Chapter 6: The Operational Amplifier

ECE 2040

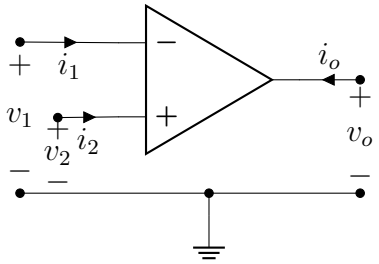

Figure 1. The Operational Amplifier, with inputs/outputs labeled.

- **Linear Op Amp:** Op-amps whose inputs/outputs satisfy the below three conditions:

$$|v_o| \leq v_{sat}$$

$$|i_o| \leq i_{sat}$$

$$\left|\frac{\mathrm{d}v_o\,(t)}{\mathrm{d}t}\right| \leq \mathrm{SR}$$

  where,

  - v_{sat} = saturation voltage
  - i_{sat} = saturation current
  - SR = slew rate limit

- **Ideal Op Amp:** A linear operational amplifier that meets the following conditions:

  1. $i_1 = 0$
  2. $i_2 = 0$
  3. $v_1 = v_2$

  Note that v_1 and v_2 are not shorted. Also, i_o is not necessarily 0 V.

Applying NVA on an Op-Amp

- Using the property $v_1 = v_2$, eliminate one of the node voltage equations
- Exploit the property $i_1 = i_2 = 0$ by using KCL at the input nodes of the op amp.
- Since $i_0 \neq 0$, do not apply KCL at this node - doing so will add an unknown.