Op-Amps

The Big Ideas:	• We've learned the circuit abstraction and ways to solve it • Op-amps enable us to abstract away circuit complexity • Ideal Op-Amp: $V_+ = V_-$ • Circuit design frequently requires tradeoffs

Introduction

Last week, we explored circuits, including different motivations to study circuits, the conventional representations associated with the study of circuits, and KVL and KCL.

This week, we talk about op-amps. Op-amps provide new functionality to circuits, introduce dependent sources, and allow modularity and abstraction in our circuit designs and diagrams. We'll still only be looking at passive components, but in other courses you may encounter capacitors/inductors, etc.

Vocabulary

In order to engage the material, be able to communicate about the topic with others, and in particular ask questions, we encourage familiarity with the following terms:

Theory

- Dependent Source
- NVCC
- Switch
- Op-Amp
- Ideal Op-Amp
- Ideal Op-Amp Paradox/Positive Feedback
- Fast
- Stable
- Uniform
- Accurate
- Bidirectional Behavior

Practice

- Buffer/Voltage Follower
- Non-Inverting Amplifier
- Charge Accumulation in an Op-Amp
- Power Rails
- `io`
  - `SensorInput.odometry`
- `le`
  - `EquationSet`
  - `Equation`

- `circ`
  - `Circuit`
  - `VSrc`
  - `Resistor`
  - `OpAmp`
  - `NodeToCurrents`
- `Spaghetti Circuit`

Check Yourself

Theory: you should understand:

- NVCC
- Op-Amps: their utility and restrictions
- Dependent sources

Practice: you should be able to:

- Solve circuit equations using NVCC
- Solve ciruit equations involving Op-Amps
- Know when to use a buffer

Resources

Theory: 6.6 of the 6.01 Course Notes is relevant to this week.

Practice: The 6.01 Software Documentation will come in handy, in particular modules `circ` and `le`.

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