

About me.

Prof. Steven R. Hall

Research interests:

- Control theory
- Control applications
 - Helicopters
 - Flexible Structures
 - Actuator Design
- Flapping flight aerodynamics

I don't have scheduled office hours; instead, I have a modified open-door policy:

- If you need help, call, e-mail, or knock
- If I can help immediately, I will, or...
- I will try to squeeze in a short appointment within 24 hours, or...
- I will schedule a firm appointment.

Teaching methods and expectations:

- When assigned, do reading before lecture
- Will use several "active learning" techniques:
 - Concept Tests
 - Turn-to-partner exercises
 - Muddiest part of lecture cards
- Extensive use of web
 - Class notes
 - muddy card responses
 - supplements

Notes on class participation:

- Most exercises (e.g., concept tests) are graded only on participation, not correctness
- Reading quizzes are graded, but count for a small part of the grade - even if you get every question wrong, you can get 83% on class participation.

What is a "signal"?

Examples of signals:

- Voltage coming out of a radio tuner
- The yoke or stick position commanded by the pilot of an aircraft
- The readout of an aircraft altimeter

A signal is a function of time (usually) that conveys useful information. E.g., the stick position is how the pilot gives an aircraft information about the desired aircraft motion.

What is a "system"?

Examples of system

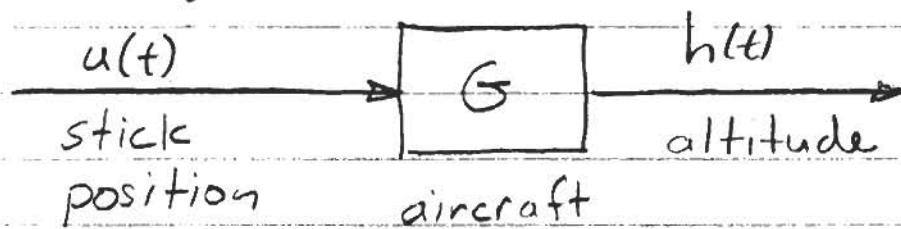
- Radio tuner
- Aircraft
- Spacecraft

A system is an object or a process that takes operates on an input signal to produce an output signal.

Example An aircraft takes the stick position commanded by the

pilot (the input signal) and produces an altitude (the output signal).
So the aircraft is a system.

Block diagram:



Over the coming year, we will have approximately 43 lectures on signals and systems:

Fall term	15 lectures	circuits
Spring term	28 lectures	generic systems

This Fall, will mostly restrict ourselves to circuits (which are systems).

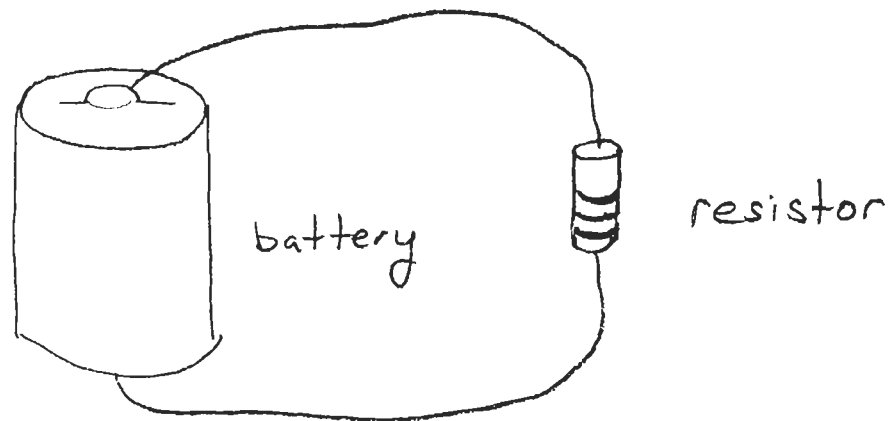
Reasons:

- ① Circuits are important in their own right
- ② Circuits are easy to model

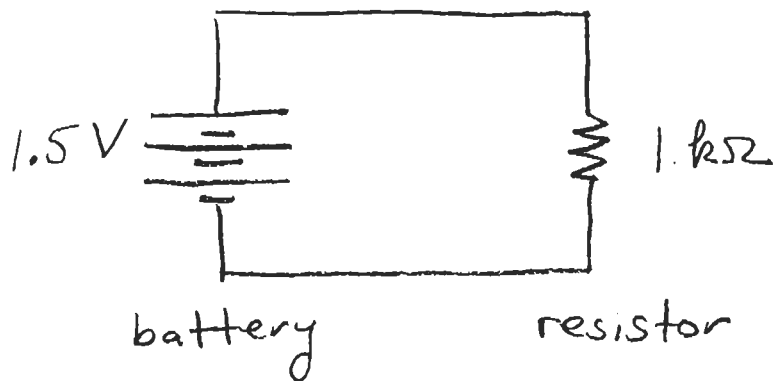
Simple Resistive Circuits

What does a simple circuit look like?

Physically:



Circuit diagram:



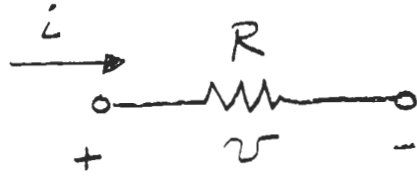
What does circuit do? Not much!

- Current flows through resistor
- Resistor heats up

"Resistance heater" (toaster, hair dryer, soldering iron)

Electrical Circuit Elements

The resistor:



Notes:

- i (current) is always drawn from + terminal to - terminal
- For a resistor, the terminal marked + is arbitrary (but i must be consistent)
- i and v can be negative numbers!

The "constitutive relation" for a resistor is

$$v = iR$$

Units:

$$v = \text{volts (V)}$$

$$i = \text{amperes (A)}$$

$$R = \text{ohms } (\Omega)$$

$$\Omega = \text{V/A}$$