the graphs displayed on the Scope(Angle).

Requirements for Submission

1. Submit your .slx file.
2. A PDF including screenshots of the graphs displayed on the Scope (Angle) along with comments explaining:
 - which terminal of the power supply is connected to the REV port of the H-Bridge, and
 - the corresponding direction of motion of the motor.
 - Explanation of the terminologies used in the block parameters (only the relevant ones for the simulation).

References

1. Youtube : https://youtu.be/ABk_y963GHk?si=L6Lk37Nw7V-Vey-g
2. MATHLAB : <https://in.mathworks.com/help/sps/ug/example-modeling-a-dc-motor.html>