Assignment 12: H-Bridge

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1 H-Bridge

Figure 1 showcases the labeled diagram of the H-Bridge circuit. At the top we have our power supply, Vdd, and the top two MOSFETs are P-type, while the bottom two are N-type. To make the motor spin in on direction, we turn on the top left and bottom right MOSFETs, while to reverse the direction we turn on the top right and bottom left MOSFETs, keeping the other two MOSFETs off.

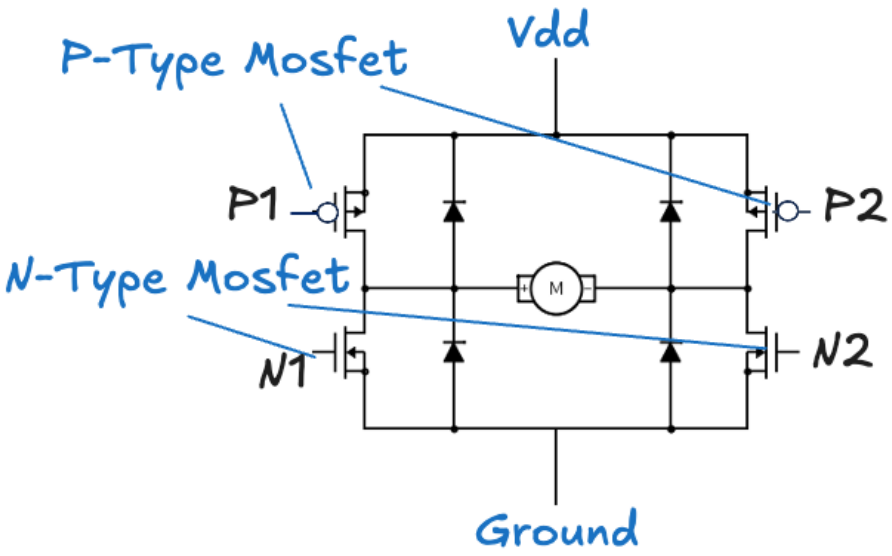

Figure 1: Labeled diagram of H-Bridge circuit

With the labeling on the diagram, the following voltages need to be applied to the MOSFET gates to turn the motor in either of the two directions.

Direction	**P1**	**P2**	**N1**	**N2**
Forward	0V - On	24V - Off	0V - Off	24V - On
Reverse	24V - Off	0V - On	24V - On	0V - Off

Table 1: MOSFET combinations for H-Bridge

The Diodes in the H-Bridge circuit are used to protect the MOSFETs from back EMF generated by the motor when it is turned on or off. This will cause the voltage to be clamped where $V_{clamp,high} = 24 + 0.7 = 24.7V$ and $V_{clamp,low} = 0 - 0.7 = -0.7V$. If the voltage tries to go above Vdd, or below ground, the diodes will turn on and clamp the voltage to the above values.

A PWM signal can be applied to the MOSFET gates to control the speed of the motor. The duty cycle of the PWM signal would keep the MOSFETs on for a certain percentage of the time, allowing the motor to spin at a certain speed. The higher the duty cycle, the faster the motor will spin as it will have more current flowing through it over time.

This speed control is open-loop, as there is no feedback from the motor itself.