

# Self-Sensing and Health

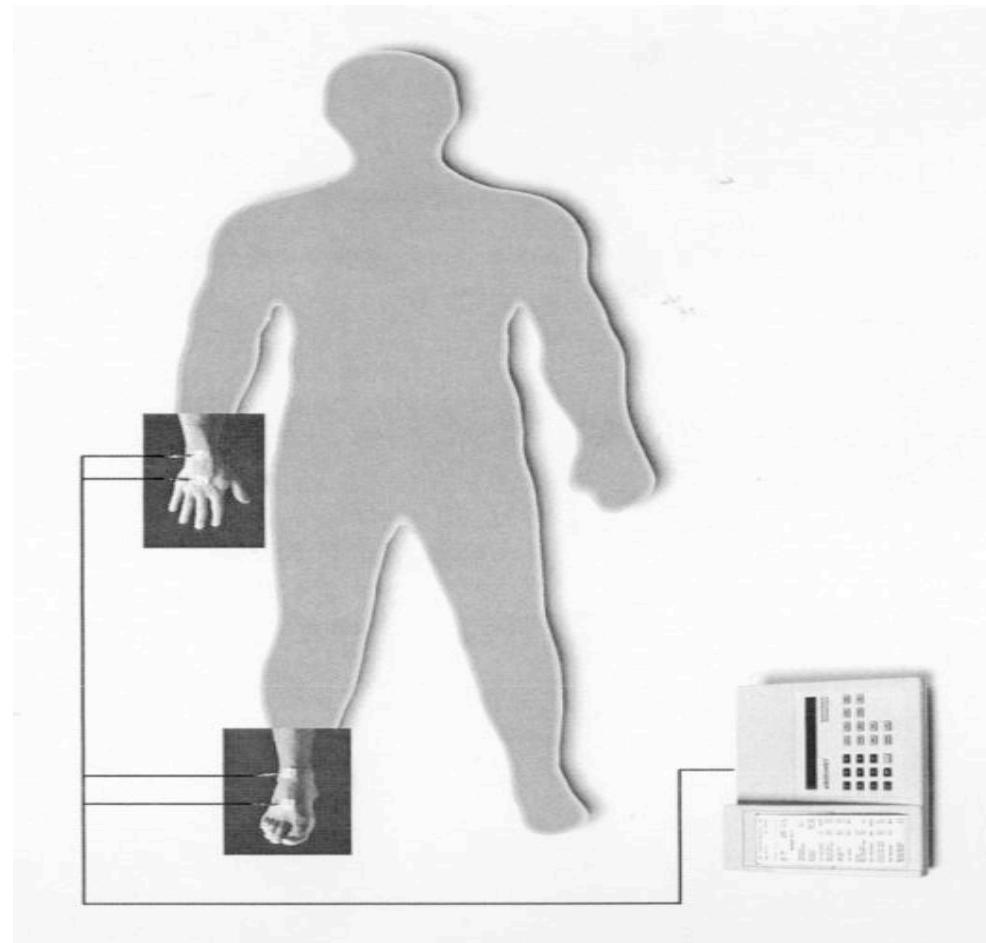
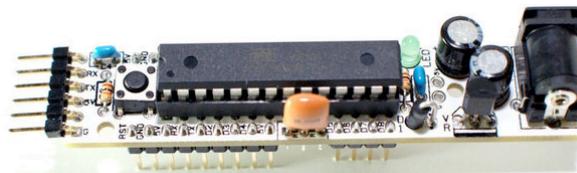
COOLER SOLUTIONS INC.

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<http://www.criticalmaking.com>



- 10AM-10:15AM: Intros, brief discussion of critical making, plans for the day
- 10:15-10:30: Discussion of interests around health, data, and sensing
- 10:30-11:00: Brief overview of potentially useful concepts (from readings):
  - 11:00-1: Making selfsensors
  - 1:00-2:00: Lunch
  - 2:00-3:00: Discussion

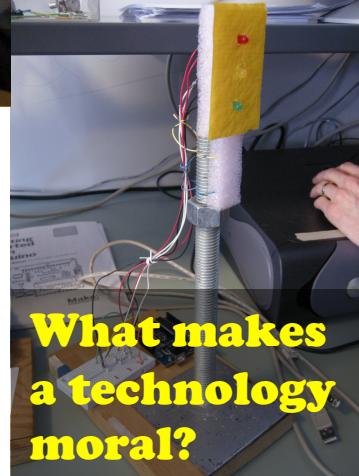


## CRITICAL MAKING

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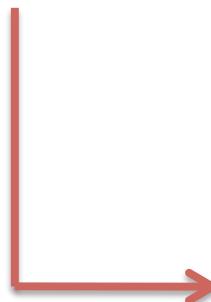
The goal of **critical making** is to reconnect two practices that are often held separate



## TECH AND TECHNIQUES

Arduino      open Source  
3D printer    design methods  
Laser cutter   prototyping  
CNC Mill     craft skills

and **making**, hands-on material work

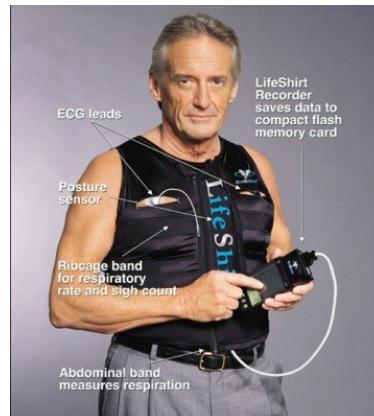
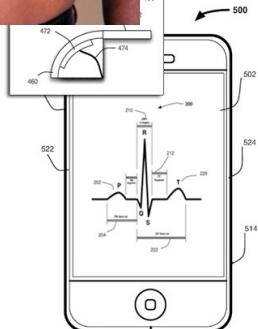
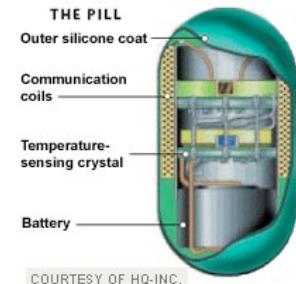
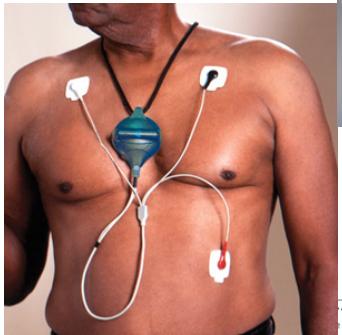
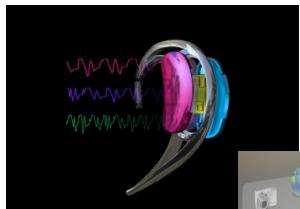


**critical thinking**, typically understood as conceptually and linguistically based



# Self-Sensing

# Examples?



# Categories/Types?

SIMULATION AND AUGMENTATION: ISSUES OF WEARABLE COMPUTERS

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Table 1. Sensor typology (from Barfield and Caudell 2001, p. 15)

Sensor type	Stimulus	Use in smart spaces
Mechanical	Position, acceleration, force, shape, mass, displacement	Detecting people's/object's position, weight, movements
Acoustic	Volume, pitch, frequency, phase, changes	Detecting sounds, interpreting speech
Biological	Heart rate, body temperature, neural activity, respiration rate	Measuring people's mood, mental state, physical state
Optical	Refraction, light wave frequency, brightness, luminance	Computer vision detection, IR motion/presence detection
Environmental	Temperature, humidity	Monitoring the conditions of the environment that people are in

Health, Work, Security, Leisure, etc (Viseu, 2003)

Empowerment or Diminishing?

# Concepts

- augmentation, 'functionality without virtuality,' pervasive (from Viseu, 2003)
- plasticity, 'profound embodiment', natural-born cyborgs (from Clark, 2007)
- self-knowledge, data-driven, personal data (from Wolf, 2010)

# Concepts – profoundly embodied

Picking up and using a stick, we feel as if we are touching the world at the end of the stick, not (usually) as if we are touching the stick with our hand...In these cases there suddenly seem to be two interfaces at play: the place where the stick meets the hand, and the place where the extended system “biological-agent+stick” meets the rest of the world...

*But insofar as they succeed at this task, the new agent-tool interface itself fades from view, and the proper picture is one of an extended or enhanced agent confronting the (wider) world. (Clark, 2007)*

# Concepts - sensing

Sensing is here depicted as the opening of a channel, with successful whole-system behavior emerging when activity in this channel is kept within a certain range. What is created is thus a kind of new, task-specific agent-world circuit. (Clark, 2007)

# Concepts – body image, body schema

...the body image is a conscious construct, able to inform thought and reasoning about the body..

The body schema is a suite of neural settings that implicitly (and non-consciously) define a body in terms of its capabilities for action, for example, by defining the extent of “near space” for action programs

I would speculate, however, that the striking conscious experiential datum of equipment (not just rakes but even cars and violins) falling transparent in use is plausibly one result, in conscious agents, of just these kinds of deeper changes: changes (that may be temporary, context-dependent, or long-term) in the body-schema itself.

# Build

- Arduino hardware and IDE (for sensor)
  - <http://www.arduino.cc>
- Processing (computer-side)
  - <http://www.processing.org>

MiniLogR™ simple ‘middle-fidelity’ prototype

- Saves data to non-volatile memory
- real-time visualization of data
- ‘plays back’ data

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“Sticky Tape” bend sensor

- Measures ‘bend’ through different pressure
- Uses changing resistance

<http://www.instructables.com/id/Stickytape-Sensors/>

# Sensor

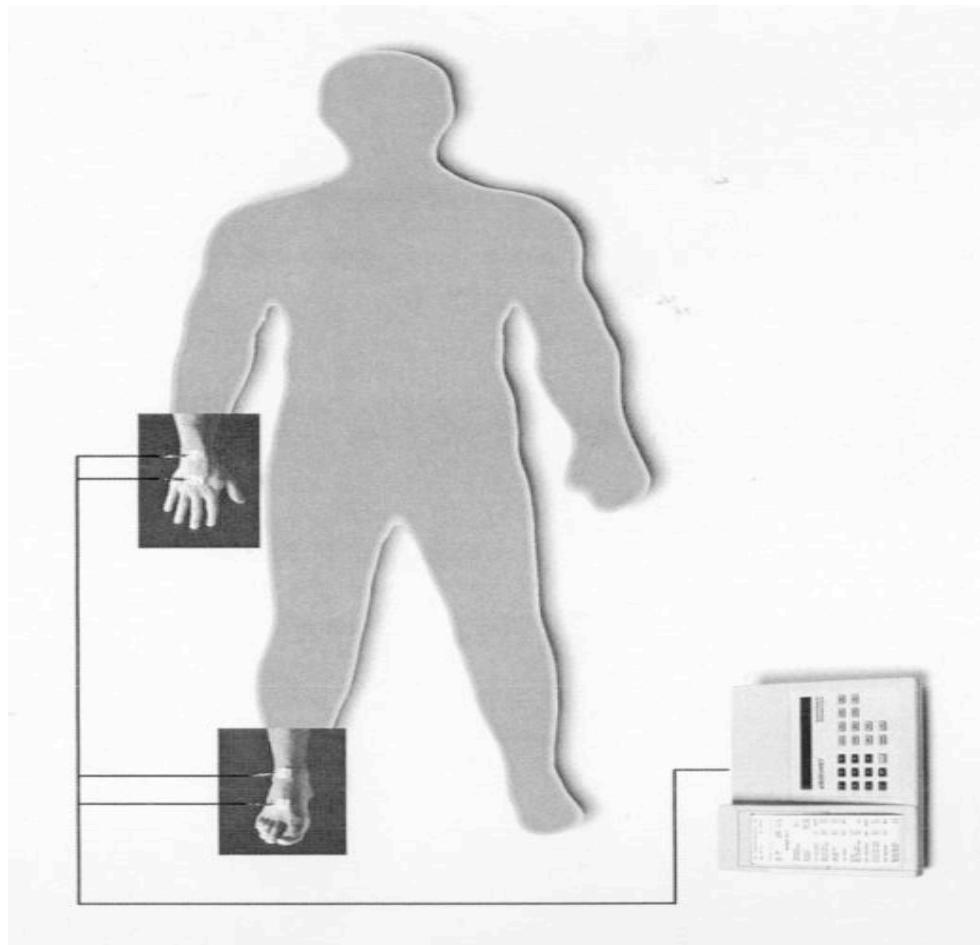
[http://www.youtube.com/watch?  
v=x7c0XmVeFV4&feature=player\\_embedded](http://www.youtube.com/watch?v=x7c0XmVeFV4&feature=player_embedded)

“Sticky Tape” bend sensor

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# Where?



# Why?

- Repetitive stress?
- Flexibility?
- Pain?
- ?

# How to Make:

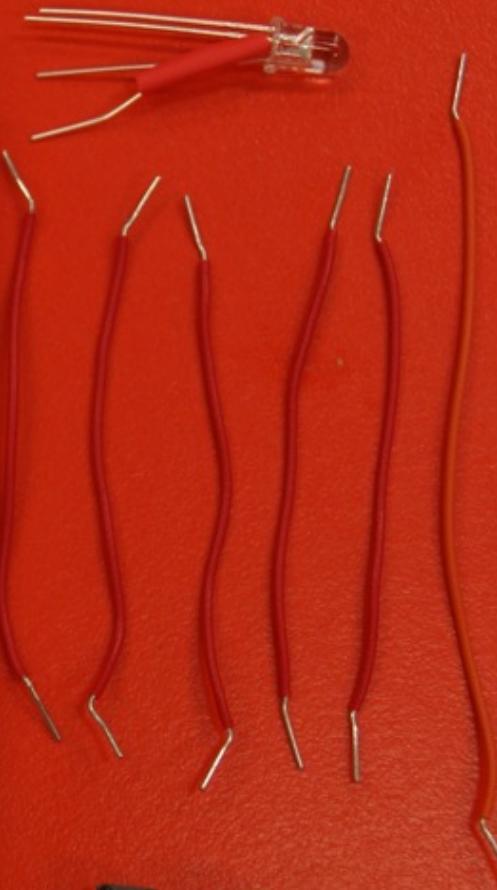
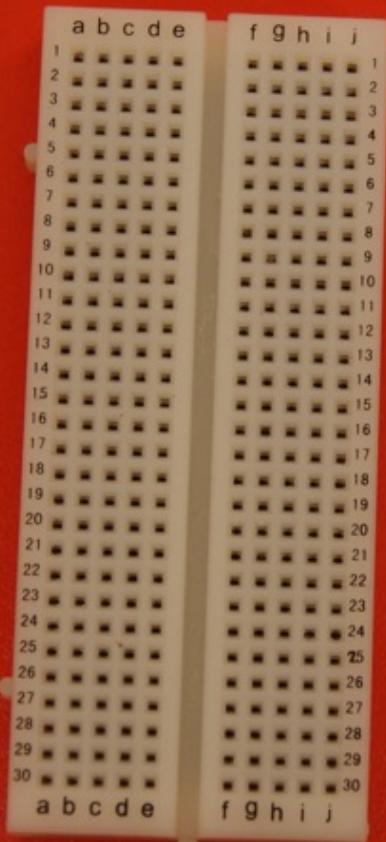
<http://www.youtube.com/watch?v=CkPekPiA-sc&NR=1>

# Build – basic concepts

- Breadboard – simple way to make and test circuits
- Arduino microcontroller– acts as analog-digital converter
- Processing – visualization of serial data

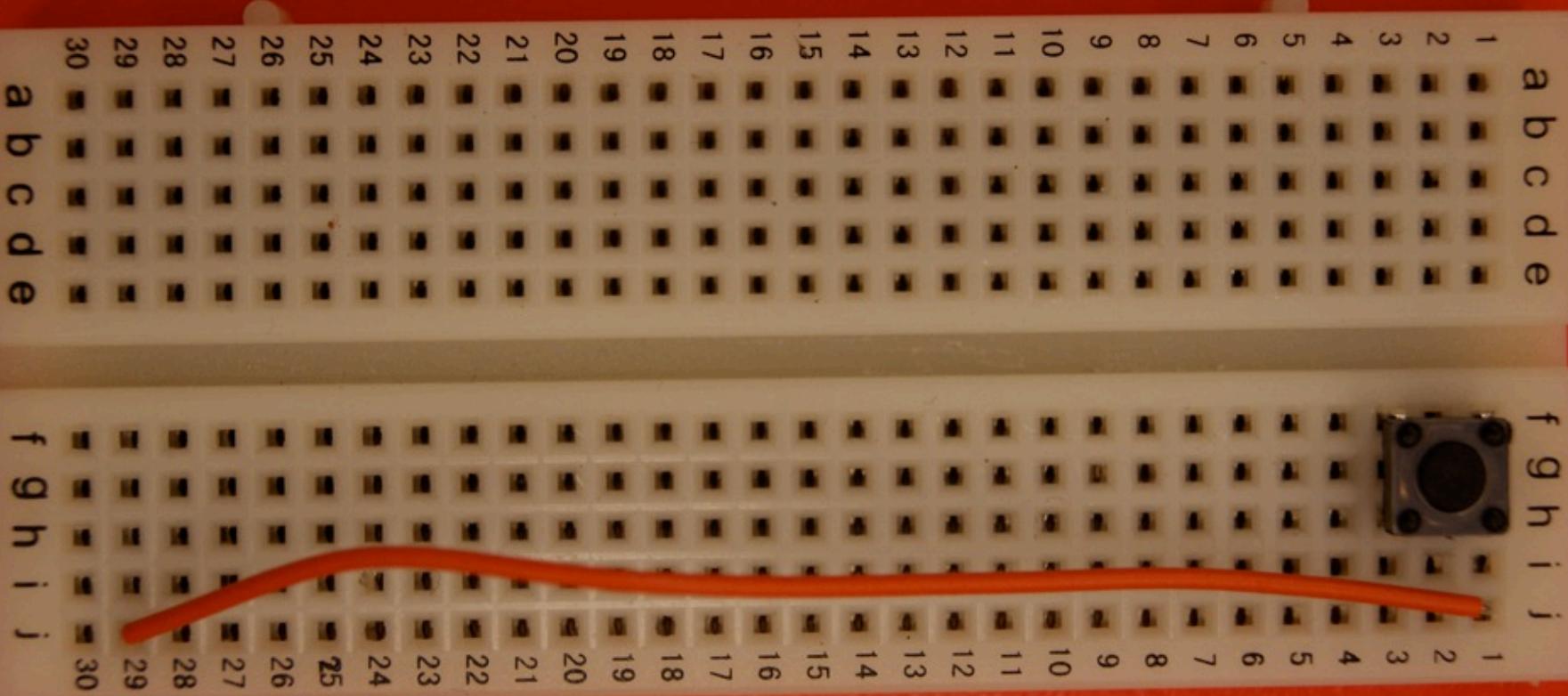
For more detailed tutorials:

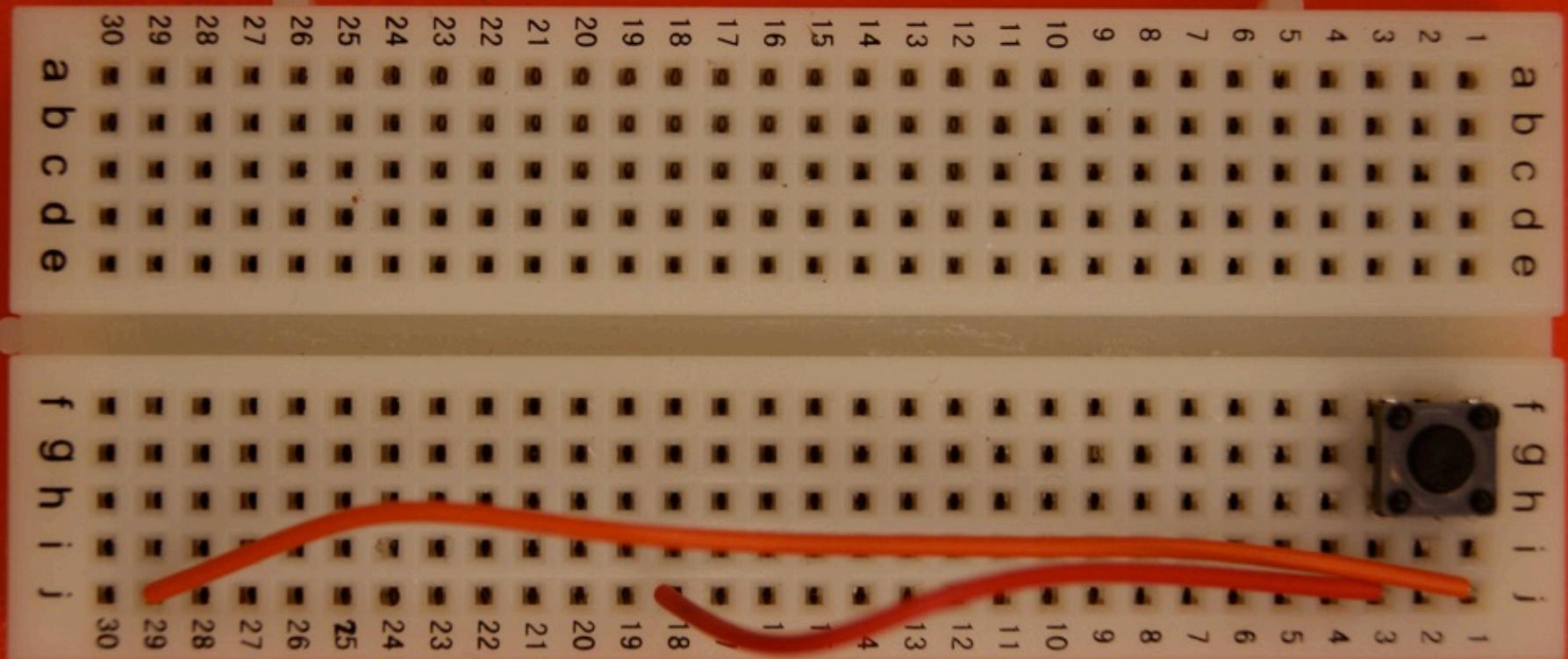
- <http://www.ladyada.net/learn/arduino/>

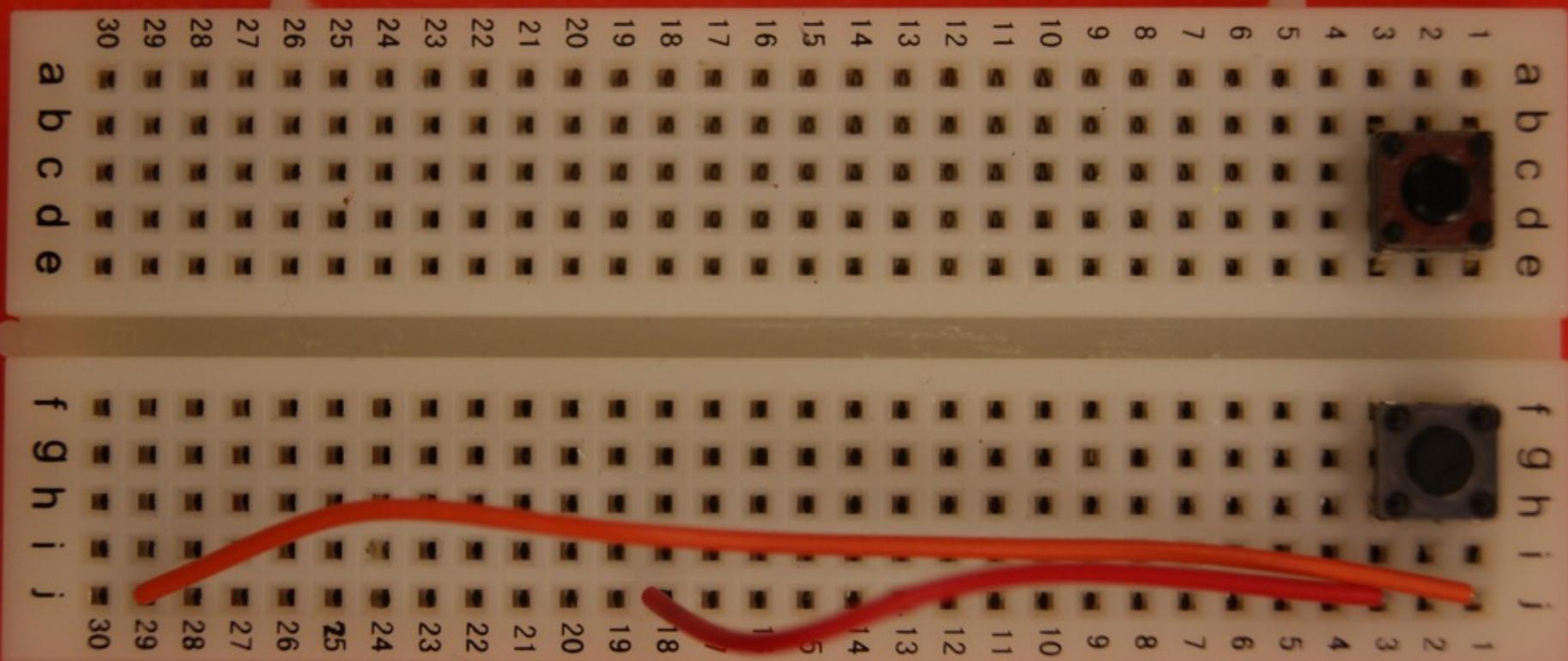


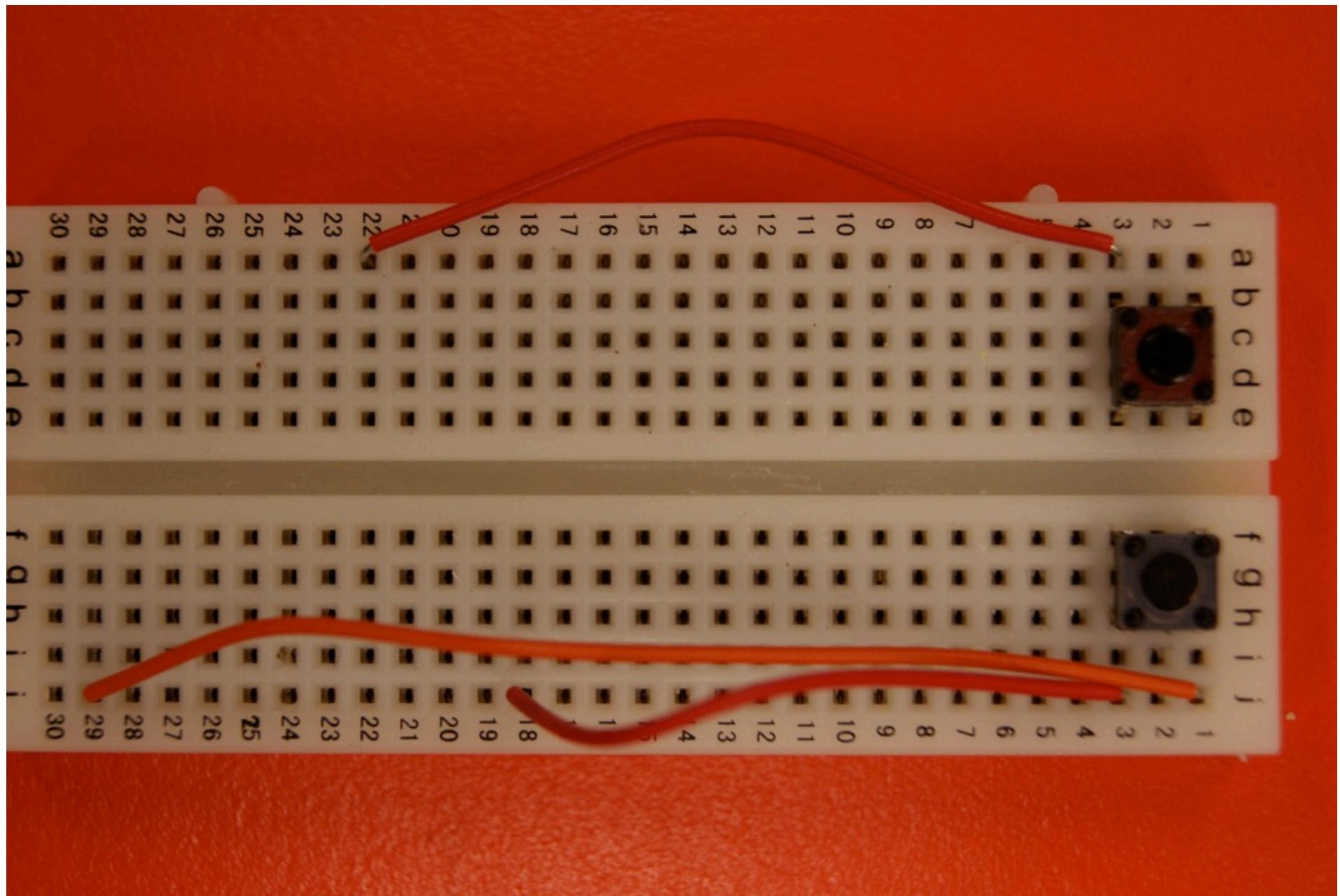
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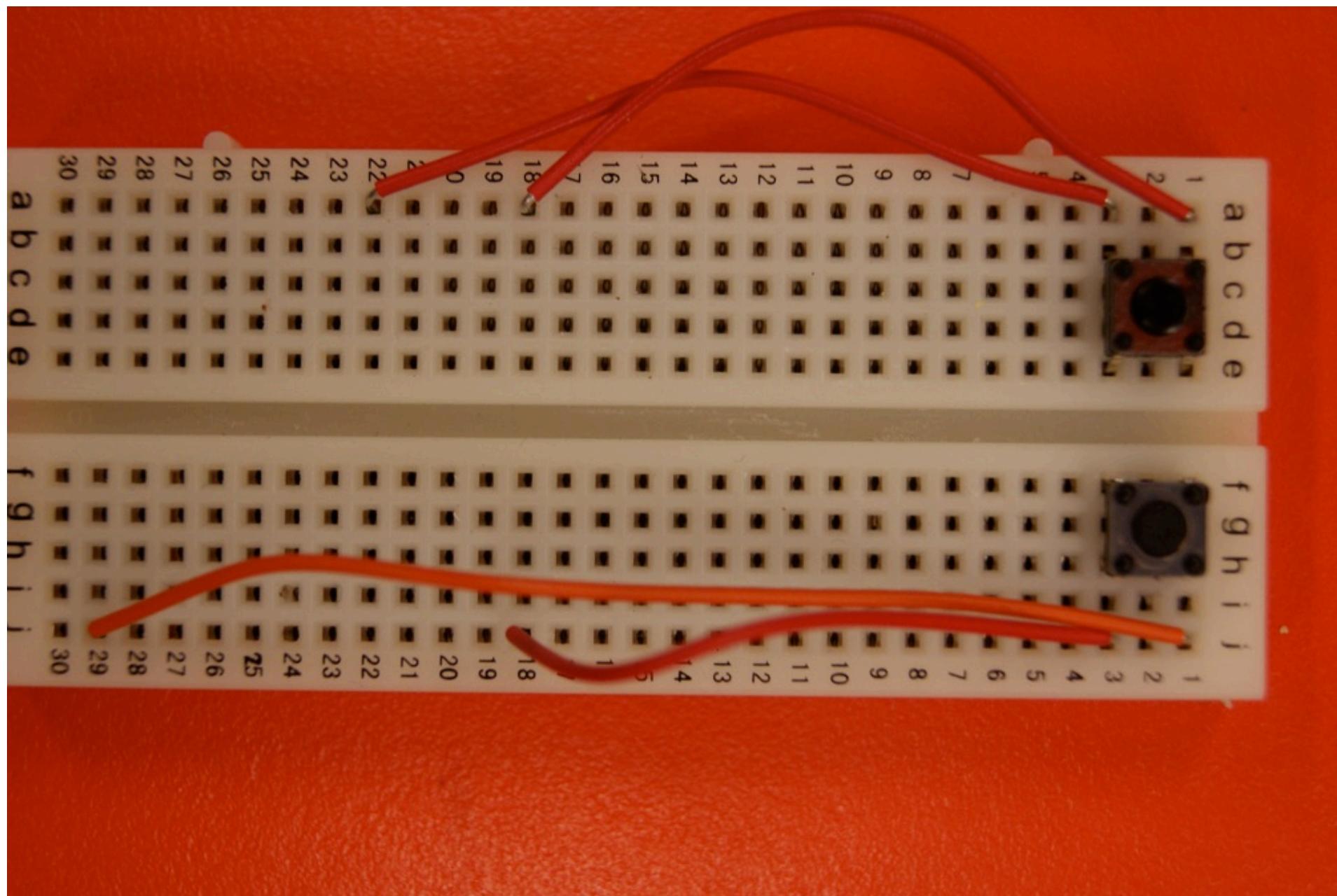
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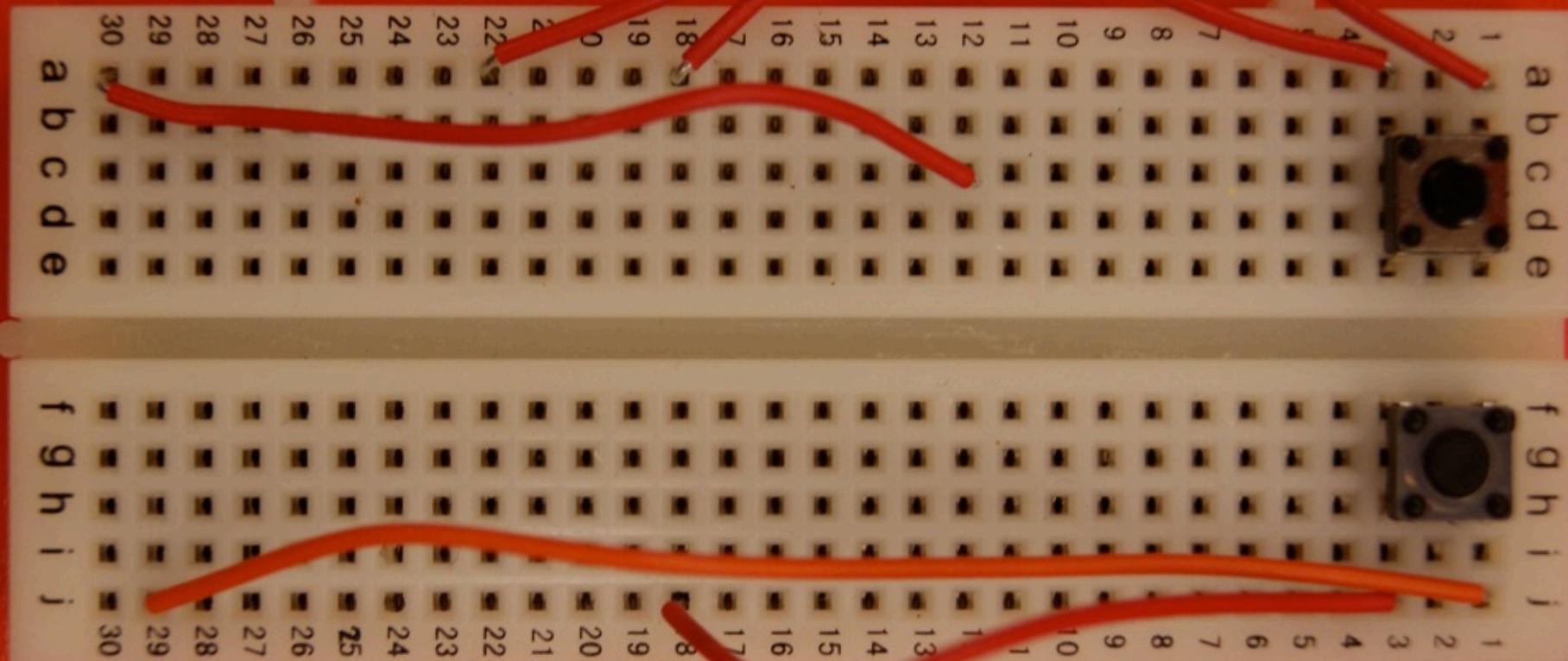


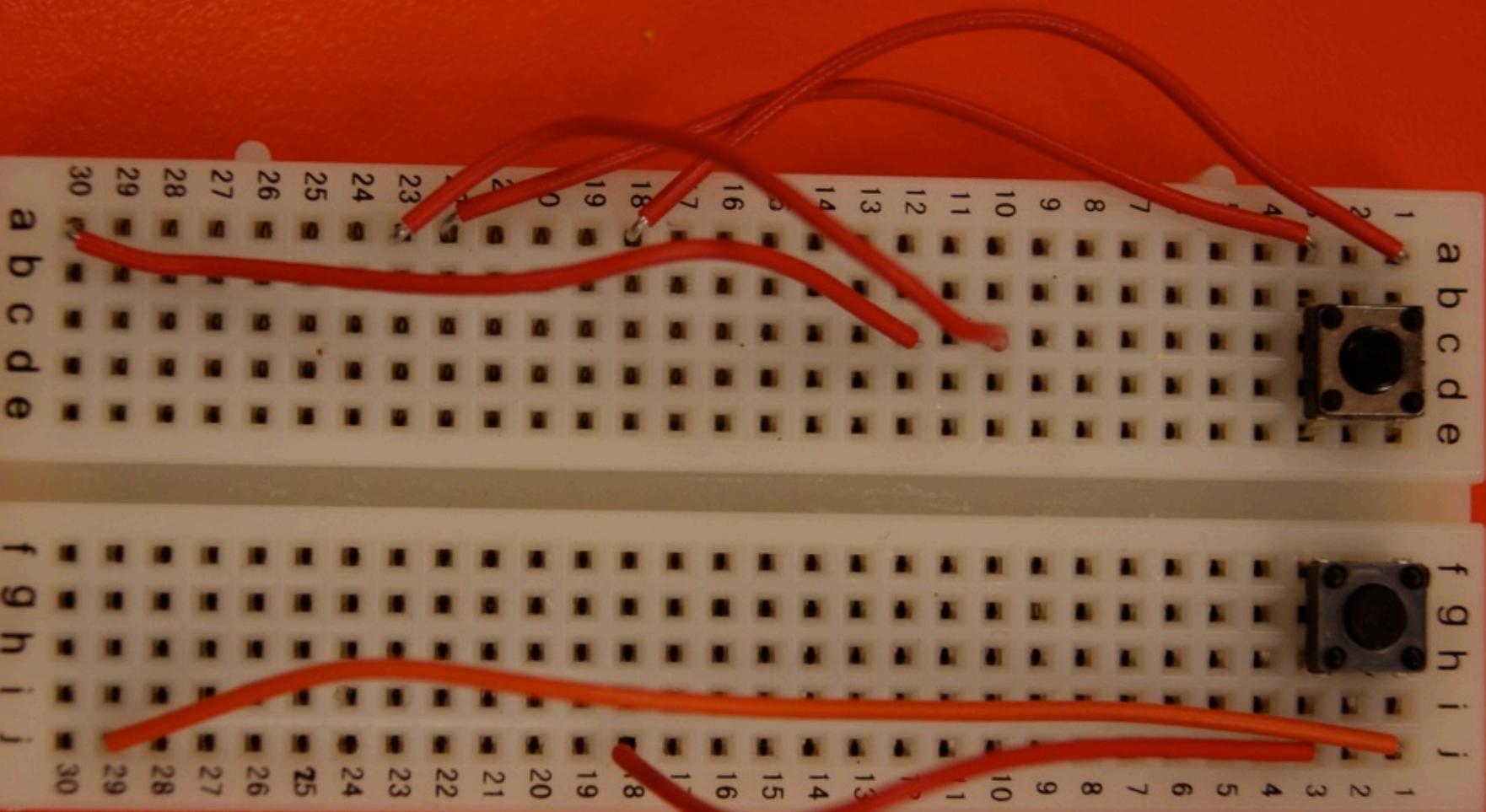


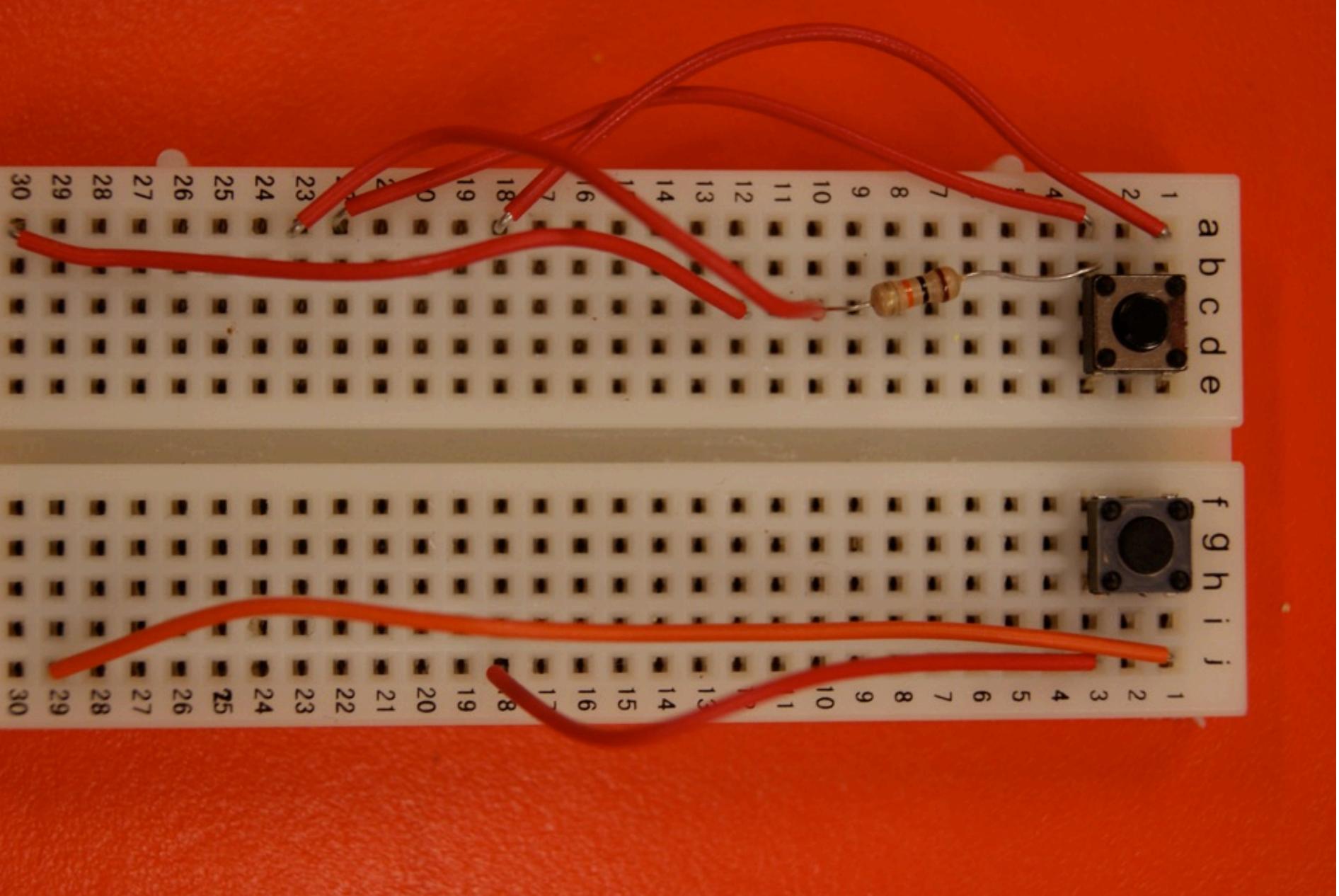


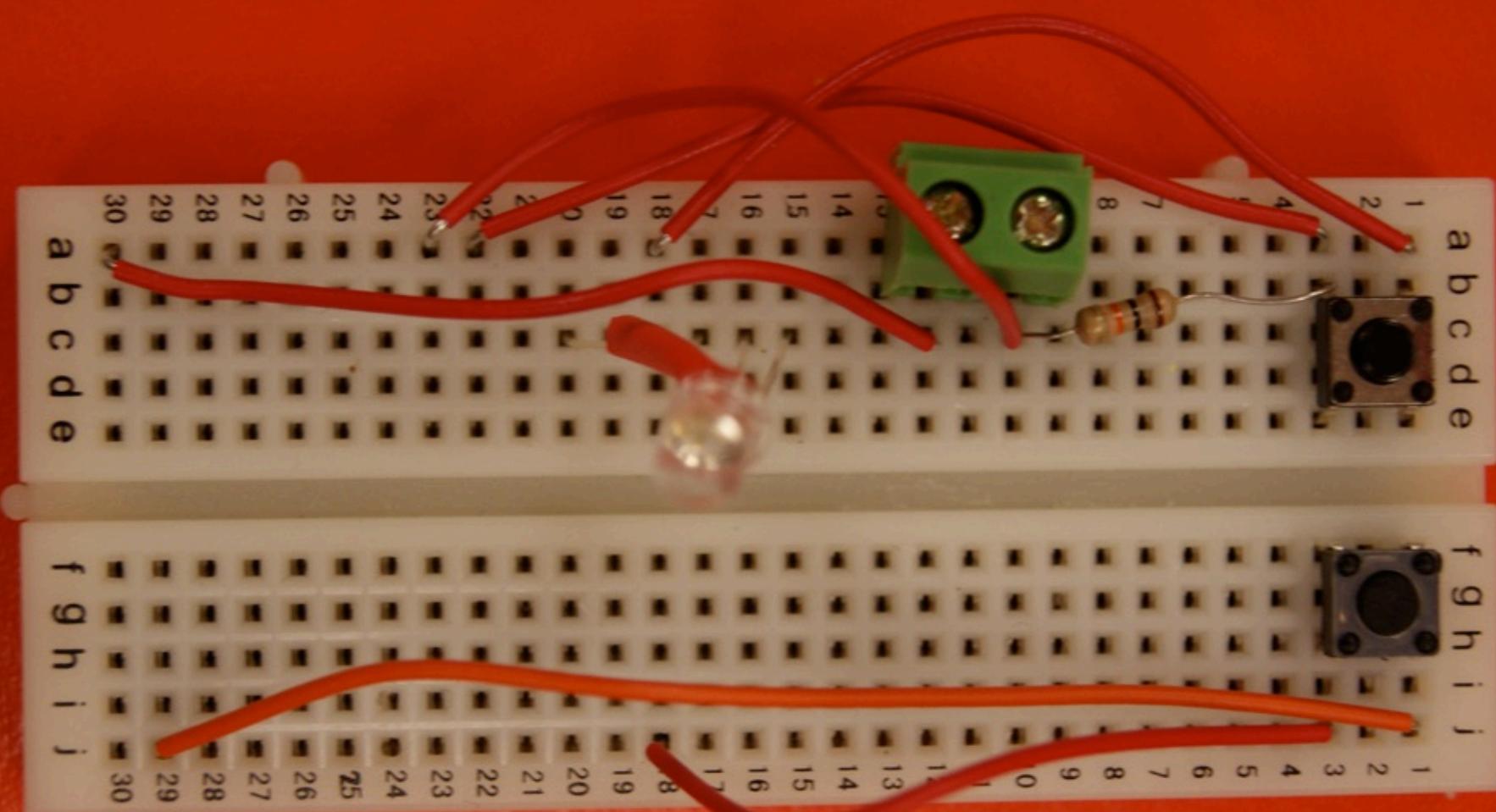












# Test Arduino

- Check software to hardware connection
- Demonstrate coding process
- Iterative design

```
/* MiniLogR -  
 * cheap and easy data logger, with record, play, and clear functions  
 * Saves to non-volatile EEPROM memory and maintains memory  
 when reset or turned off  
 * Edit eepromMem to set amount of available eeprom  
 * Edit timing to set how often data is recorded - higher numbers = less  
 freq.
```

The circuit:

- \* button connected between digital pin 12 and ground
- \* button connected between digital pin 5 and ground
- \* RGB LED (common ground) connected to ground and
- \* RED to digital pin 11, GREEN to digital pin 10, BLUE to digital pin 9
- \* Uses PWM for output control so no resistors needed
- \* analog sensor connected to analog pin 0, 5V, and ground through  
10K resistor

\*\*\*\*\*Button behavior\*\*\*\*\*

- \* From 'ready' state (green LED), press 'record' to save data to eeprom  
(blinking red)
- \* From 'record' state, press 'record' to return to ready
- \* From 'ready' state, press 'play' to go to play or clear mode (blue LED)
- \* From 'play or clear state', press 'play' again to send data to serial port
- \* From 'play or clear state', press 'record' to go to 'ready to clear' state  
(white LED)
- \* From 'ready to clear' state, press 'record' to clear EEPROM, press  
'play' to return to ready without clearing

\*\*\*\*\*

- \*
- \* created by Matt Ratto
- \* last modified July 12, 2010
- \* for use in Self Sensor, critical making experience
- \* Critical Making lab - <http://www.criticalmaking.com>
- \*
- \*/

```
// -----USER CHANGE VARIABLES BELOW-----  
const int eepromMem = 1024; //set depending on 168 (512) or 328 (1024)  
  
int timing=500; //use to set how often data is saved - approx. timing  
numbers here  
  
//-----END SECTION-----
```

# Strap it!

- Planned uses
- Unplanned uses
- Hacks
- Users
- System.infrastructure

# Brainstorm/Storyboard/Bodystorm