

# Hacking & Prototyping

Press Play: Interactive Device Design | April 6, 2011

# Getting to know you

Introductions | Questions so far |

I like, I wish | Lab this week

# Hacking

Culture | Understanding how things work

Being rough and ready

**Hacker:**  
[a] person who  
delights in having an  
intimate  
understanding of the  
internal workings of a  
system, computers  
and computer  
networks in particular



Homebrew:  
Several very high-  
profile Silicon Valley  
hackers and IT  
entrepreneurs  
emerged from the  
DIY computer  
movement of the mid  
1970's.

## NEWSLETTER

### Homebrew Computer Club

Robert Reiling, Editor □ Post Office Box 626, Mountain View, CA 94042 □ Joel Miller, Staff Writer  
Typesetting, graphics and editorial services donated by Laurel Publications, 17235 Laurel Rd., Los Gatos, CA 95030 (408) 353-3609

#### RANDOM DATA

By Robert Reiling

Computer clubs continue to form around the country...E. Brooner would like to have material to help him get started with the "Flathead Computer Society" in the Kalispell area. His Address is P.O. Box 236, Lakeside, Montana 59922.

Did you see the SOL terminal demonstrated by Bob Marsh at the Sept. 1st meeting? An excellent design that will interest hobbyists and commercial users alike. It's available from Processor Technology, 6200 Hollis St., Emeryville, CA 94608. Write them for prices and specifications.

The OSI Systems Journal has been sent to all OSI customers (free—at least for the time being). It's a bi-monthly magazine with plans to go monthly in the future. There are 28 pages in the first issue (August 1976, Vol. 1, No. 1) with a hardware feature covering the OSI 440 Video Graphics System and software, features concerning Tiny BASIC for the 6800 and a Graphics Editor for the 6502. It also includes OSI product and software catalog data. The BASIC is, of course, the 2K Tiny BASIC developed by Tom Pittman. Many of you have met Tom at the Homebrew computer Club meetings. The OSI Systems Journal is a good way to learn more about the OSI computer hardware and software along with helpful user information. The contact address is: The OSI Systems Journal, P.O. Box 134, Hiram, Ohio 44234.

KIM-1 users now have a newsletter. Eric Rehnke is producing the newsletter every 5-8 weeks, MOS Technology, Inc. helped get it started by sending copies to all known KIM owners. The user group, however, is independent of MOS Technology, Inc. The newsletter is devoted to KIM-1 support. Subscriptions are \$5.00 for the next six issues. Contact "KIM-1 User Notes," c/o Eric C. Rehnke, Apt. 207, 7656 Broadview Rd., Parma, Ohio 44134.

The BAMUG club has a new contact address. It is BAMUG, c/o Timothy O'Hare, 1211 Santa Clara Ave., Alameda, CA 94501. Write Timothy for club information. I suggest you include a stamped, self-addressed envelope.

Beware of board snatchers! Glenn Ewing reports 11 boards were taken out of his IMSAI computer. The boards are: MPU, 4 RAM-4's, SIO-2, P10-4, PIC-8, PROM-4, IFM and FIB. Glenn suggests you consider providing good security for your computer and associated equipment. In his case the computer was in a locked office which was burglarized. In the event you

have information on the above boards, write Lt. Glenn Ewing, Code 62EI, Naval Post Graduate School, Monterey, CA 93940.

For family and friends of people who always wanted to know about computers, but didn't want to ask them, four easy-going classes are available starting Oct. 19th on Tuesdays from 7 to 9 p.m. You can learn how computers work and what they can and can't do. You will also have some of the jargon deciphered, see what you can do with a computer, play some games and learn to program. The cost is \$25. Contact the Community Computer Center, 1919 Menalto Ave., Menlo Park, CA 94025, phone (415) 325-4444.

A call for papers in personal computing has been issued by the 1977 National Computer Conference. The conference is scheduled for June 13-16, 1977. I have a few copies of the guidelines if you would like to submit a paper.

The First West Coast Computer Faire will be held April 16 and 17, 1977 at the San Francisco Civic Auditorium. This faire is shaping up rapidly. If you would like to lead a conference or participate in a conference session, please contact me. More information about the Faire is in the accompanying article.□

#### THE FIRST WEST COAST COMPUTER FAIRE

A Call For Papers And Participation

The San Francisco Bay Area is finally going to have a major conference and exhibition exclusively concerned with personal and home computing—The First West Coast Computer Faire. And, it promises to be a massive one! It will take place in the largest convention facility in Northern California: The Civic Auditorium in San Francisco. It will be a two-and-a-half day affair, starting on Friday evening and running through Sunday evening, April 15-17.

It is being sponsored by a number of local and regional hobbyist clubs, educational organizations and professional groups. These include:

- The two largest amateur computer organizations in the United States—the Homebrew Computer Club and the Southern California Computer Society
- Both of the Bay Area chapters of the Association Of Computing Machinery—the San Francisco Chapter and the Golden Gate Chapter
- Stanford University's Electrical Engineering Department

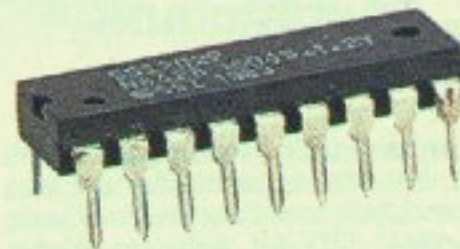


iFixit





### FM Receiver On-A-Chip



11<sup>95</sup>

**TDA7000.** Combines RF, mixer, IF and demodulator stages in one monolithic IC! Mute circuit reduces spurious reception. Frequency-locked-loop system with non critical 70 KHz IF. With data. 276-1304 . 11.95





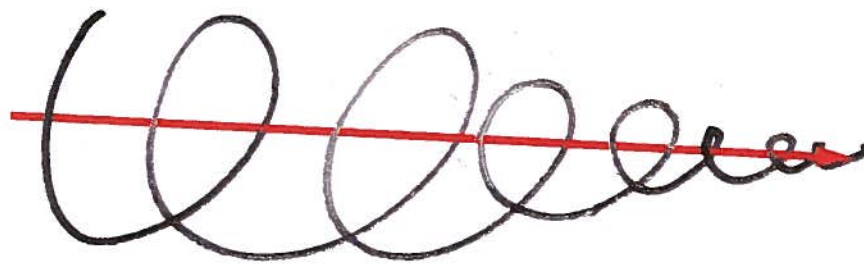




# Getting the Right Design

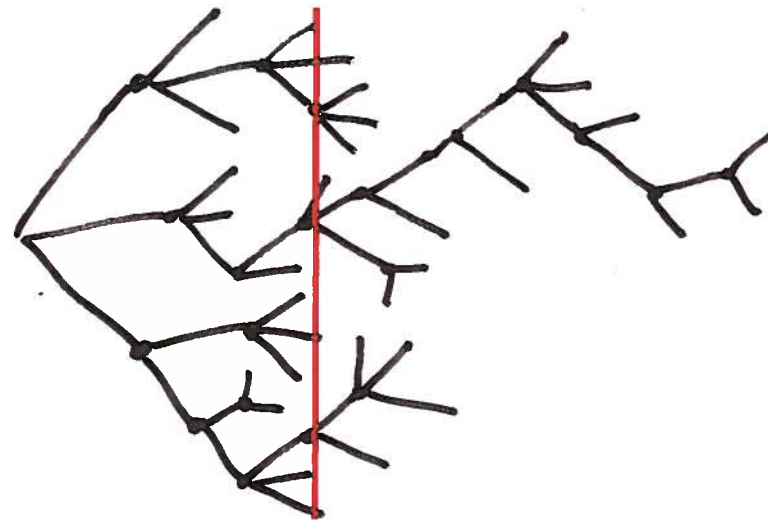


*image from NYT, <http://www.nytimes.com/2007/06/03/nyregion/nyregionspecial2/03artswe.html>*



**Figure 149: Prototyping as Iterative Incremental Refinement**

In engineering, prototyping is like a spiral closing in along a single trajectory. Each prototype is a refinement of the previous one, and takes you one step closer to the final product. Iterative prototyping is a form of incremental refinement and validation, rather than a technique of exploration.

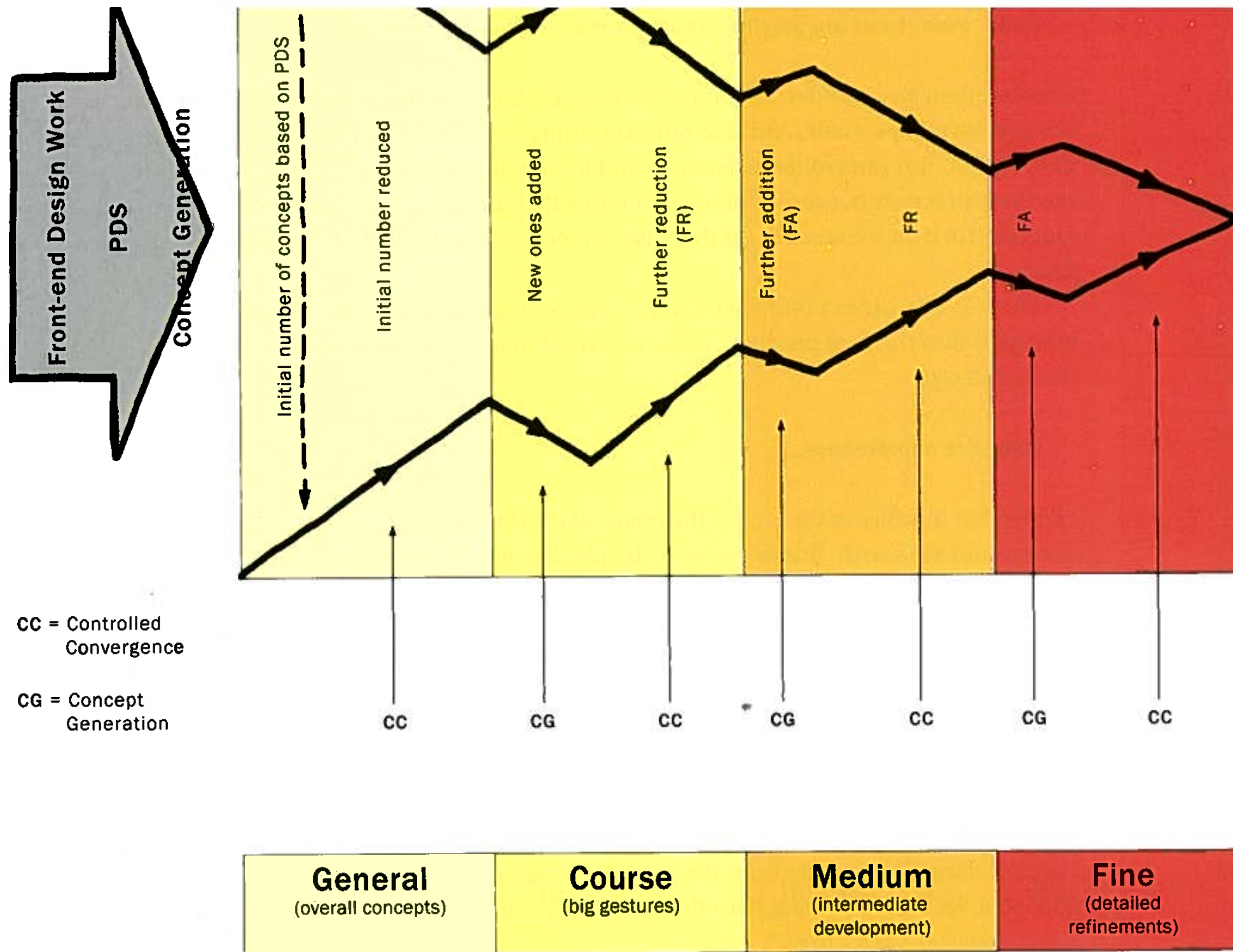


**Figure 150: Design as Branching Exploration and Comparison**

Design is about exploring and comparing the relative merits of alternatives. There is not just one path, and at any given time and for any given question, there may be numerous different alternatives being considered, only one of which will eventually find itself in the product.

*images from Buxton, Sketching User Experiences*





*images from Buxton, Sketching User Experiences*

# Sketches vs. Prototypes

What's the difference?

Sketches are:

- ❑ Quick
- ❑ Timely
- ❑ Inexpensive
- ❑ Disposable
- ❑ Plentiful
- ❑ For suggestion and exploration (vs. confirmation)
- ❑ Ambiguous



## Prototypes:

☐ Describe

☐ Refine

☐ Answer

☐ Test

☐ Resolve

☐ Specify

☐ Depict

# Prototypes:

What is significant is not what media or tools were used to create them, but **how they are used by a designer** to explore or demonstrate some aspect of the future artifact.

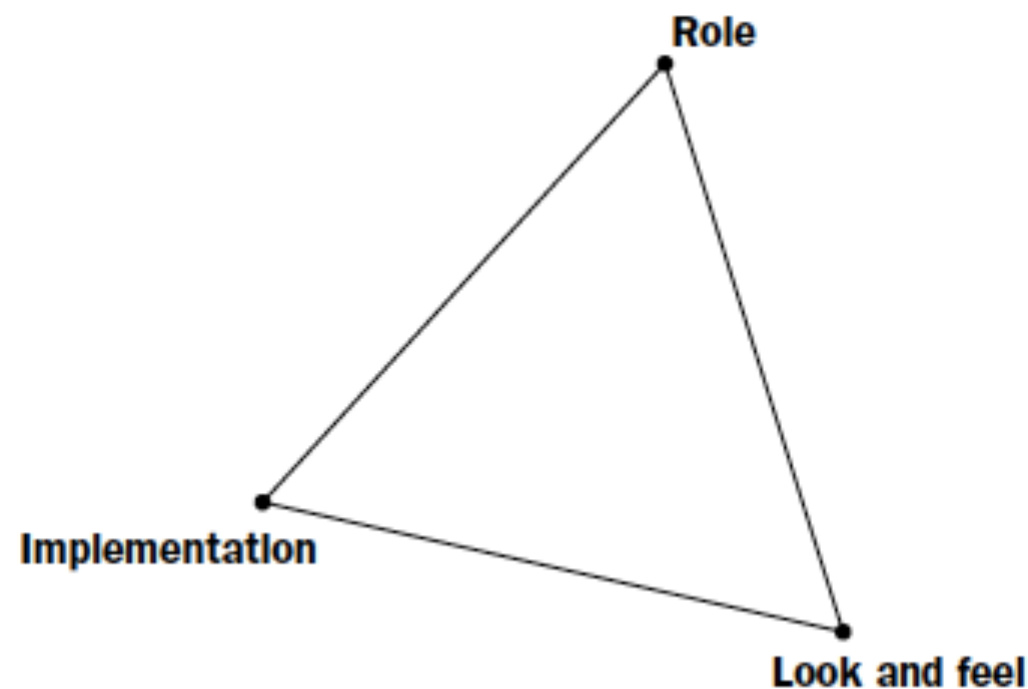


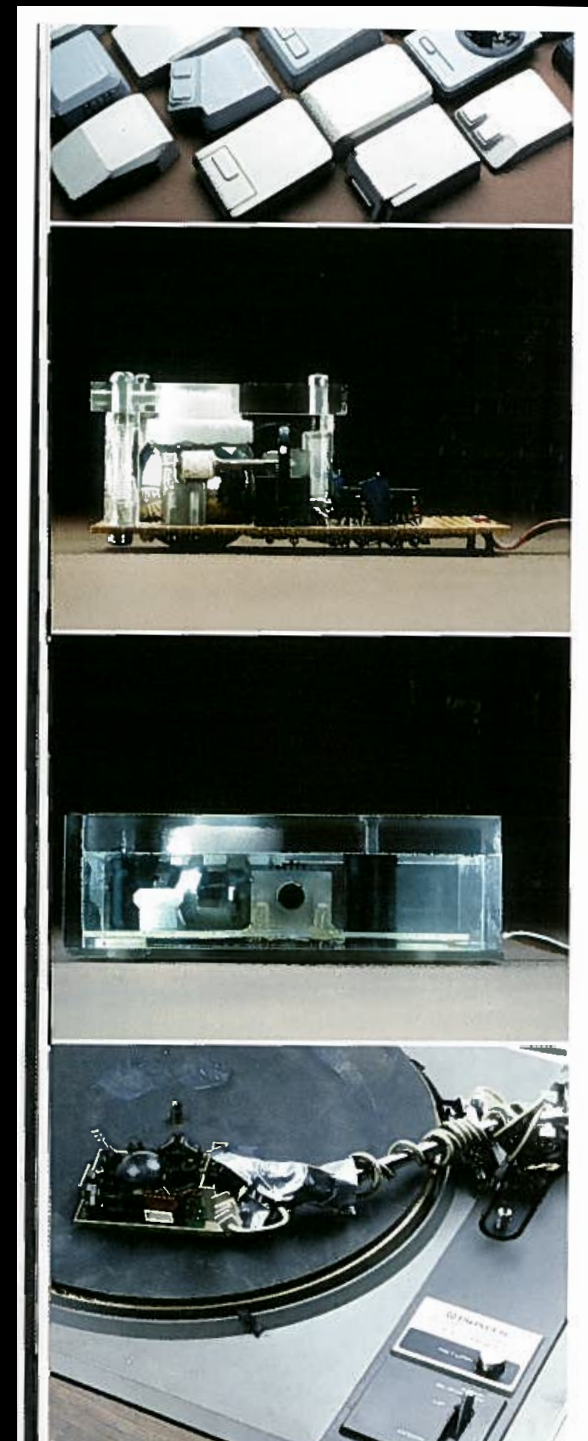
Figure 1. A model of what prototypes prototype.

*Houde & Hill (1997) What do Prototypes Prototype? in Handbook of Human-Computer Interactions, Elsevier*

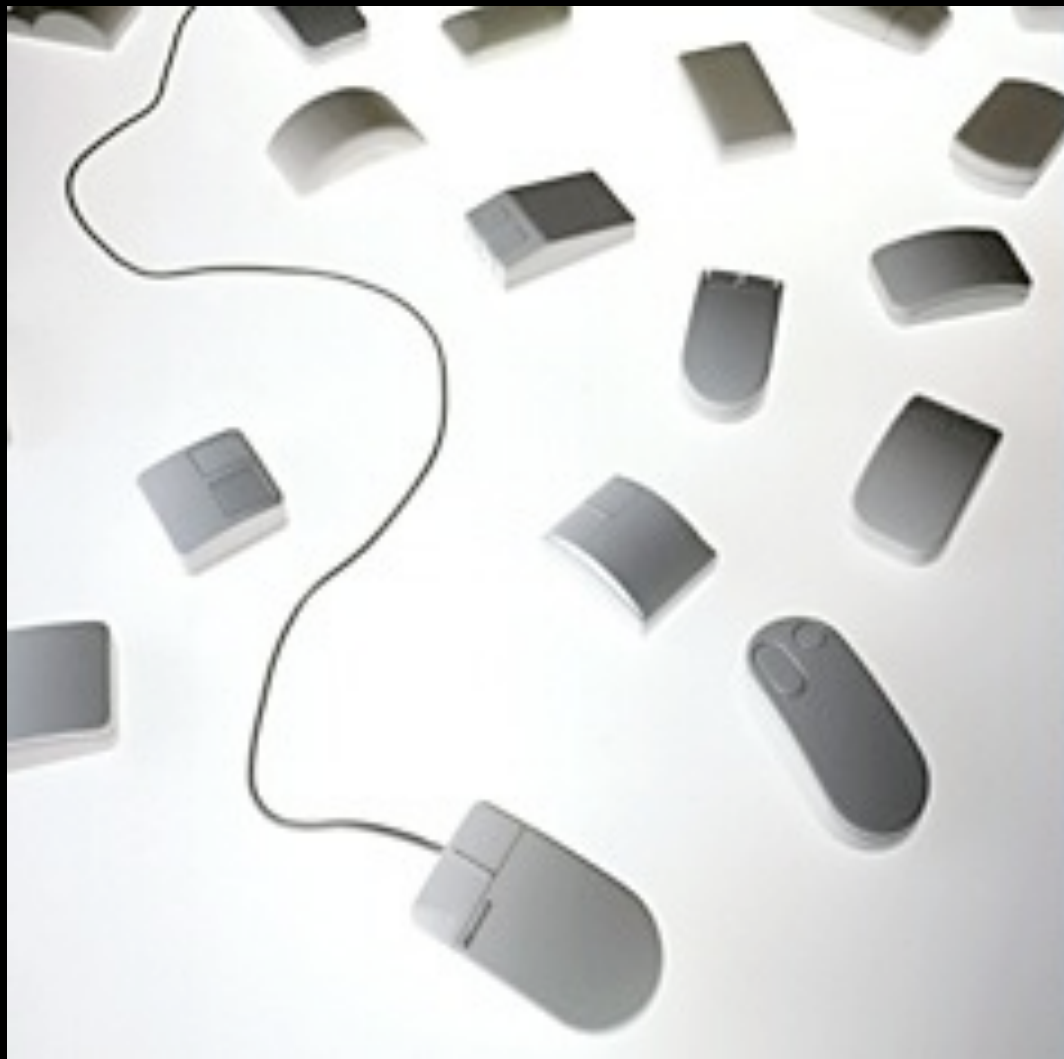
# Examples

Sketches, Prototypes, & How they are used





*image from Bill Moggridge, Designing Interactions (2006)*



*image from Bill Moggridge, Designing Interactions (2006)*



# Wii Fit

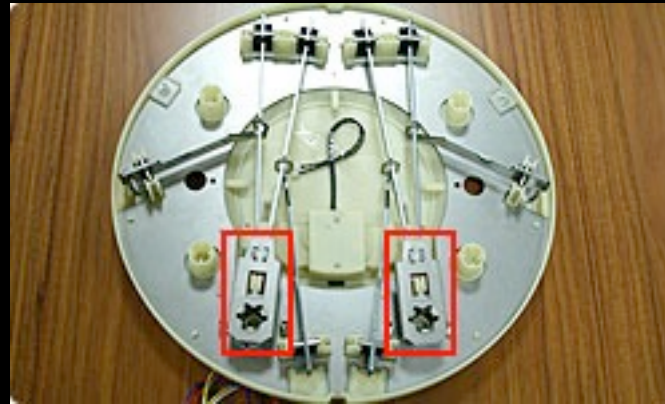






image from Philips Design, Creating Value by Design



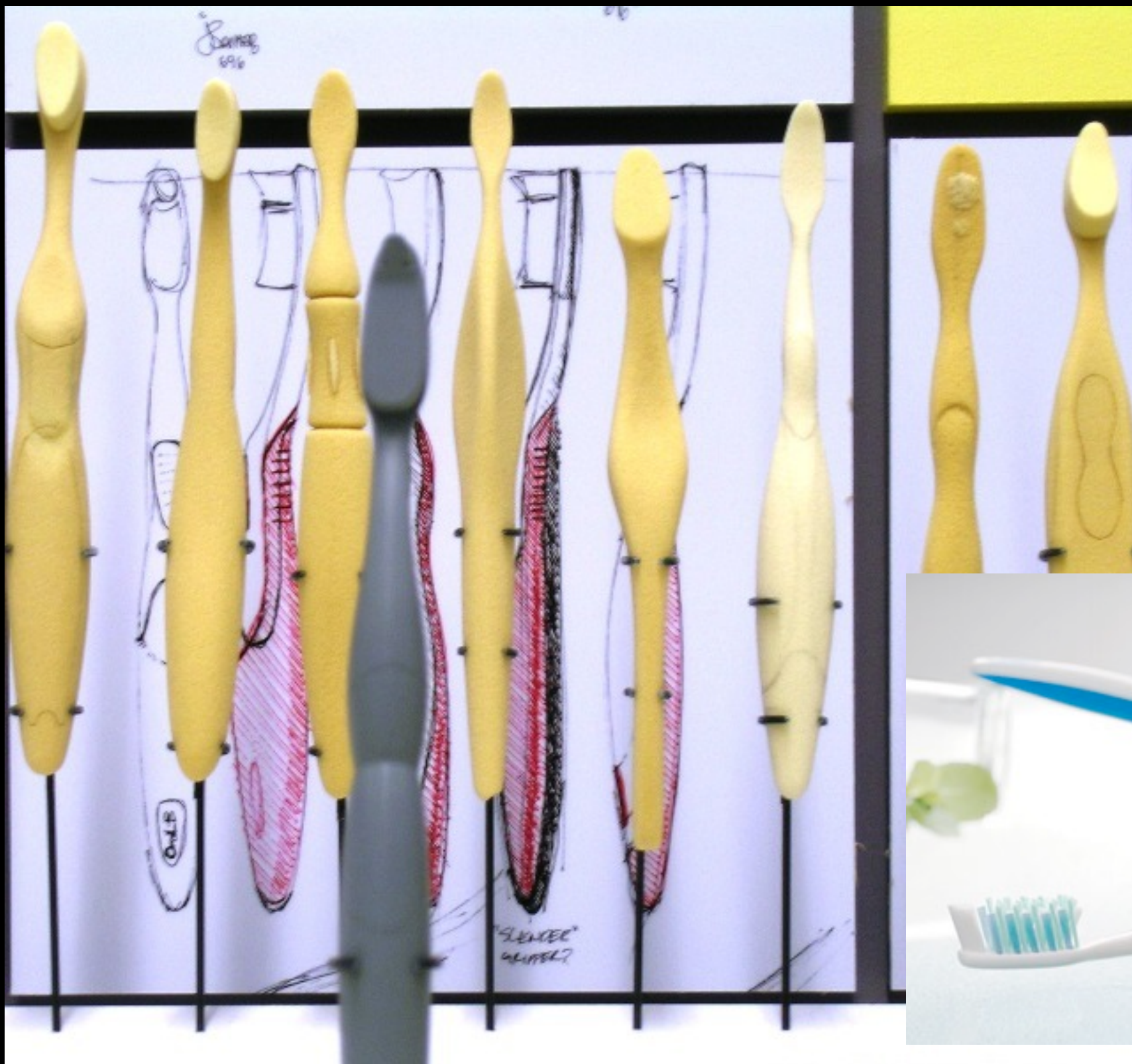


*image from Philips Design, Creating Value by Design*





*image of SFO exhibit, From Prototype to Product from danachis, Flickr*



*image from SFO exhibit, From Prototype to Product, Lunar Design portfolio*









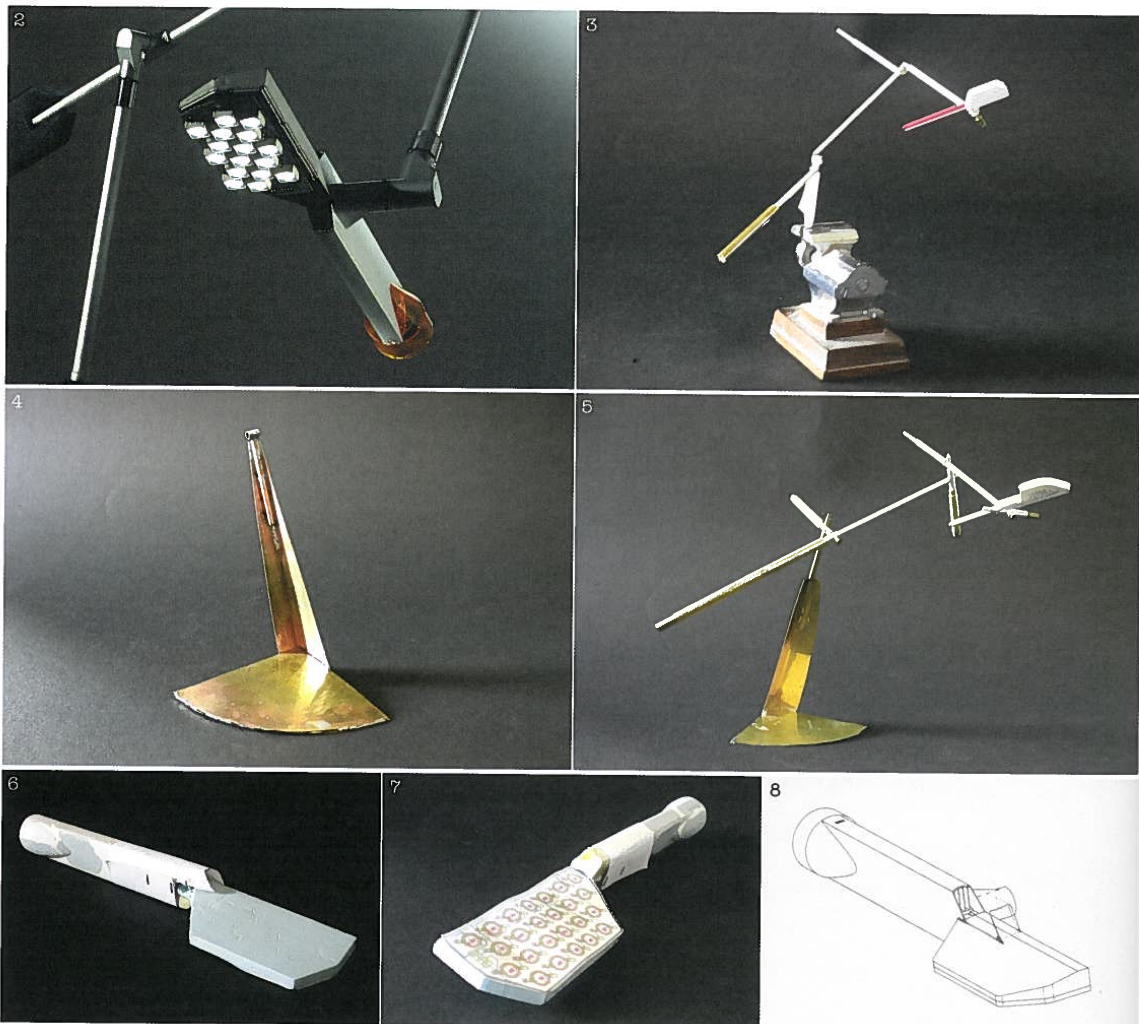
1. 'The lamp to me resembles a comet with its luminous head and tail,' says Sapper. 'I named it Halley in honour of the astronomer who discovered the comet that bears his name.' The chrome ball made Sapper think of the comet orbiting the earth.

2. A system to cool the powerful LEDs was borrowed from laptop technology: the lights are mounted on a printed circuit board attached to a heat-absorbing aluminium plate. A copper tube containing a conducting liquid carries the heat to a miniature radiator, which is cooled by a fan. The fan is kept visible, becoming part of the light's aesthetics.

3-4. Sapper's first model, defining the articulated arm of Halley and the head with the 'tail' containing the concept for a cooling element (3) was sent to Lucesco along with a brass model of the base (4). The base was conceived to allow papers to slip on to its gently curving profile to save desk space.

5. Lucesco produced their own model to check they agreed with Sapper's basic concept. The design was developed in an ongoing collaboration between Sapper and Lucesco's engineers in the form of sketches, models, emails and technical drawings.

6-8. First model of the head and fan made by Sapper in foam and paper showing the initial form of the cooling air intake (6-7). Lucesco examined the model and returned a technical drawing, which Sapper amended in pencil (8, amendment centre right) to improve the formal overlap of head and tail.

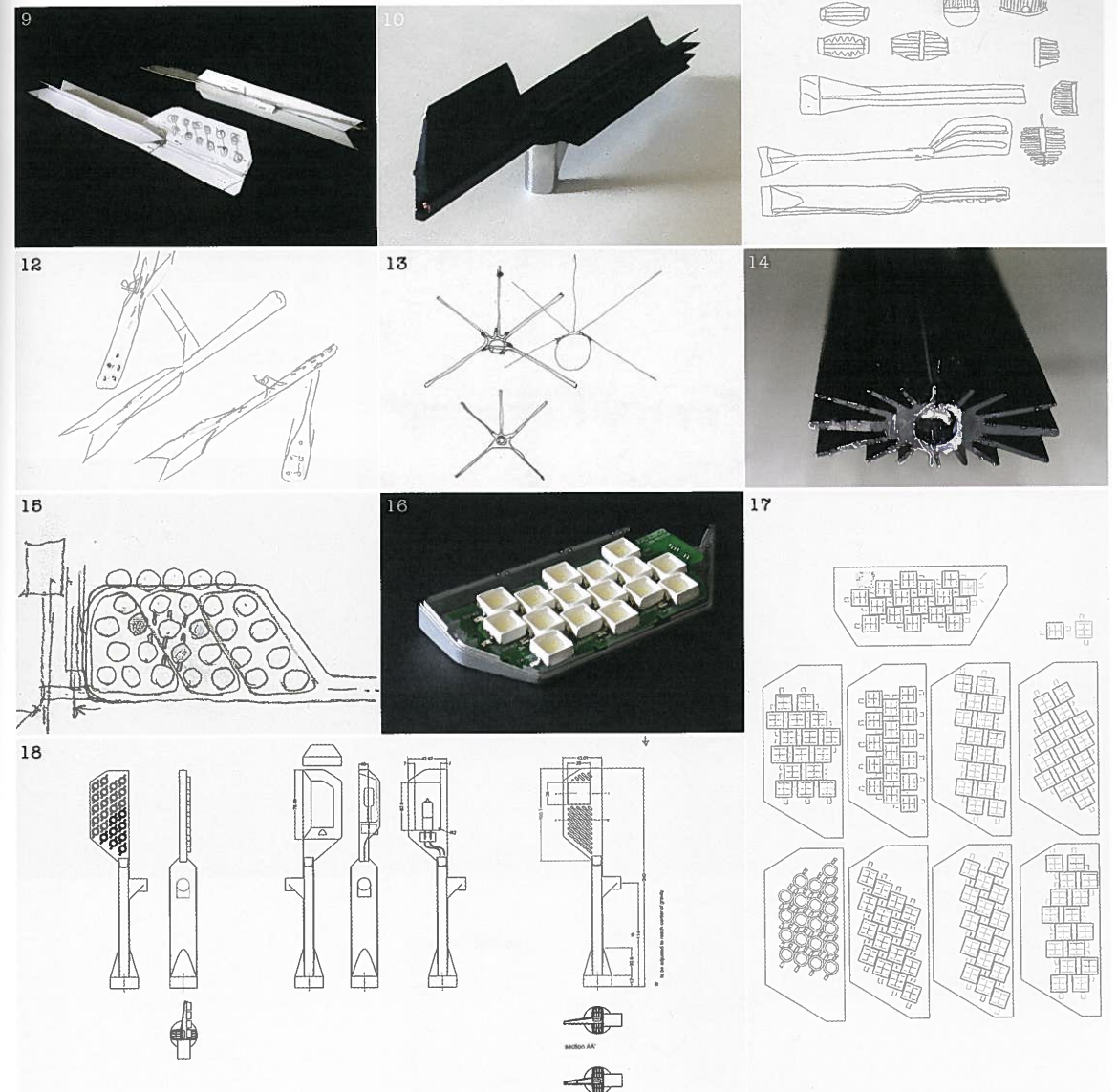


9-13. Models and drawings showing experiments for the cooling fins.

14. The cooling fins were designed to be contained in the radiator housing. The heat pipe can be clearly seen in the centre of the model.

15-17. Various LED configurations were discussed between Lucesco and Sapper, and sketches, models and technical drawings produced.

18. Alternative light sources. Two different kinds of LEDs (left and right) and halogen (centre) were also examined.

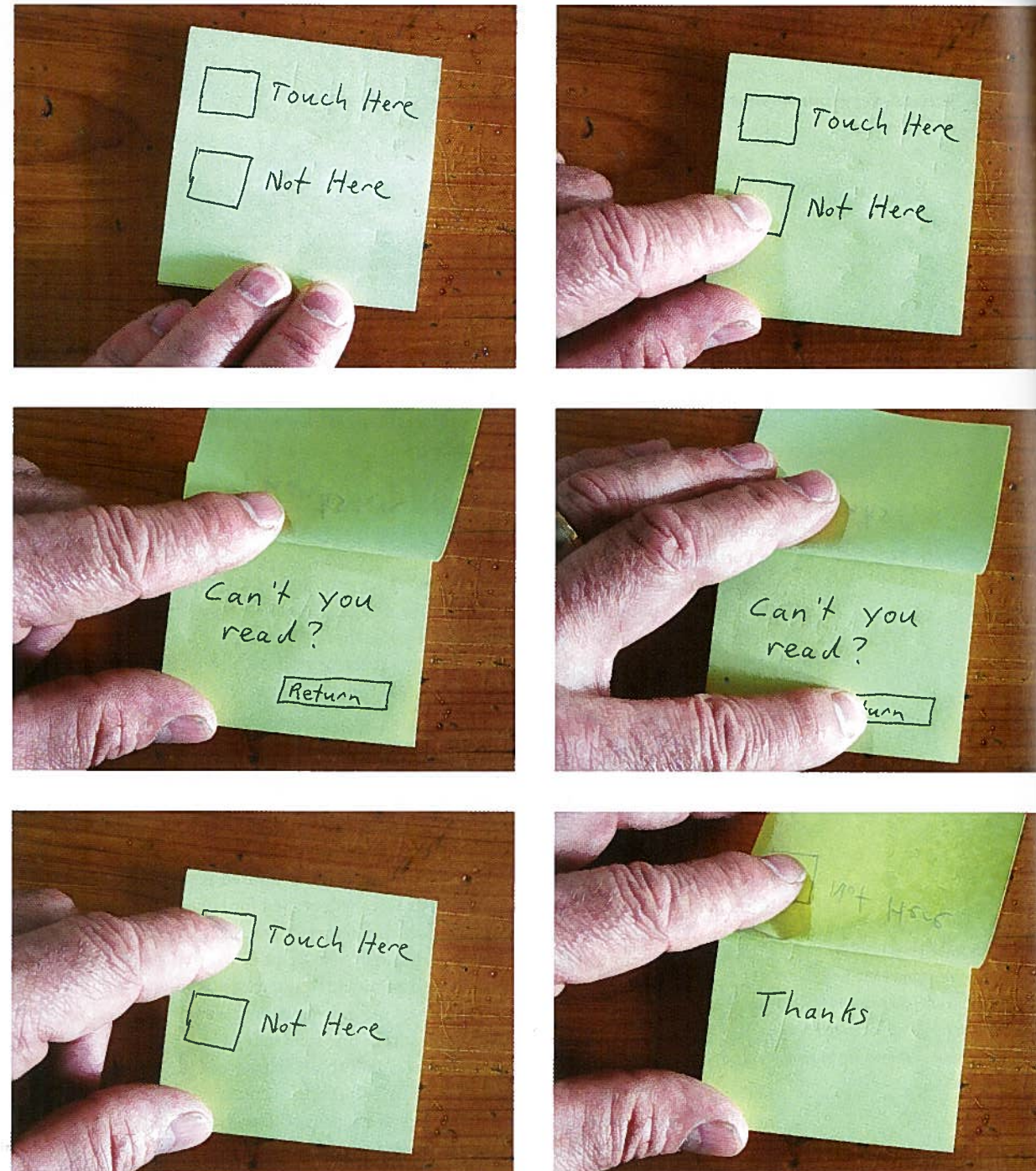


*images of Richard Sapper's Halley Lamp from Hudson's Process, 2008*



*image from Buxton, Sketching User Experience*



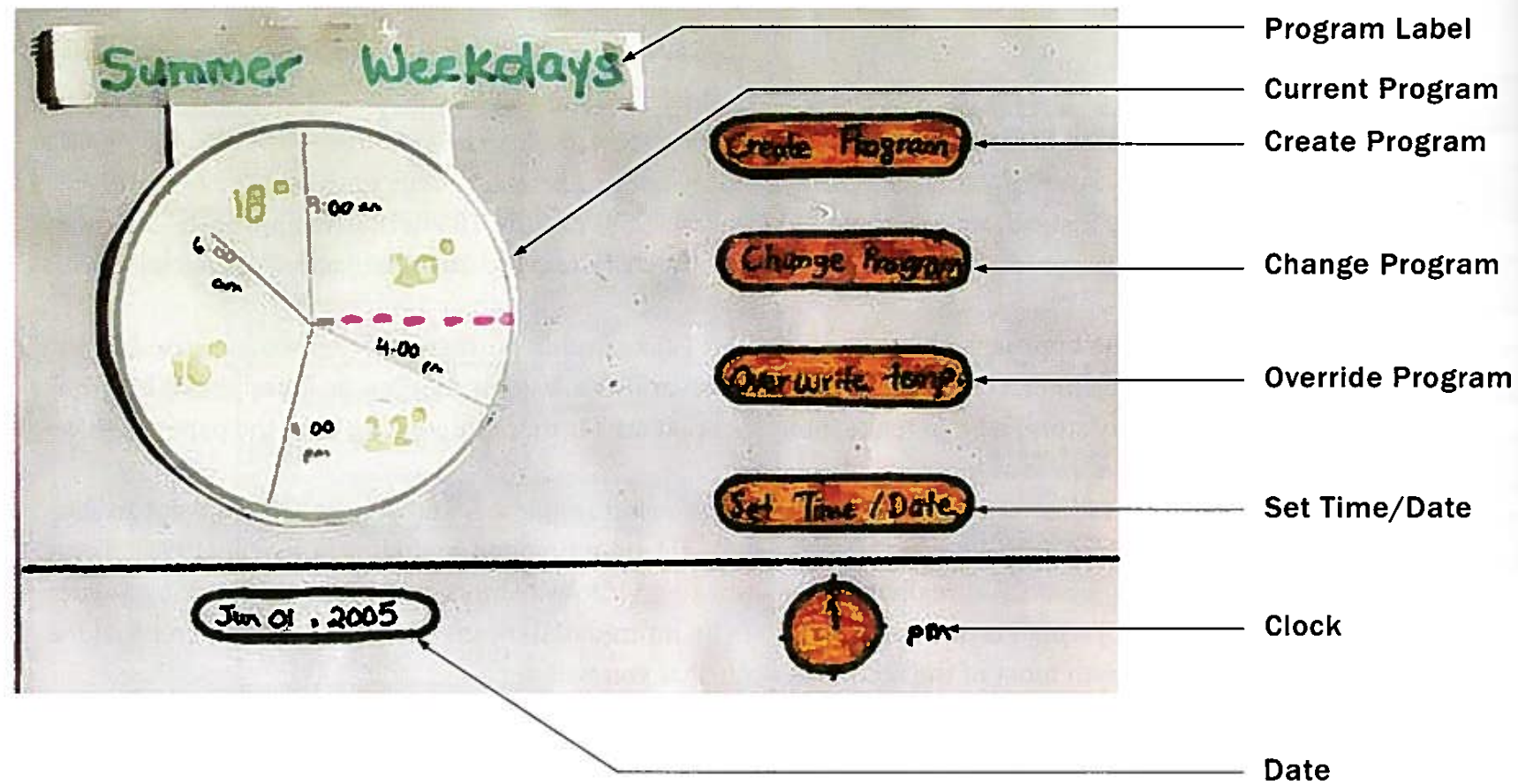


**Figure 143: A Simple Finger Exercise**

One can create and experience an interactive paper interface in two minutes with nothing more than Post-it notes and a pen. Push a button to go to a particular page. Push the wrong button and return to the first page.

*image from Buxton, Sketching User Experience*

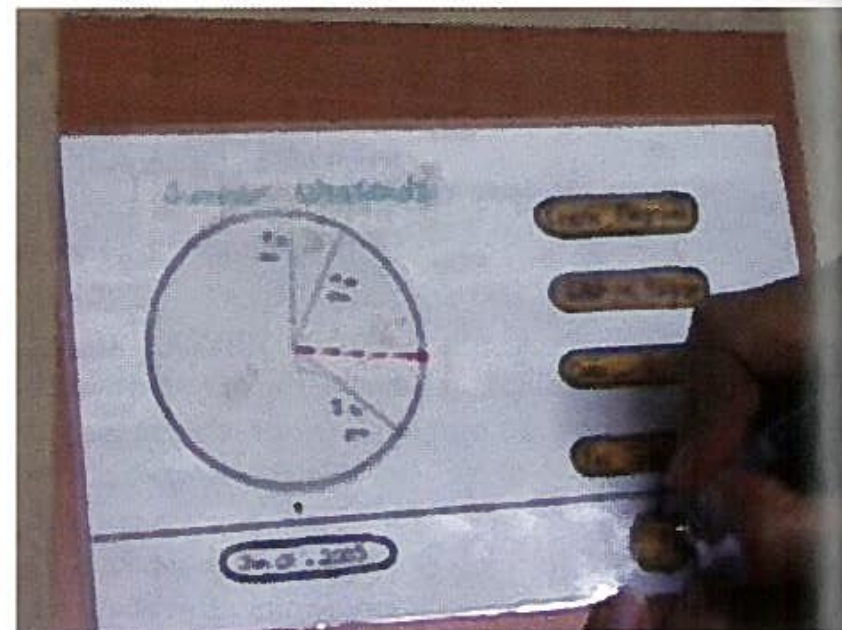
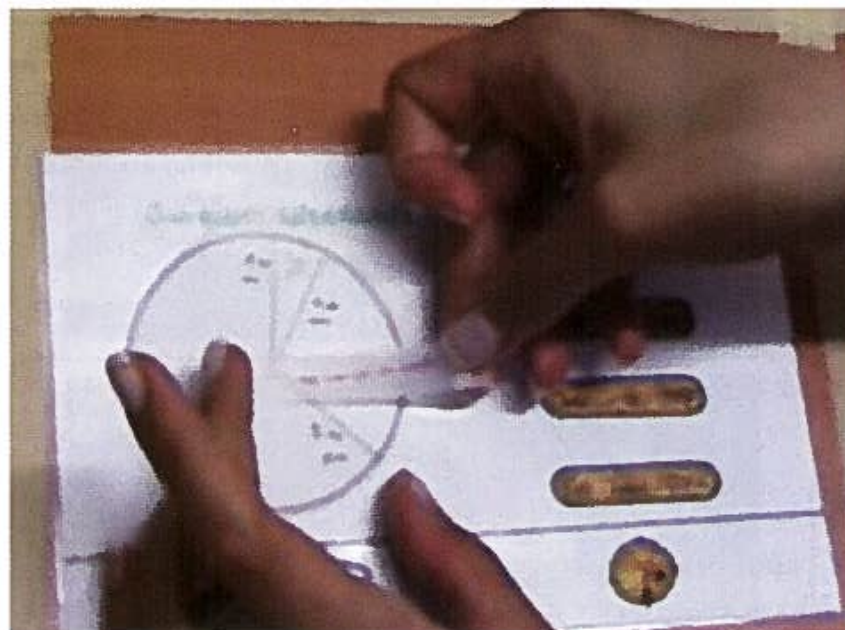
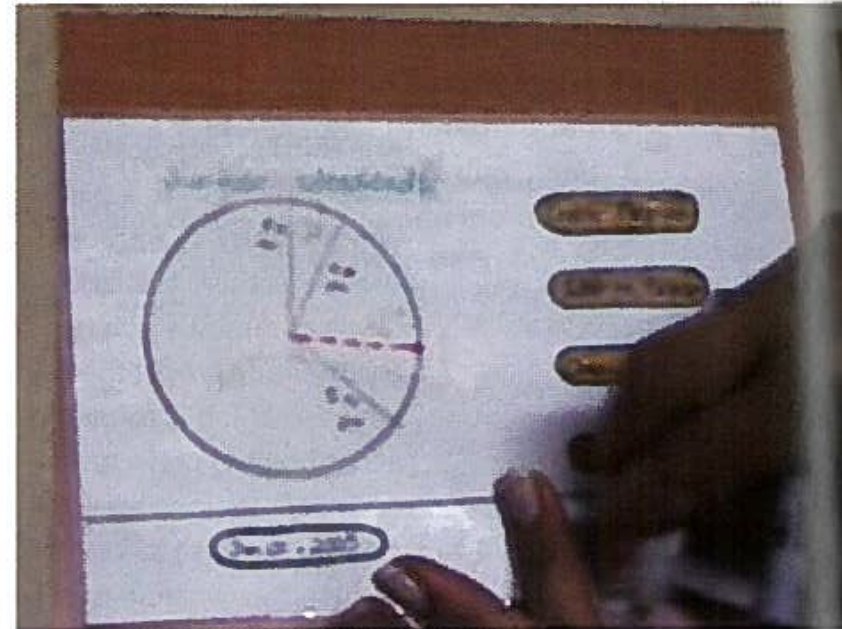
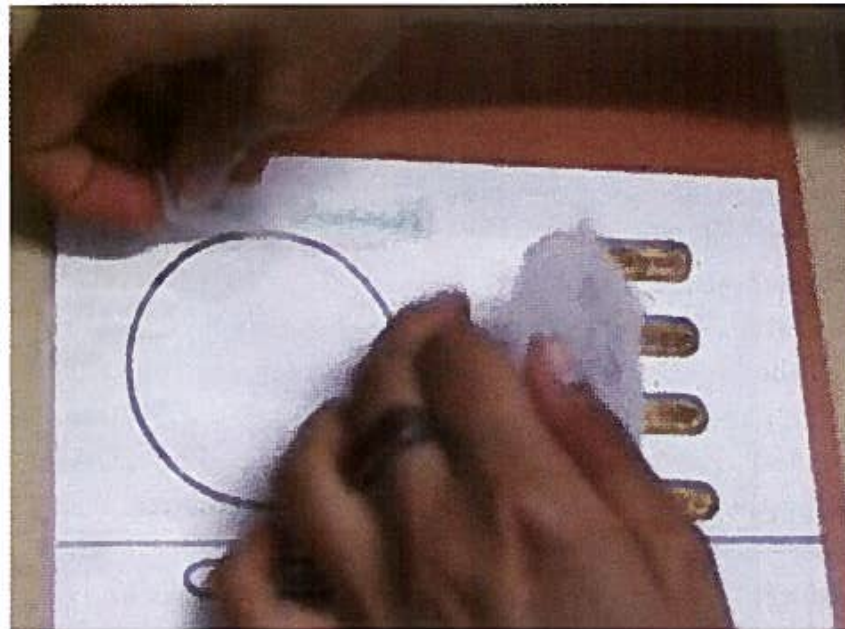




**Figure 145: Paper Interface to a Programmable Climate Control System**

The basic interface is made up of buttons and circular dials, and displays. The concept is that the user would interact directly on the screen by means of a touch screen.

*image from Buxton, Sketching User Experience*



*image from Buxton, Sketching User Experience*



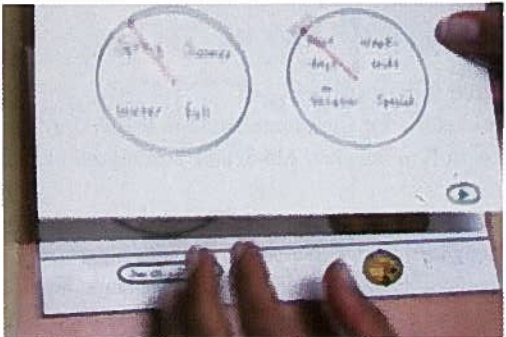
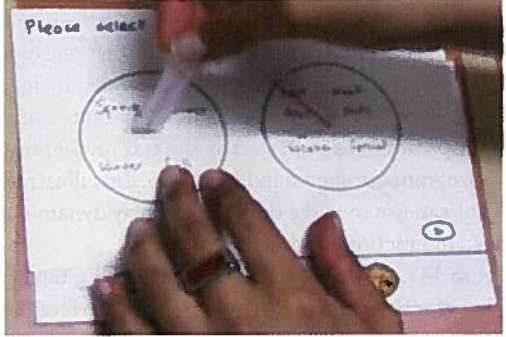


	<p>If the user pushes the Create Program button, the main part of the display is replaced by two dials. The left one shows the four seasons, the right one four options: "Week Day", "Weekend", "On Vacation", and "Special". The user selects the season and type of day by touching the appropriate "slice" of the display, or dragging the red dial indicator.</p>
	<p>The indicator is actually a piece of transparent tape that is stuck to the dial. The glue is like that on a Post-It. That is, it can be easily lifted up and stuck down in a new position. That is what the facilitator is doing in this image: moving the indicator to reflect the season chosen by the user.</p>
	<p>When the new program is set, the facilitator returns to the original screen, shown in Figure 66, and updates the Program Label.</p>
	<p>The "face" of the dial is also replaced with one that reflects the new program.</p>

Figure 146: Creating a New Program

Program

	from	to	temperature
Morning	7:00	9:00	15
Day	9:00	5:00	15
Evening	5:00	12:00	15
Night	12:00	7:00	15

---

Date

Time

Temperature

Today:  Time: 12:00

Time

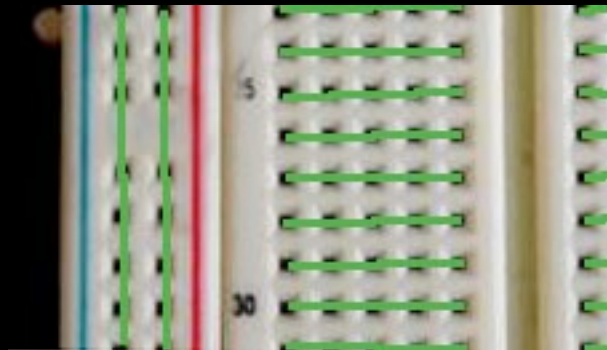
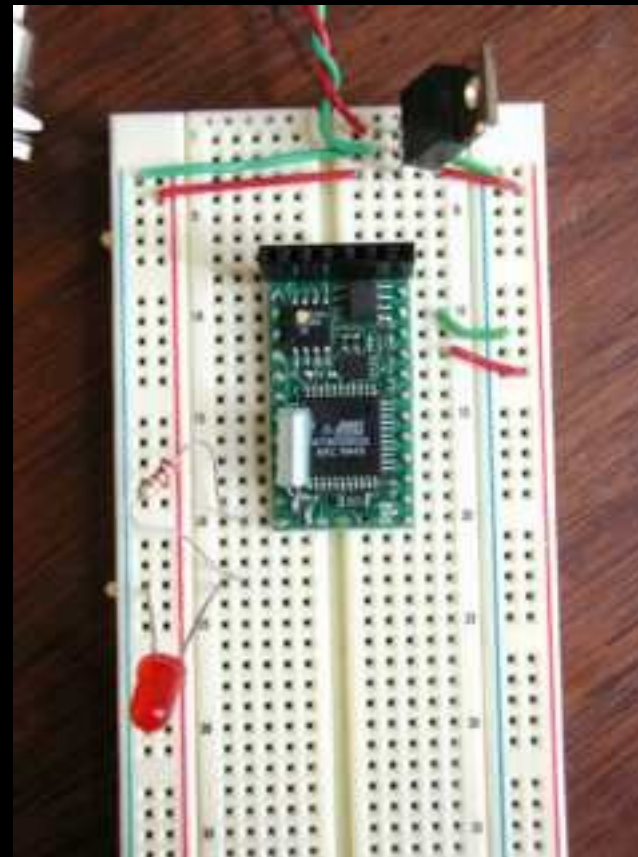
Temp.

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*image from Buxton, Sketching User Experience*



# Breadboarding:



*image from Tom Igoe, <http://www.tigoe.net/pcomp/code/understanding-electricity/breadboards>*



# Protoboarding:

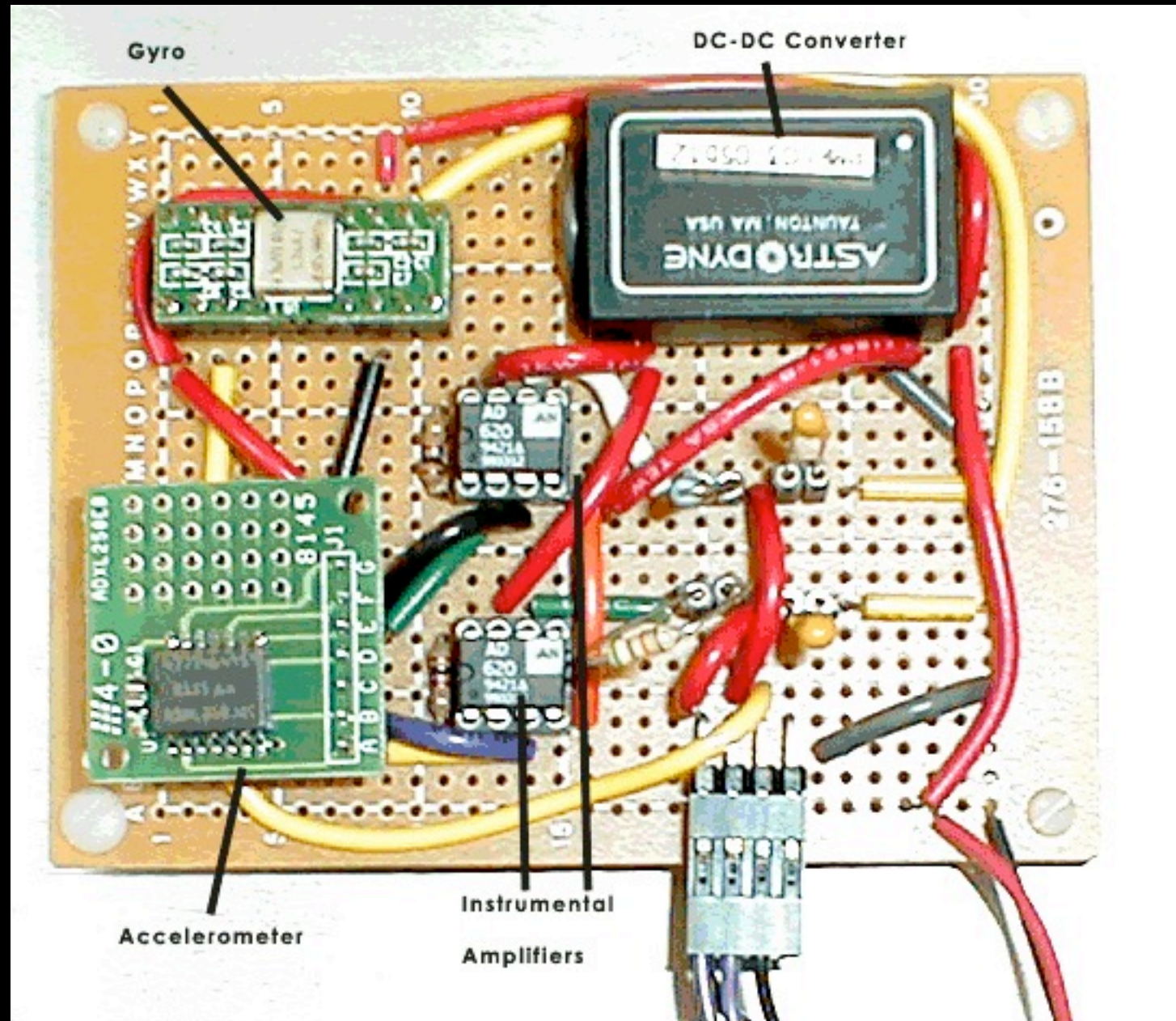


image from <http://coecsl.ece.uiuc.edu/ge423/spring04/group9/images/diagrams/protoboard2.gif>





# Sketching Activity

Boxes | 2 point perspective People | Hands