

# Pedagogy

Παιδαγωγέω

The Art or Science of Teaching

# Teaching Style – The Big Picture



Immanuel Kant  
1724-1804

Teleology  
How all individual  
components fit into a  
larger system

# my Thesis

Exploring an effective way to teach  
computer engineering concepts

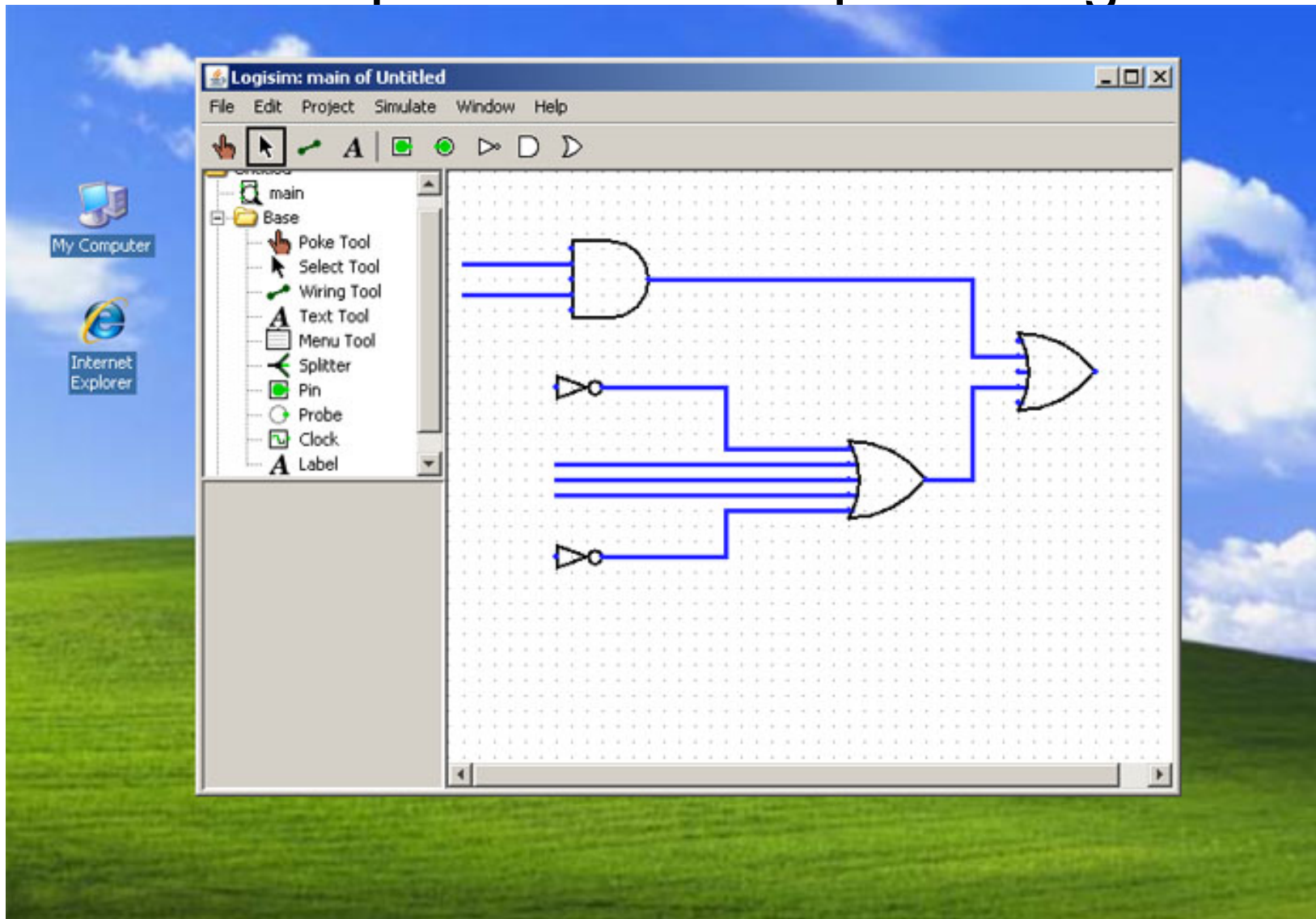
Using the Big Picture teaching style

Interactive Software

# the Project

- Interactive Software
  - Html Format
    - Explaining each subject through links
  - Java/Flash applets
    - Electronic circuit illustrations created with components on a virtual protoboard
    - Kirchoff's/other circuit equations described
    - Electronic components also explained
  - Also incorporating learning material as links from outside sources

# Interactive Software – Electronic Components – Computer Logic





# Interactive Descriptions

Howstuffworks "How Capacitors Work" - Windows Internet Explorer

http://electronics.howstuffworks.com/capacitor.html

Search HowStuffWorks and the web:

howstuffworks  
It's good to know

Electronics Solid State Electronics

PRINT EMAIL

## How Capacitors Work

by Marshall Brain and Charles W. Bryant

Inside This Article

1. Introduction to How Capacitors Work
2. Capacitor Circuit
3. Farad
4. History of the Capacitor
5. Lots More Information
6. See all Solid State Electronics articles

Solid State Components are the building blocks of today's technology. From batteries and circuit breakers to oscillators and microcontrollers, they make up the gadgets and machines that we use every day.

Related Categories:

- > Business Electronics
- > Cameras & Photography
- > Gadgets
- > Games & Gear
- > Home Audio & Video
- > Personal Audio
- > Phones
- > Trade Shows

RELATED AD CATEGORIES

- Capacitor Battery
- Capacitor Manufacturers
- Tantalum

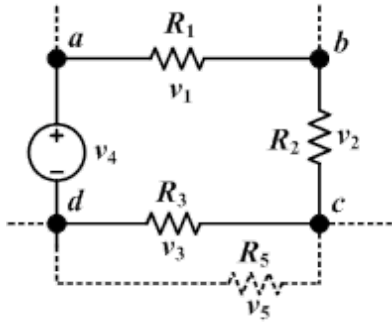
In a way, a capacitor is a little like a battery. Although they work in completely different ways, capacitors and batteries both **store electrical energy**. If you have read [How Batteries Work](#), then you know that a battery has two terminals. Inside the battery, chemical reactions produce [electrons](#) on one terminal and absorb electrons on the other terminal. A capacitor is much simpler than a battery, as it can't produce new electrons -- it only stores them.

In this article, we'll learn exactly what a capacitor is, what it does and how it's used in [electronics](#). We'll also look at the history of the capacitor and how several people helped shape its progress.

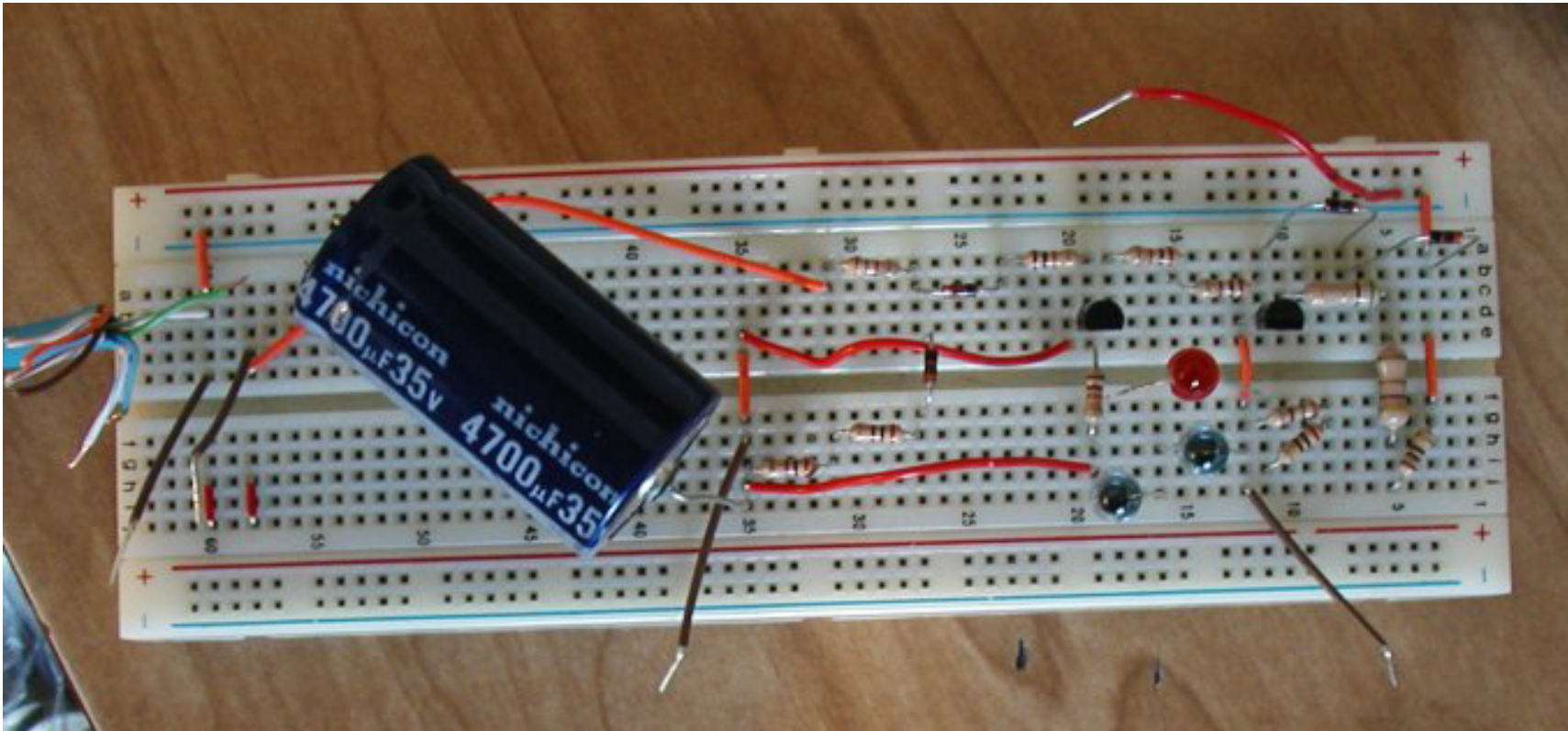
Inside the capacitor, the terminals connect to two metal **plates** separated by a **non-conducting substance**, or **dielectric**. You can easily make a capacitor from two pieces of [aluminum](#) foil and a piece of paper. It won't be a particularly good capacitor in terms of its storage capacity, but it will work.

Flash capacitor from a point.

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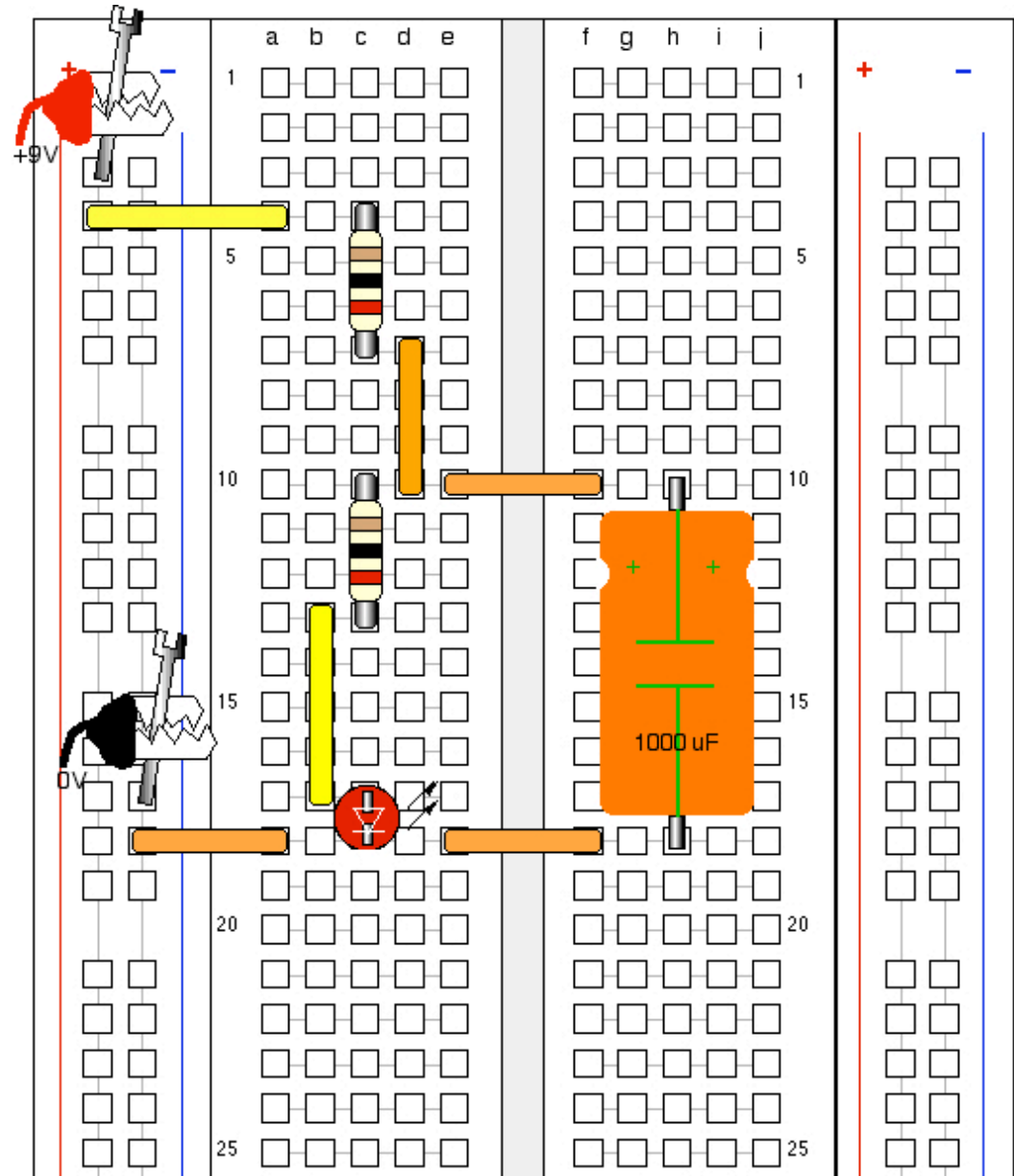
## Software protoboard project – electronic components and algebra



$$v_1 + v_2 + v_3 + v_4 = 0$$

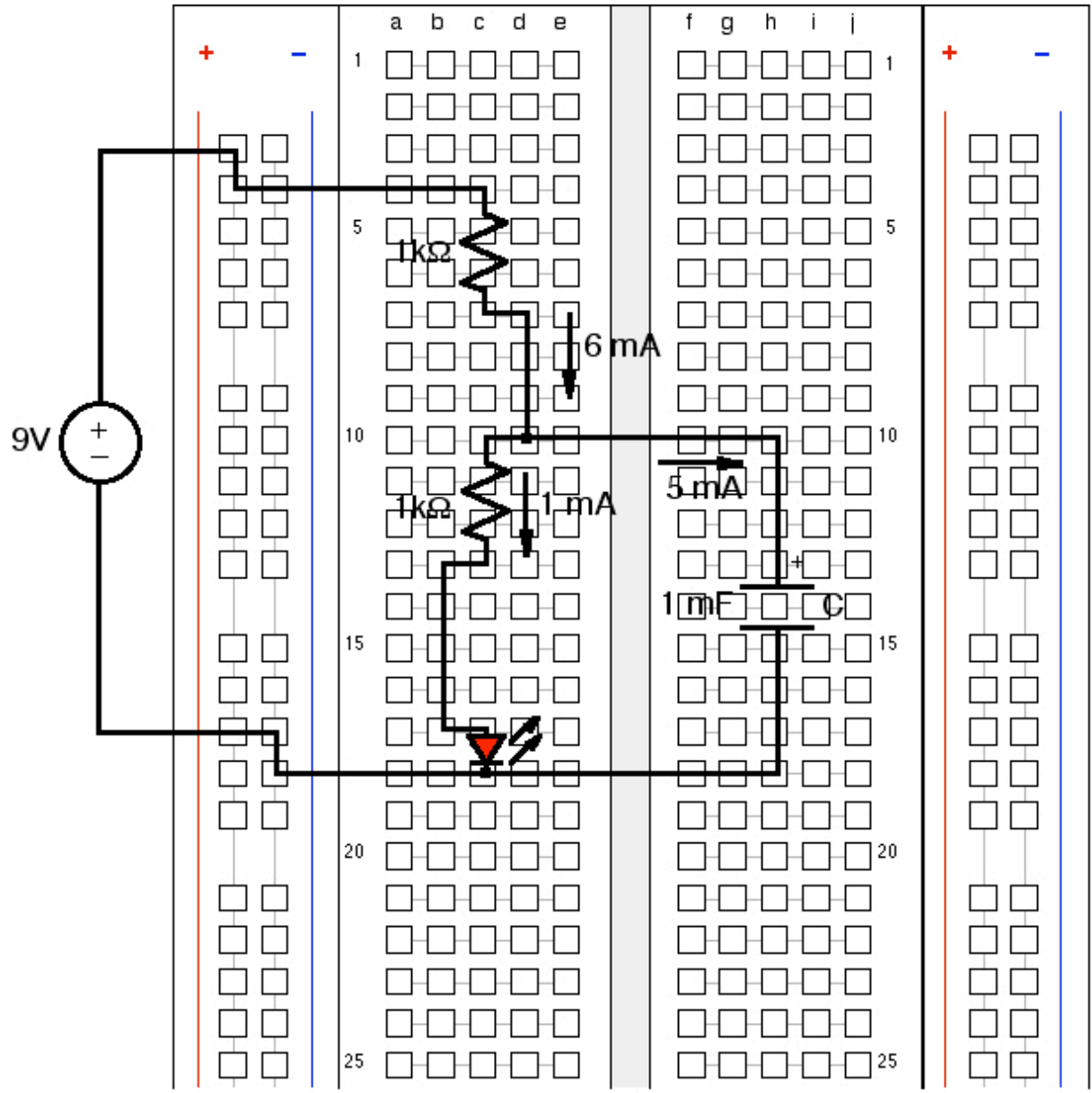
place  
components  
on protoboard  
in software

illustrates  
physical  
electronics  
project





relate the circuit to electrical schematic



# High School Outreach Program – Professor Neil Cotter

- Introduction to Analog and Digital Electronics
- Presents physical projects and Lessons
- My Interactive Software will supplement and further teach the fundamental principles of electronics via these projects

# Electronic Components and Concepts in the Software

- resistors, LED's, op-amps, switches, inductors, capacitors, transistors, LF353 OpAmp Chip, 4011 NAND Gate Chip
- voltage, power, current, Ohm's Law, Kirchoff's Laws

# Priority List of Tasks for Thesis

Below I have outlined the tasks for my thesis based on priority. The tasks in level 1 are the top priority and will be accomplished. Level 2 and particularly level 3 tasks will be completed as time permits.

## Level 1

### Graphics Layout

- Circuit board
- Electronic components in box to choose from
- Place electronic component objects on circuit board
- Ability to rotate components on board

### Learning - Interactive

- Explanation of each component
- Overview of a few projects + how the parts fit together

## Level 2

### Simulation

- Basic output waveforms at each node – voltage, current levels
- Graphic representation of short circuit/higher values than a component can handle (ie smoking/exploding component).
- Applied math variable illustrations

### Learning

- Java applets incorporated

## Level 3

### Simulation

- Basic oscilloscope simulator

### Learning

- Apply concepts to specific areas in classes

Work with high school teachers for each learning application based on their lesson plans.



# Timeline

- Weekly meetings with Professors Cotter and Zachary for duration of thesis
- March/April – preliminary thesis proposal
- August/September – setup design layout and pseudo code, components as picture objects
- October/November - finish coding and obtain all materials from other sources
- January/February/March - work through bugs, interactivity with user, incorporate material and software from outside sources
- Done by April 1 ( 1 month before graduation )

# Advisor - Professor Joe Zachary

- Will oversee my interactive software development
- Director of Educational Programs – CS
- Developed interactive learning software for our curriculum  
(ECE 1010 Intro to Unix, etc.)
- Currently teaching Introduction to Computing – using software to illustrate concepts

# What is effective teaching?

- Describe the Big Picture
- Explain the Individual Details
  - Tie the Pieces Together

# THE BIG PICTURE

$$v_1 + v_2 + v_3 + v_4 = 0$$

algebra

circuit

electronic  
components

