

Design Tools

MICHAEL BERNSTEIN

CS 376

Design tools should...

[Hartmann, PhD thesis '09]

- Decrease UI construction time
- Isolate designers from implementation details
- Enable designers to explore an interface technology previously reserved to engineers or other technology experts

Goal: facilitate rapid iteration

[Hartmann, PhD thesis '09]

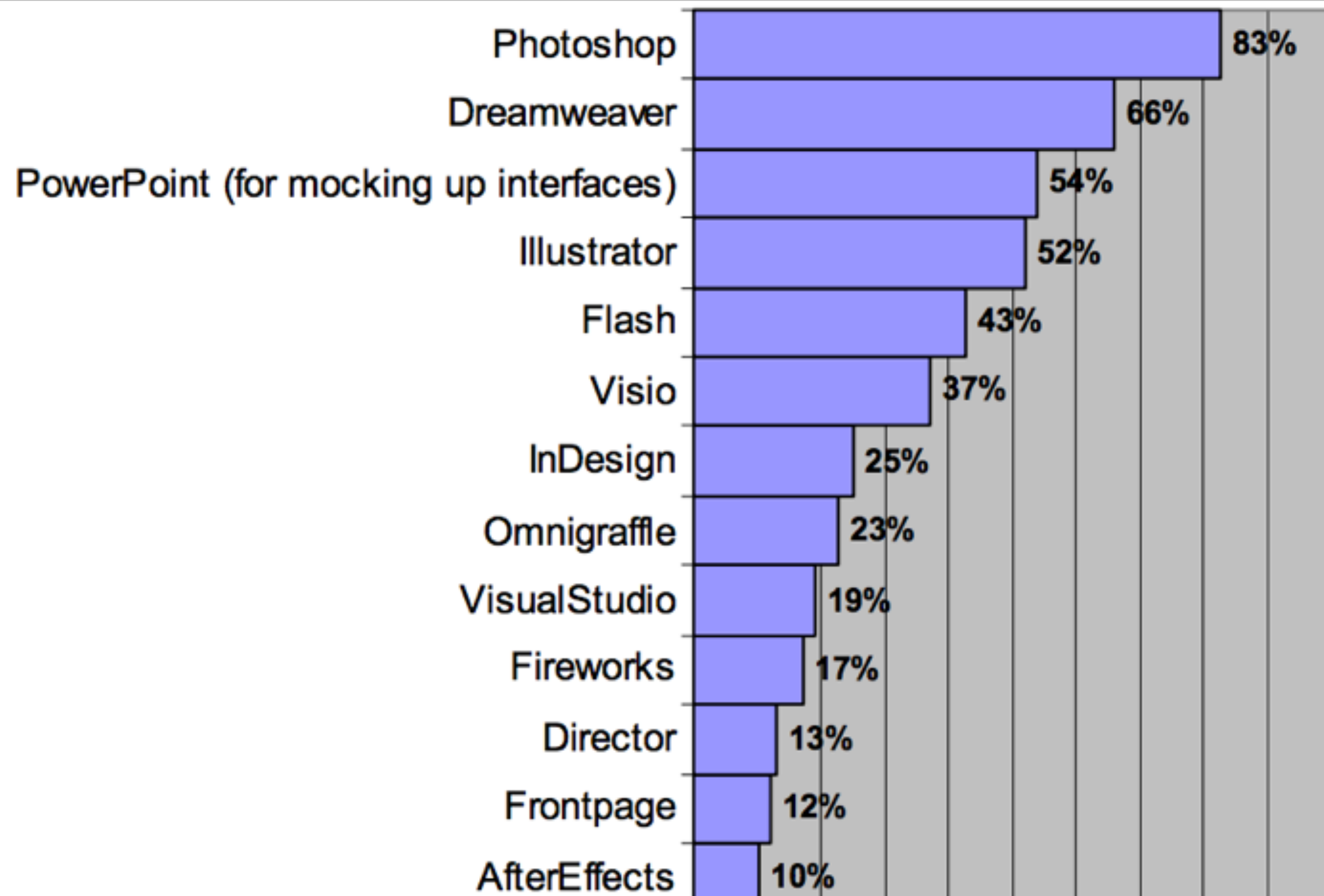
- Prototypes enable exploration and iteration around concrete artifacts
- The more fluid the prototyping process is, the more you can learn before you sink time into engineering

Early stage design

What tools do designers use?

[Myers et al., VLHCC '08]

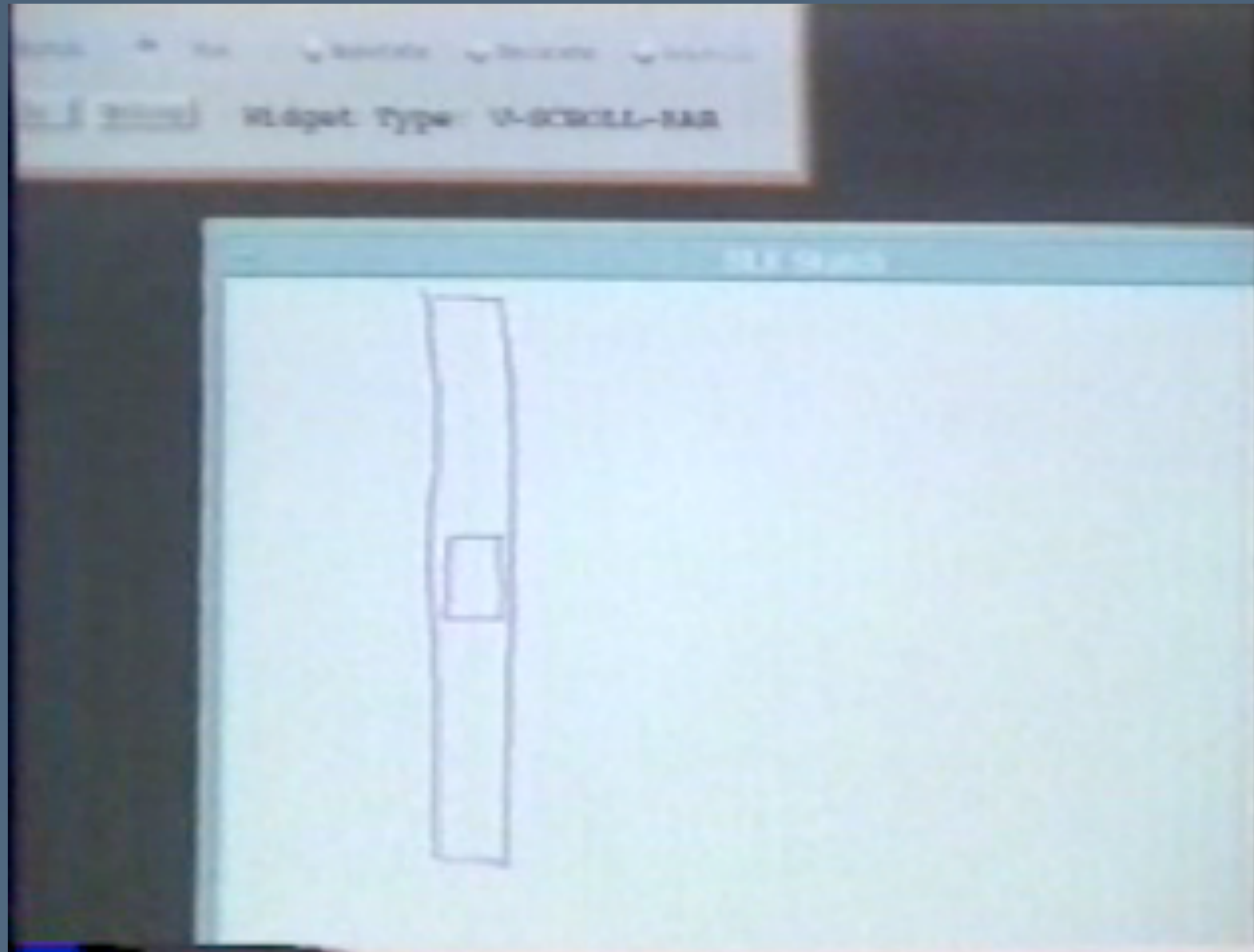
- Survey of 259 interaction designers



SILK: Sketching Interfaces Like Crazy

[Landay, CHI '96]

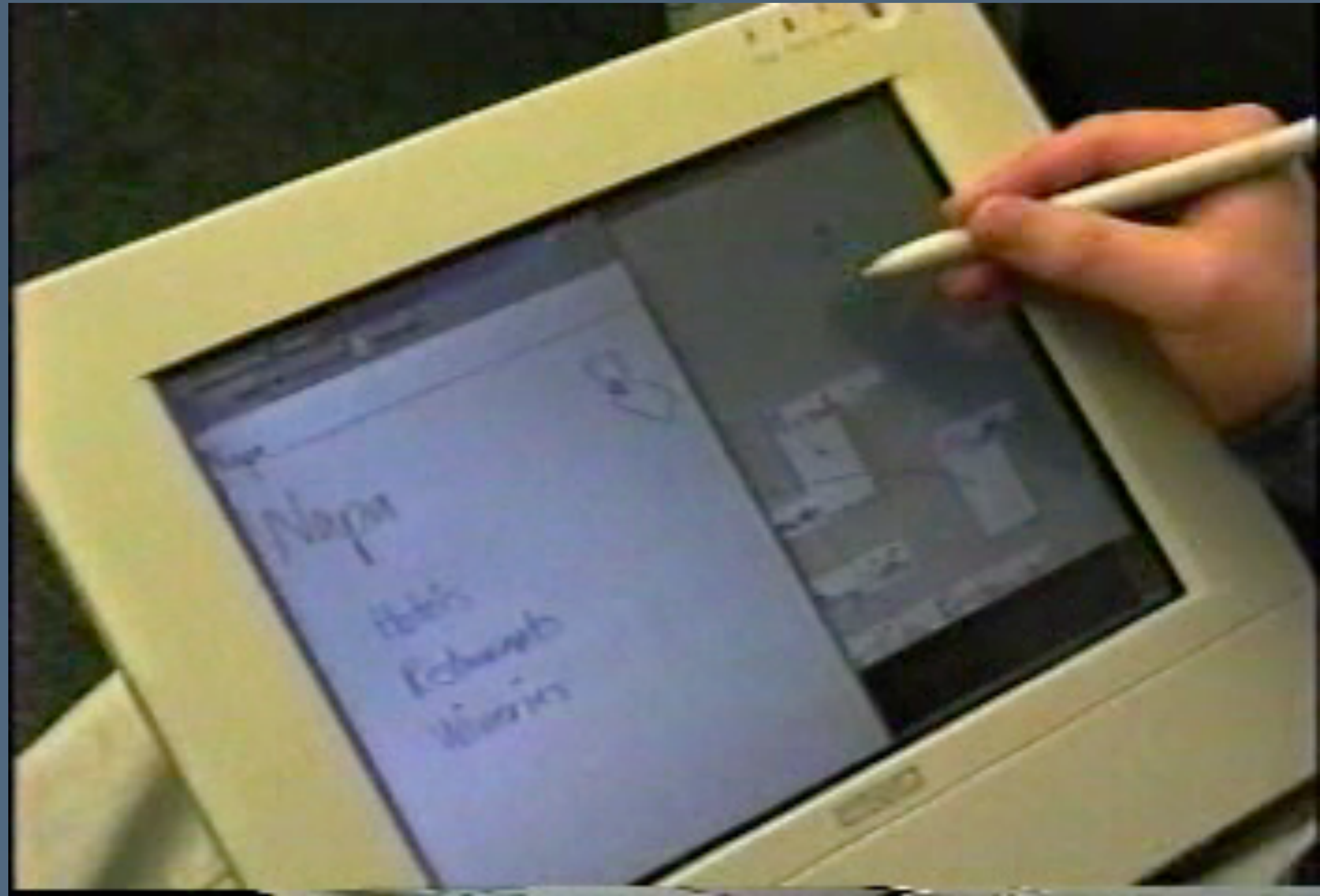
- Combine the fluidity of paper-based sketching with the interactivity of tools
- Technique: sketch recognition of basic UI components



DENIM: web site storyboarding

[Lin et al., CHI '00]

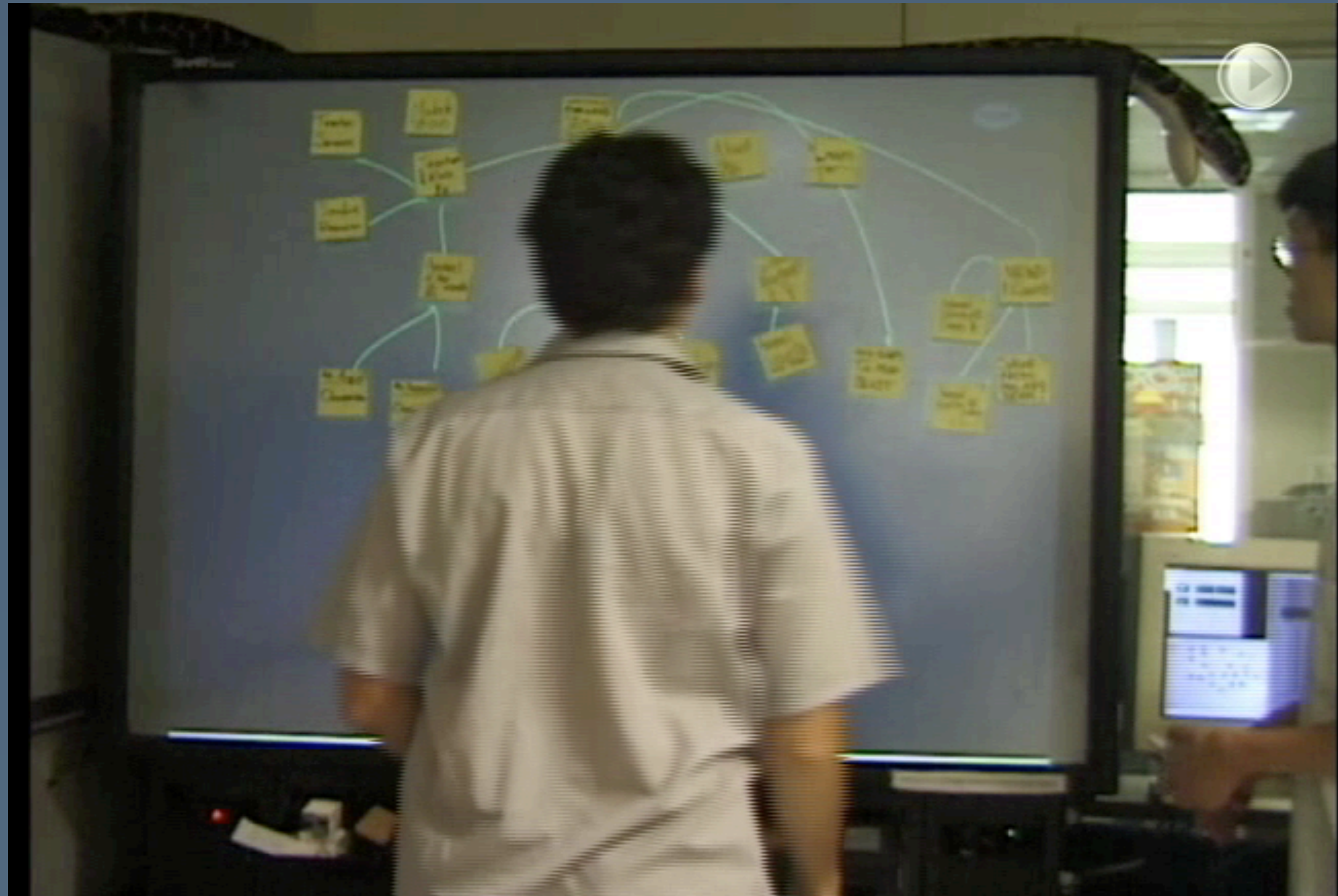
- Enable fluid, informal interactions for web site design
- Work at a higher level of abstraction than HTML



Designer's Outpost

[Klemmer et al., UIST '01]

- Fluid interactive brainstorming that bridges physical and digital artifacts

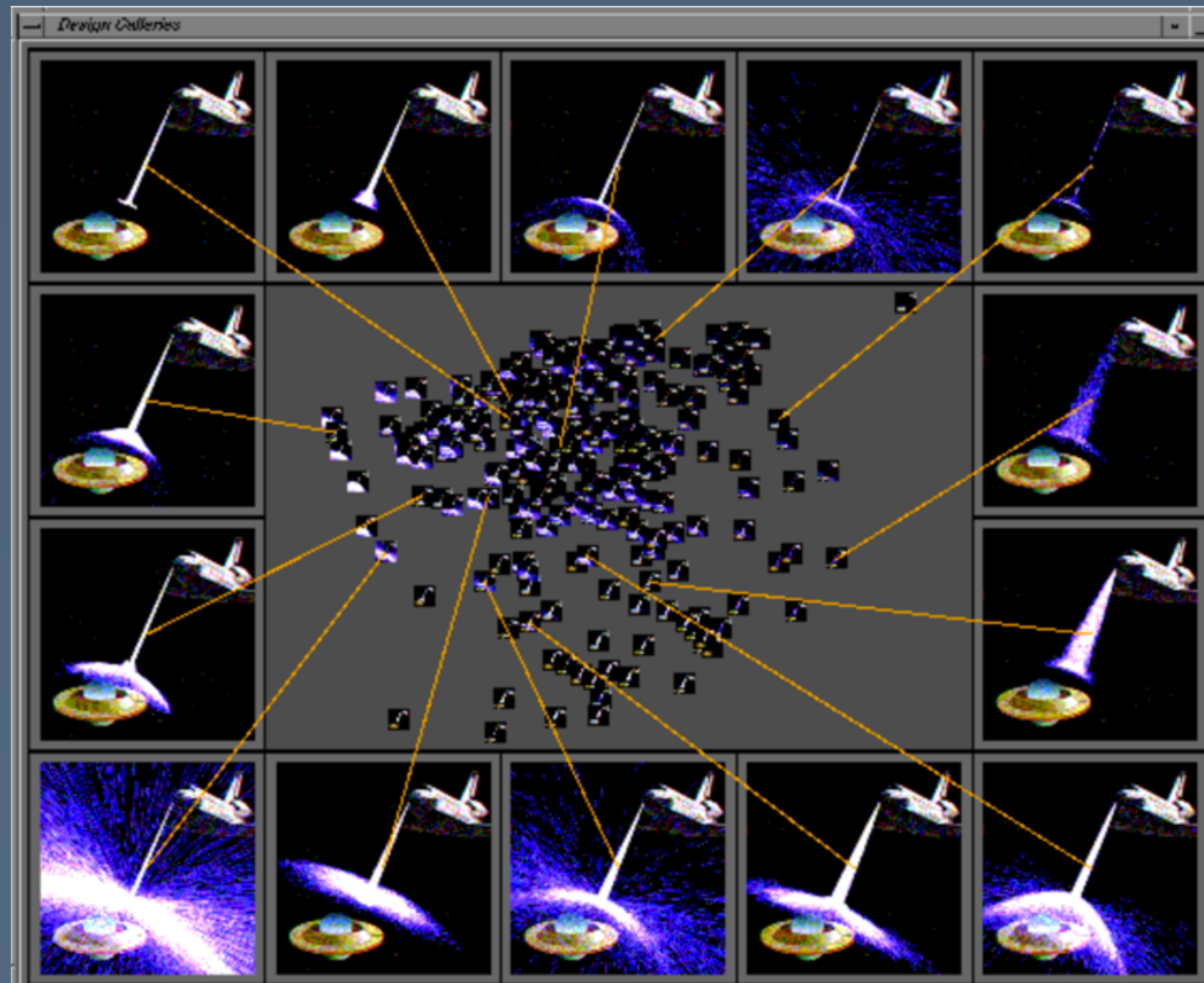


Mid-and-late
stage design
tuning

Design galleries

[Marks et al., SIGGRAPH '97]

- Automatically generate perceptually-varying alternatives within a design space



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```
File Edit Run
Run Add Alternative Linked Edit
Alternative 1
// load asset file "task1-assets.swf", which defines movieclips "circle", "box", and "boxes"
//@SWF_ASSET_FILE task1-assets.swf

class FlashApplication {
    static var app:FlashApplication;

    //////////////////////////////////////
    // variables to be tuned
    var xNumber:Number = 12; //@RANGE 2..12
    var yNumber:Number = 12; //@RANGE 2..12
    var scale:Number = 100; //@RANGE 1..195

    //////////////////////////////////////
    //class constructor - all initialization code goes in here
    function FlashApplication() {
        var canvasWidth:Number = Stage.width;
        var canvasHeight:Number = Stage.height;

        var total:Number = xNumber*yNumber; //total number of atoms that will be created
        var gridSpacing:Number = 20; //spacing between atoms
        var counter:Number = 0;
        //_root.scale = 100;
        _root._x=0;
        _root._y=0;
        //see the parent class for more
    }
}
```

Juxtapose: parameter tuning

[Hartmann et al., UIST '09]

Voyant: crowd feedback

[Xu, Huang, and Bailey CSCW '13]

The screenshot displays the Voyant web interface. At the top, there is a navigation bar with the text "Voyant", "My Designs", "Edit account", and "Logout". Below this, the main content area features a poster on the left and a feedback panel on the right. The poster is titled "FRESH SMOOTHIE" and shows three smoothie glasses with straws against a green background with a yellow sunburst. The feedback panel is titled "Elements" and has sub-tabs for "First Notice", "Impressions", "Goals", and "Guidelines". The "Impressions" tab is active, showing a list of feedback items categorized into "object", "color", "activity", and "shape".

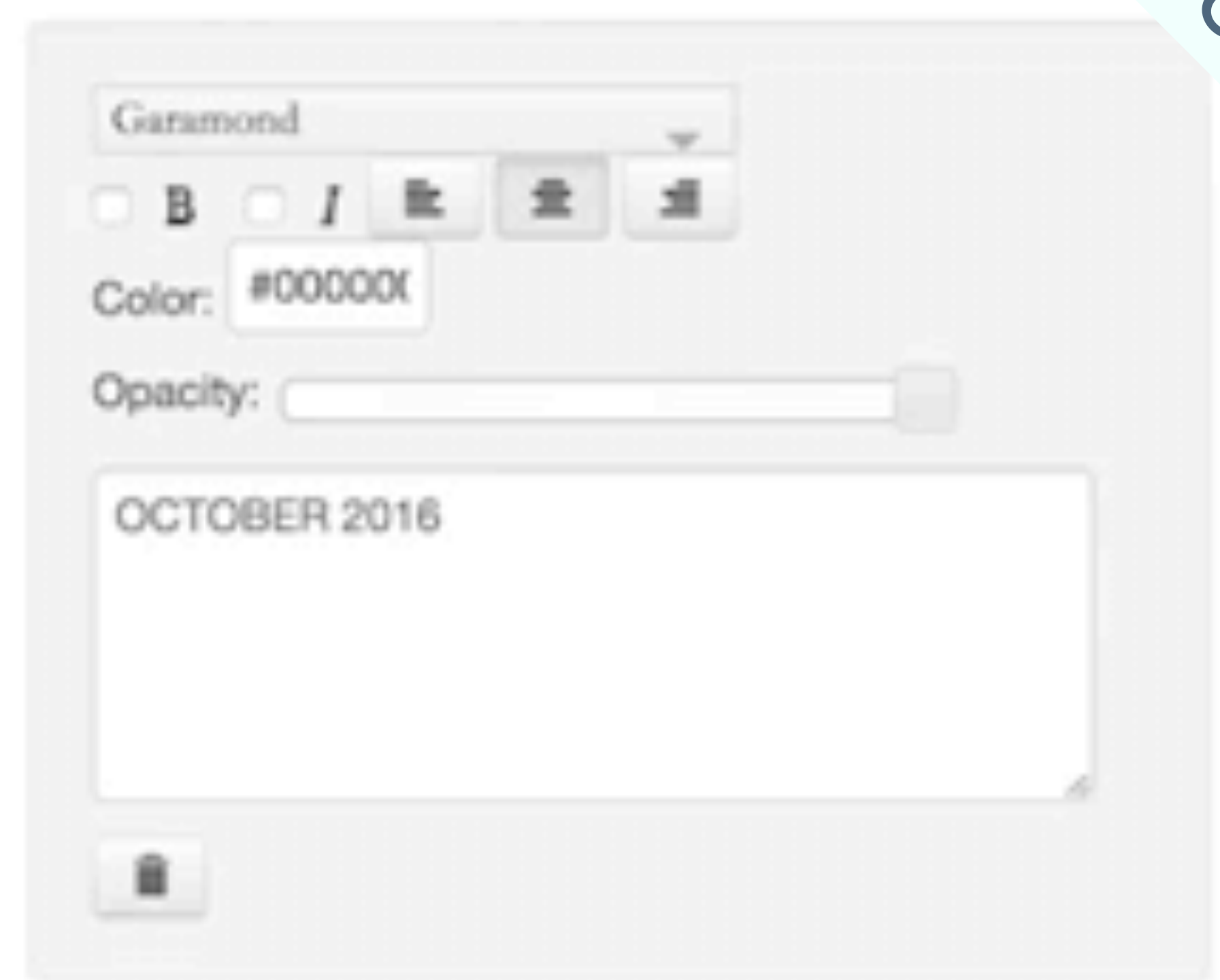
object	color	activity	shape
beverages	blue	drinking a smoothie	circle
drink	brown	fresh	cone
glass	green	sipping	hourglass
smoothie	orange	sunbathing	rectangle
straw	pink		
sun	red		
words	white		
	yellow		

DesignScape: interactive layout

[O'Donovan, Agarwala, and Hertzmann CHI '15]

The image shows a screenshot of the DesignScape interactive layout tool. The interface is divided into several sections:

- Tweak Your Design:** A vertical sidebar on the left containing three design variants for the advertisement. Each variant shows a different arrangement of icons (microscope, calculator, flask) and text.
- Main Canvas:** The central workspace where the selected design is displayed. It features the text "HIGH SCHOOL CHEMISTRY TUTOR" at the top, a large red flask icon on the right, a microscope and calculator icon on the left, and a list of services: "Available after 6pm weekday evenings, 10am-5pm on weekends", "555-555-5555 help@tutor.ca", and "Learn how to: - identify types of chemical reactions - balance chemical equations - balance redox reactions - convert grams to moles - write in scientific notation".
- Brainstorm New Designs:** A vertical sidebar on the right showing three alternative design variants, each with a unique layout of icons and text.
- Toolbar:** A horizontal bar at the top of the main canvas with buttons for "File", "Add", "Undo", "Redo", a lock icon, a zoom level of "35.7", "Randomize", and "Save".



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Learning Visual Importance

[Bylinskii et al., UIST '17]

Physical prototyping

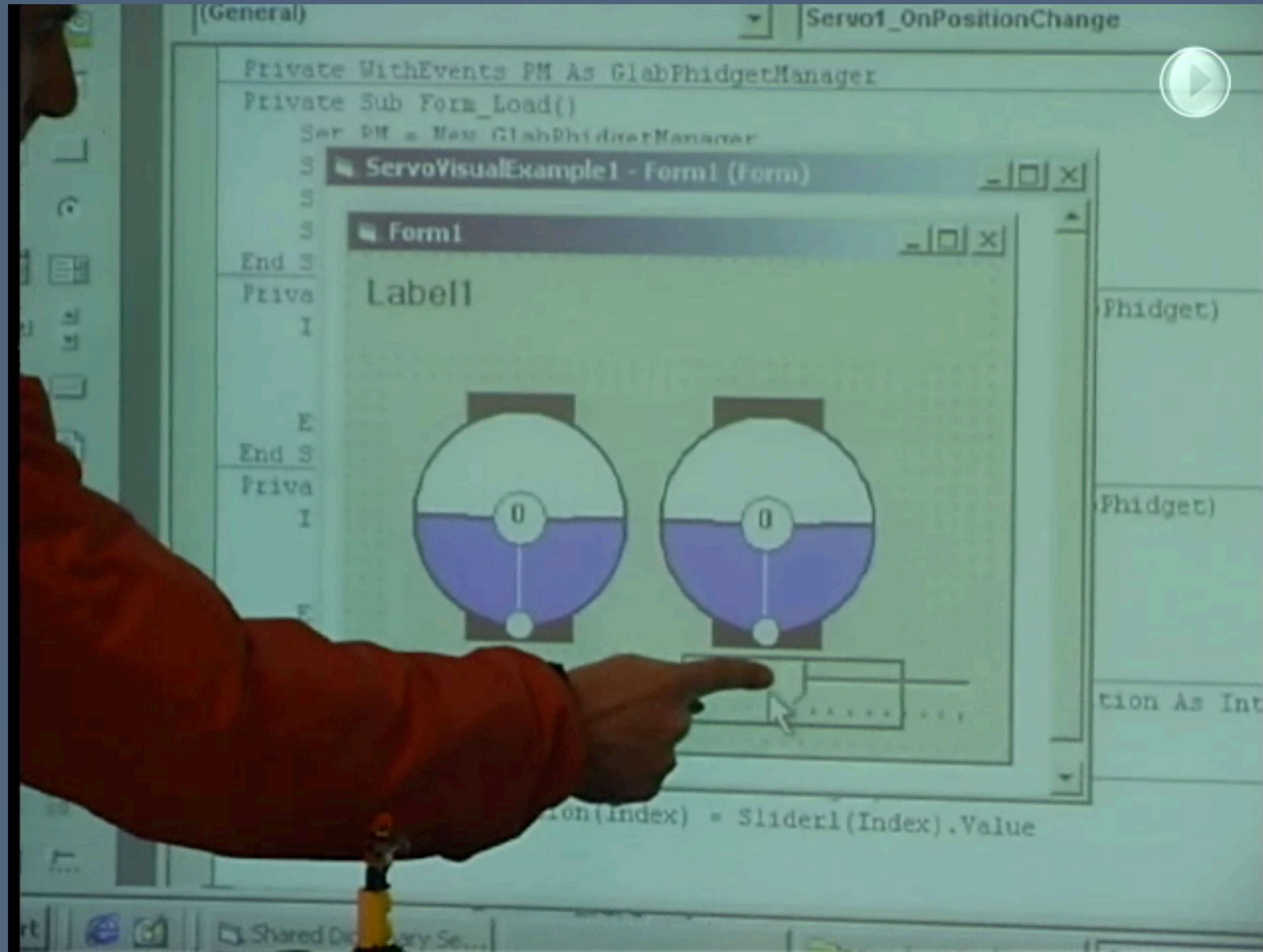
The challenge of physical prototyping

- Prototype the bits, or prototype the atoms?
- Goal: lower the threshold to prototype interactive systems that depend on electronics and physical materials

Phidgets

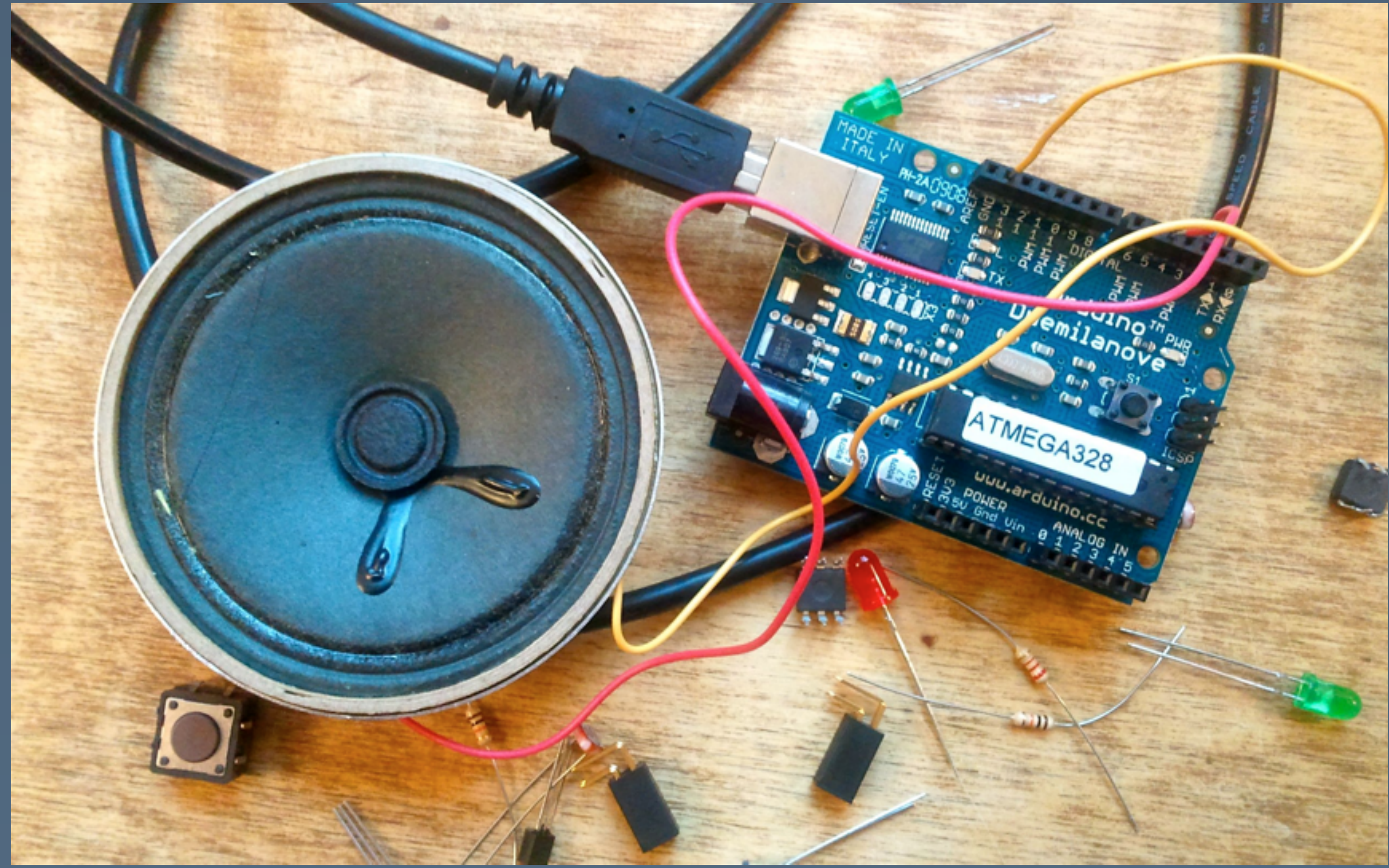
[Greenberg and Fitchett, UIST '01]

- USB plug-and-program I/O devices
 - servos
 - LEDs
 - buttons
 - sliders
- Goal: program physical devices like you would a GUI widget



Led to: Arduino

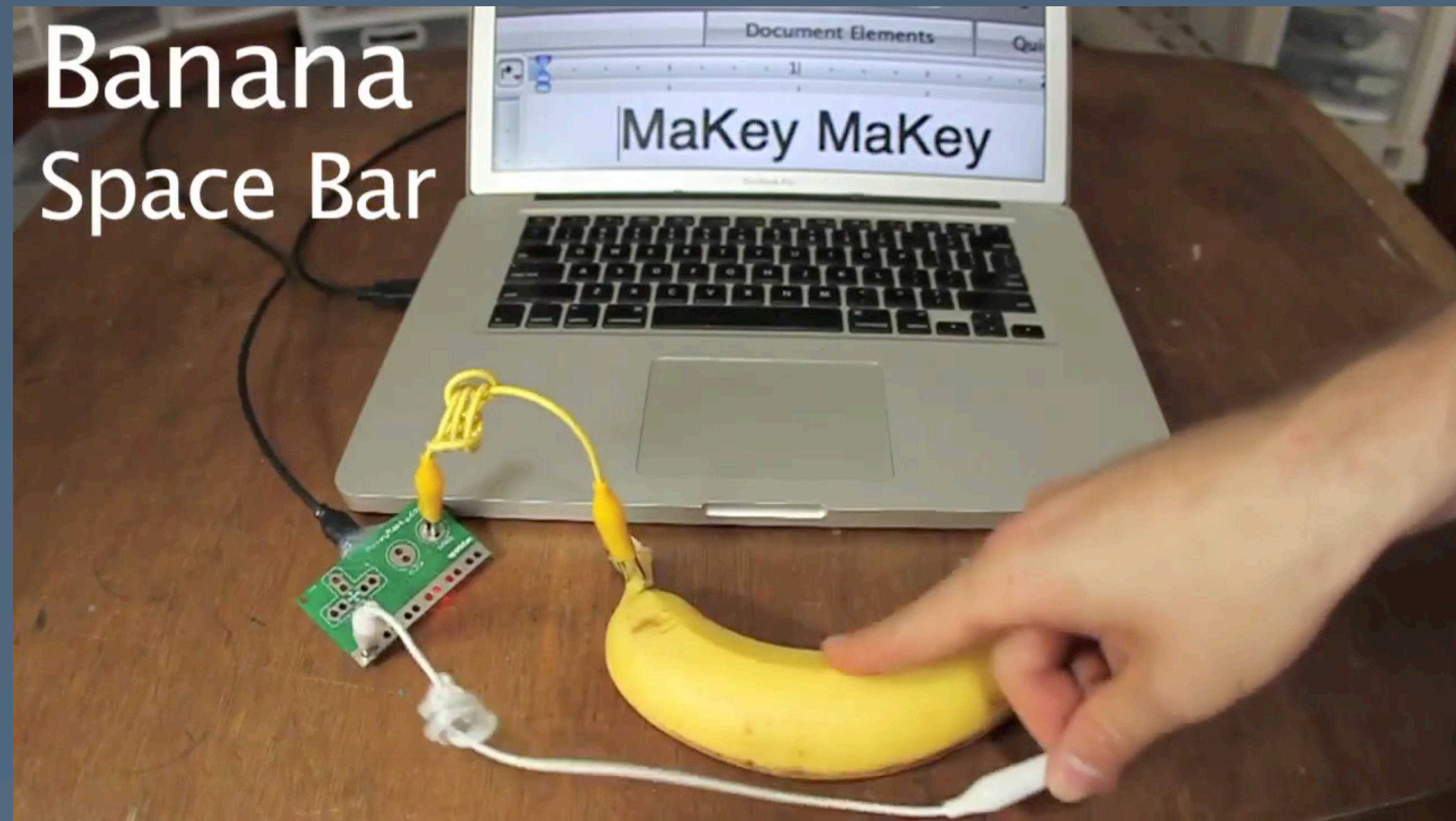
- Maker board for artists, programmers and hobbyists



Led to: Makey Makey

[Silver et al., TEI '12]

- Alligator clips map onto keystrokes



d.tools: prototyping behavior

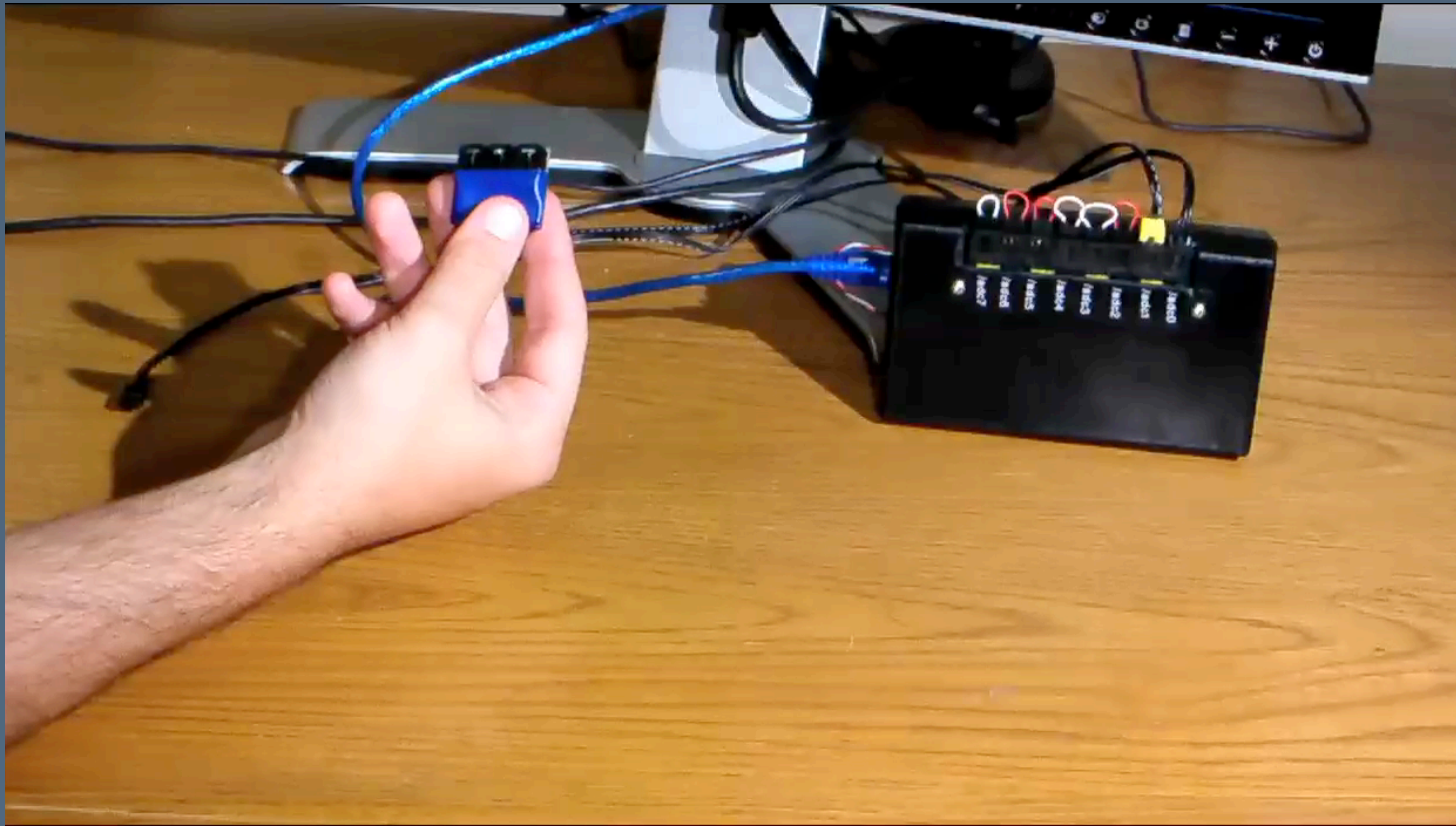
[Hartmann et al., UIST '06]

- Plug-and-play
HW, visual
statechart
behaviors

prototyping with d.tools

Sensor interaction by demonstration

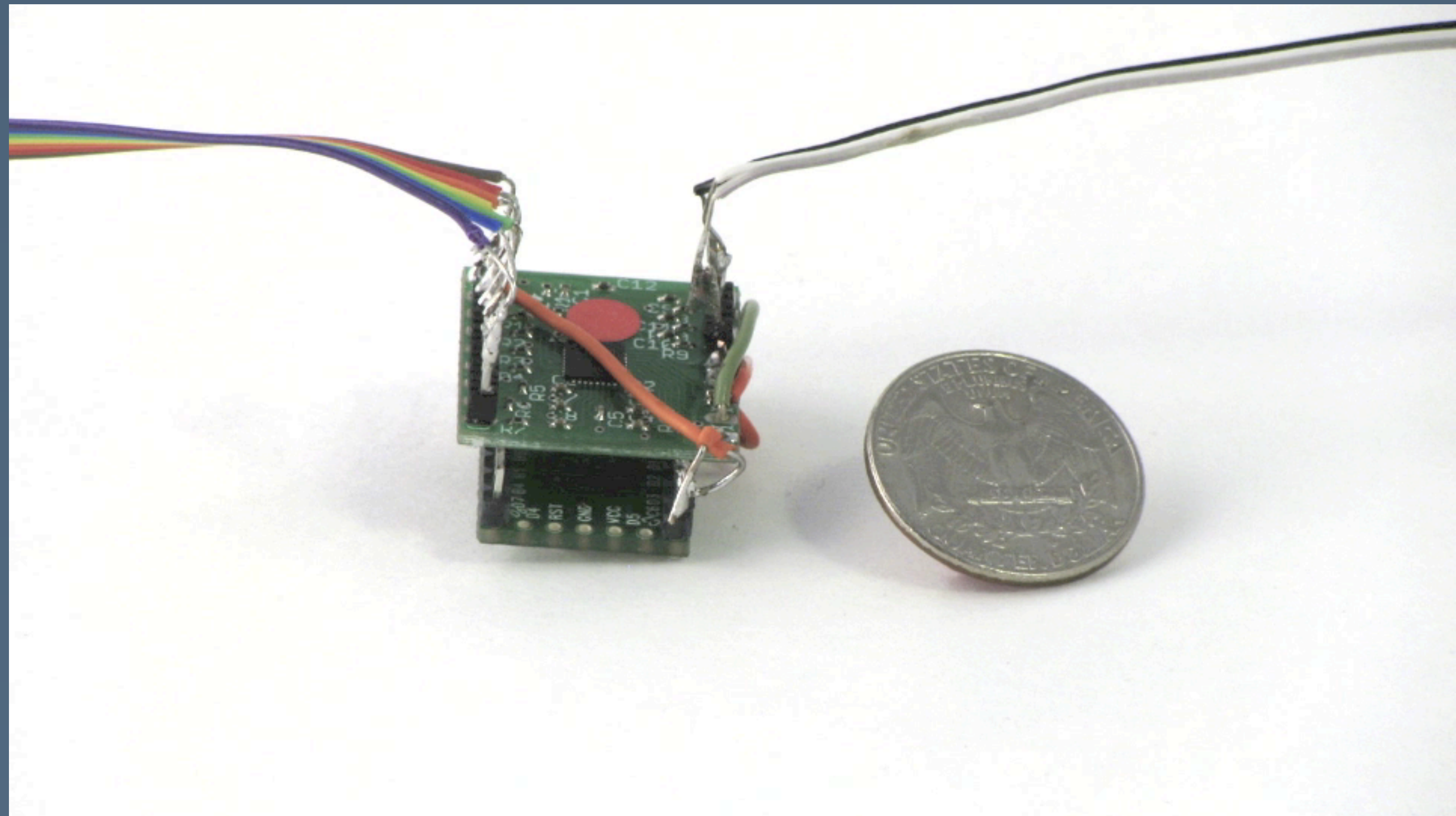
[Hartmann et al., CHI '07]



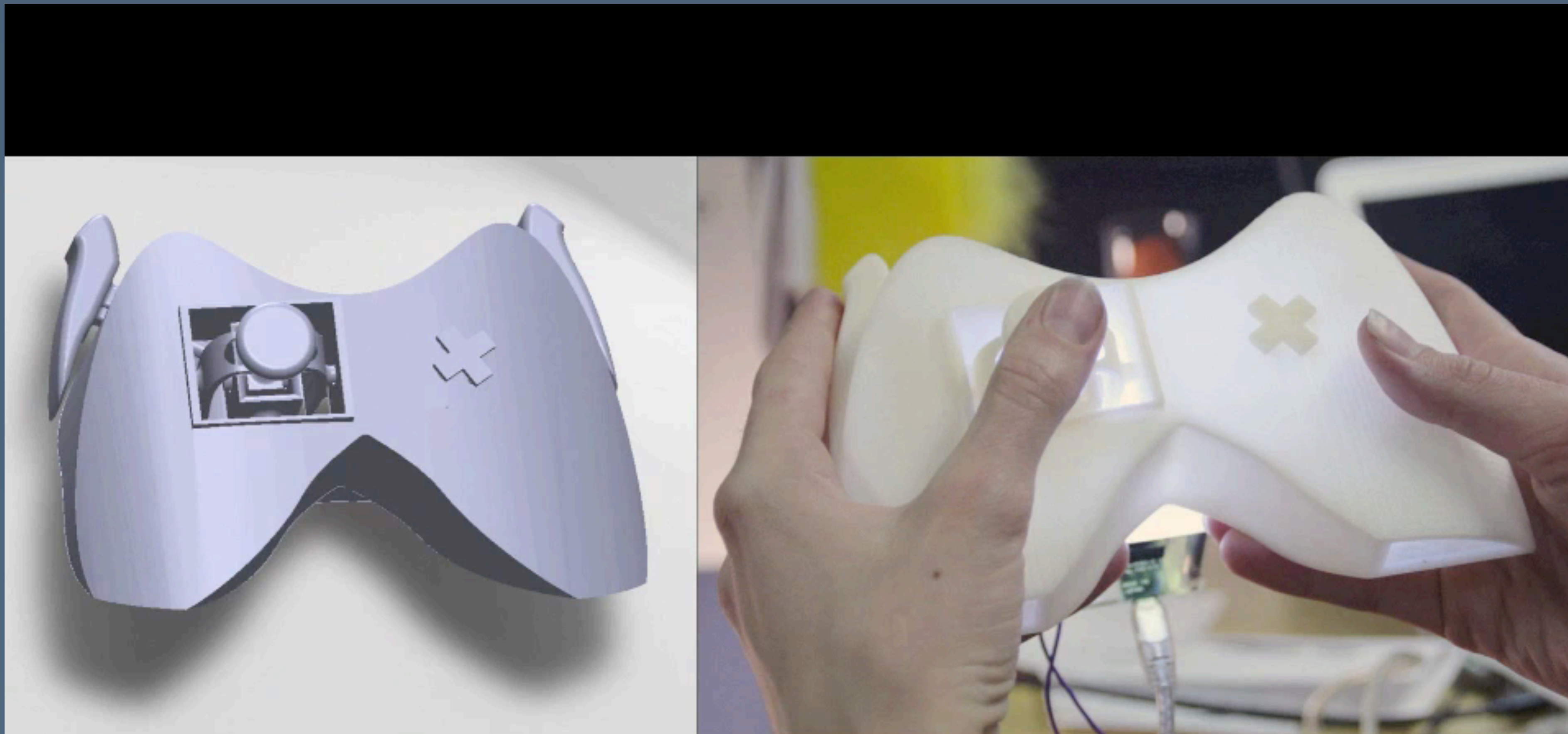
Fabricating capacitive hardware

[Savage et al., UIST '12]

- Author behaviors
- Software does circuit layout



3D printing+camera prototypes

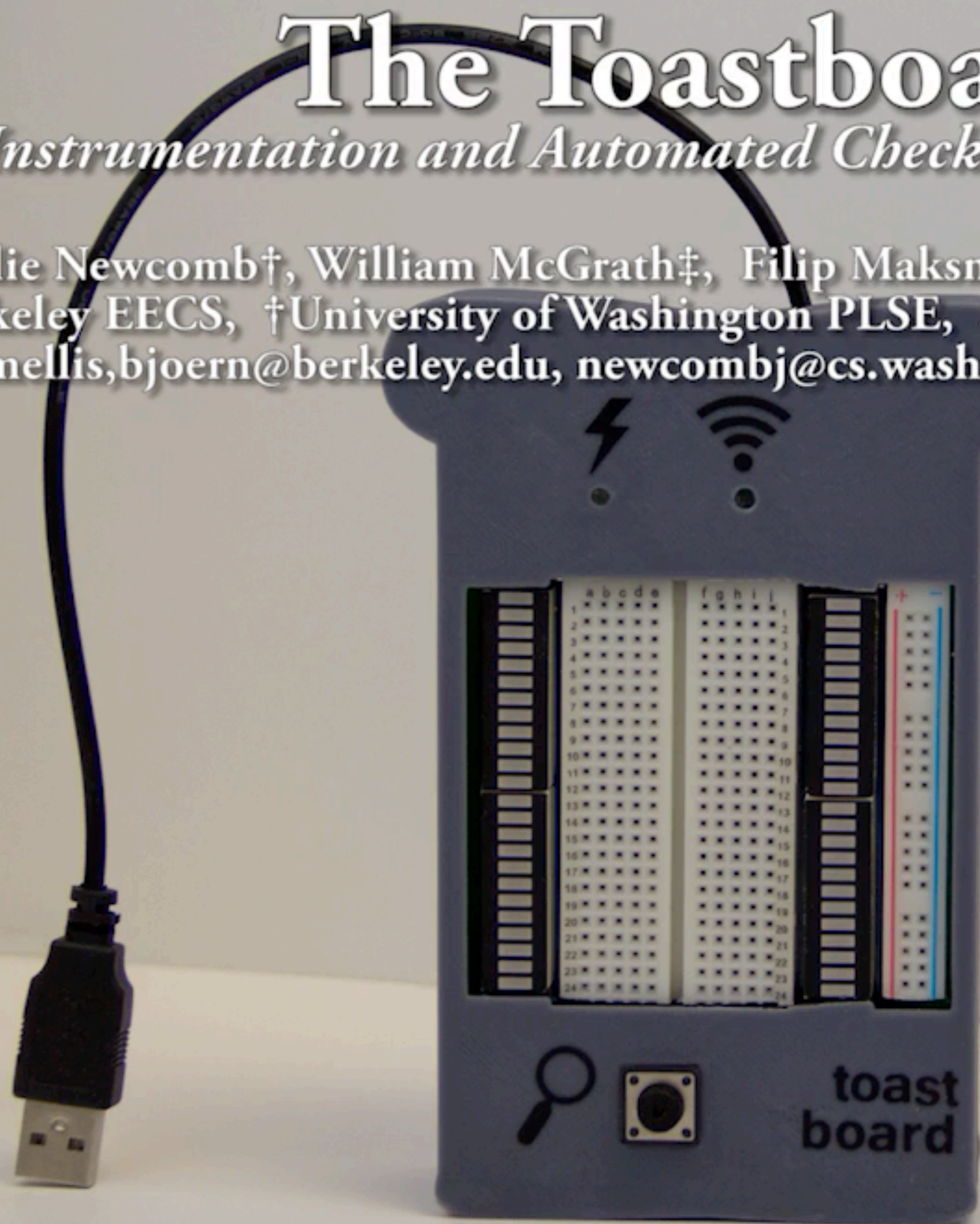


The Toastboard

Ubiquitous Instrumentation and Automated Checking of Breadboarded Circuits

Daniel Drew*, Julie Newcomb†, William McGrath‡, Filip Maksimovic*, David Mellis*, Bjoern Hartmann*

*UC Berkeley EECS, †University of Washington PLSE, ‡Stanford University HCI Group
ddrew73, fil, mellis, bjoern@berkeley.edu, newcombj@cs.washington.edu, wmcgrath@stanford.edu



Skills for design tools research

- The same general criteria as design process research:
 - Experience teaching and doing interaction design — the ability to reflect on...
 - Which feedback loops are too open?
 - Why do design teams succeed and fail?
 - What structural support would amplify designers' cognition?
- But with an orientation toward software that can either nudge behavior or tighten those feedback loops for the designer