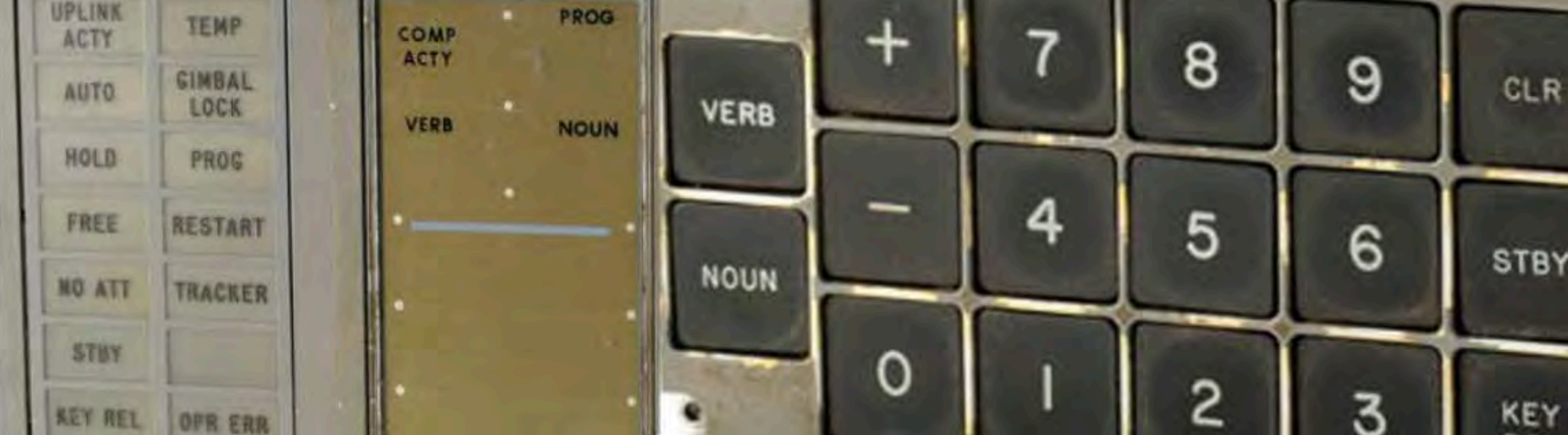


CS160

USER INTERFACE DESIGN

FALL 2020



HCI TOPICS

28 OCT 2020

ERIC PAULOS

www.paulos.net

UNIVERSITY OF CALIFORNIA



Berkeley



BACK TO GRAPHIC DESIGN

PRODUCT DESIGN IS ABOUT FORM AND FUNCTION

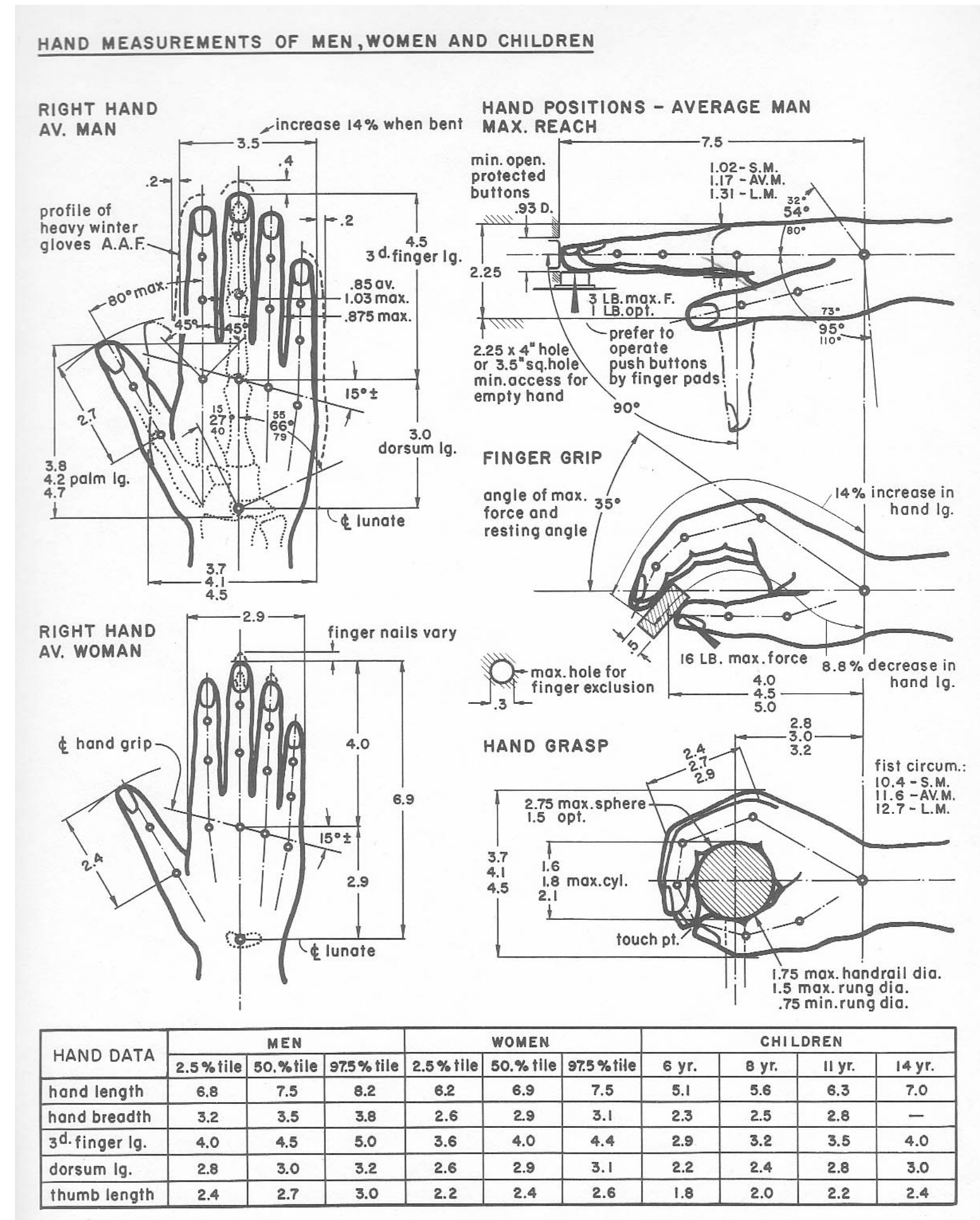
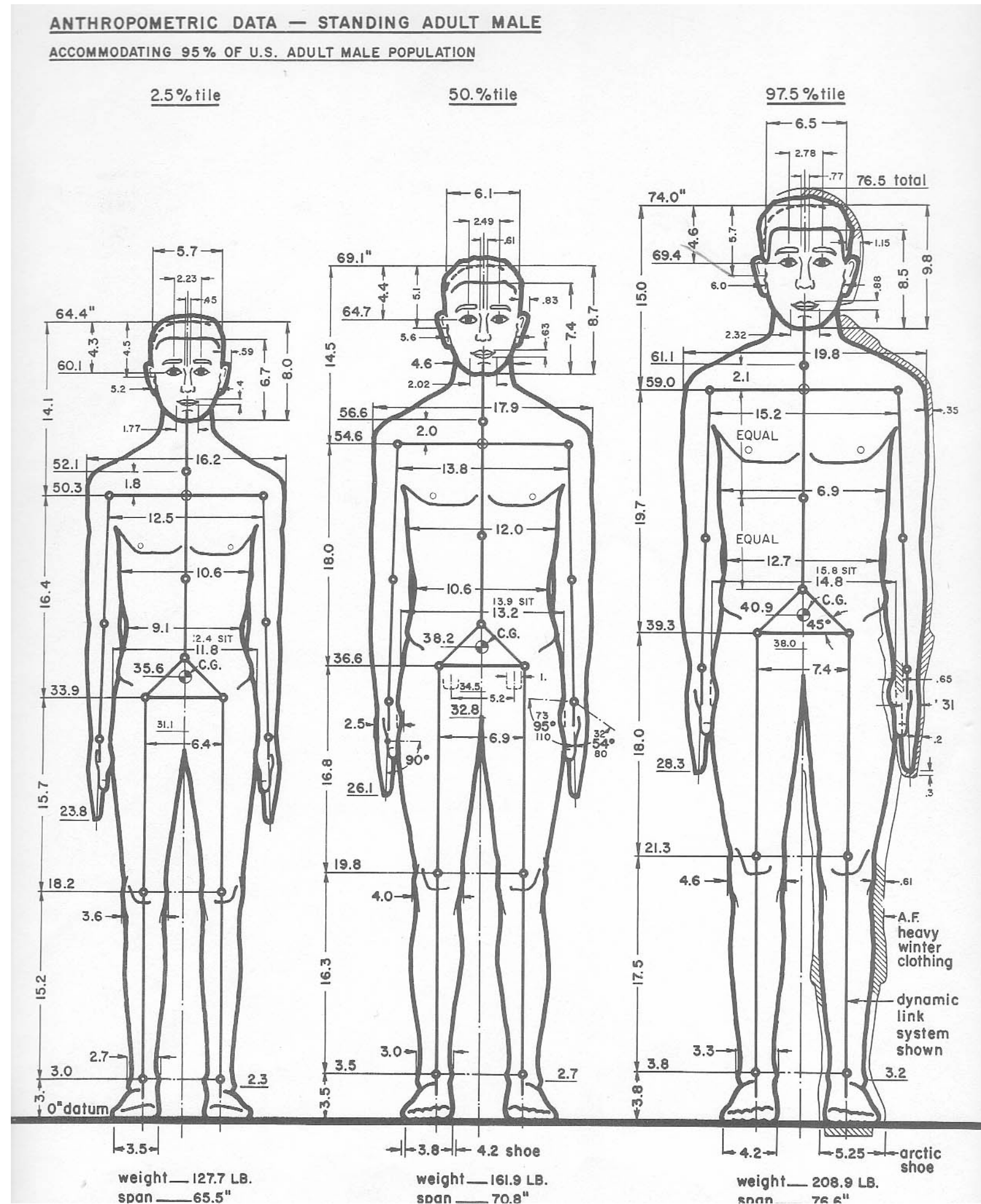


Philippe Starck, Juicer for Alessi



Oxo Angled Measuring Cup

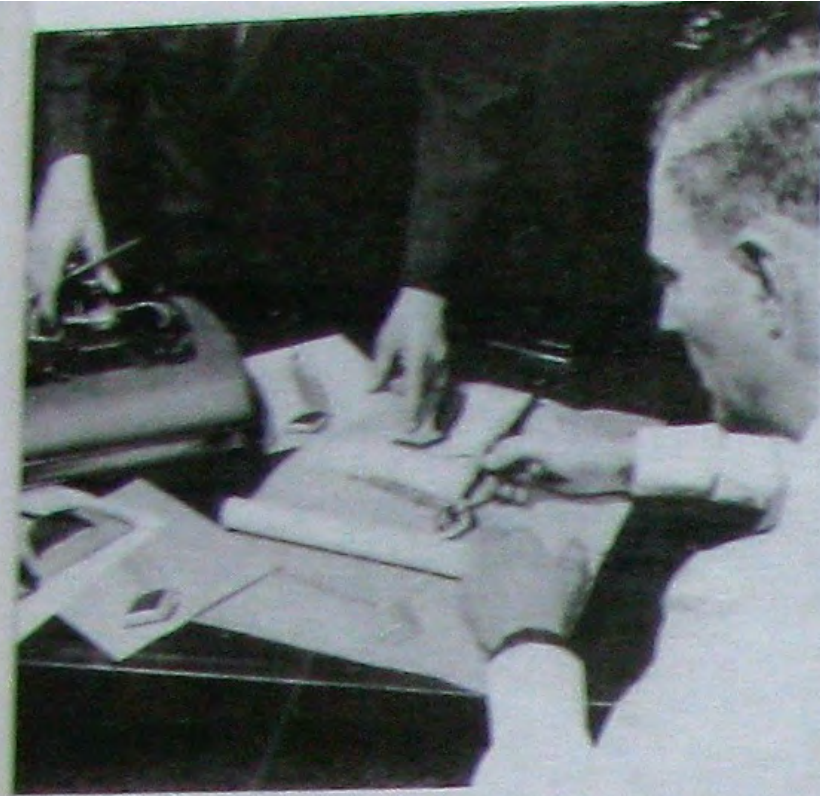
HENRY DREYFUSS: HUMAN FACTORS



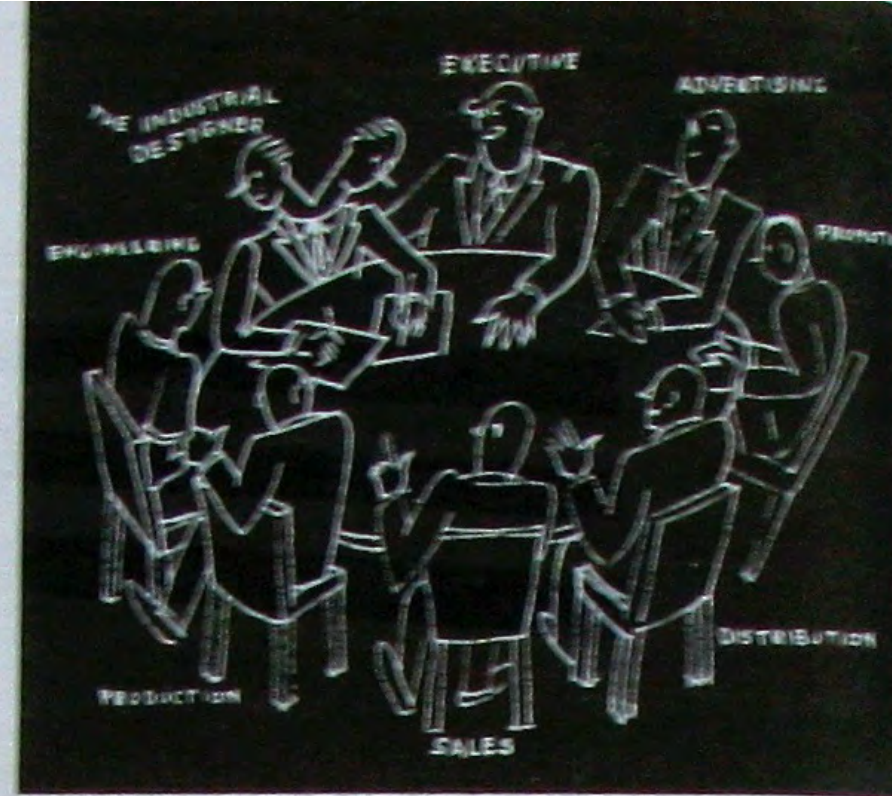
DREYFUSS: MODEL 500 PHONE



DREYFUSS: PROCESS



1. When the industrial designer is summoned by a potential client he must first conscientiously determine that he can make a positive contribution to the product. If, after study and consultation, it is found that he can, the following sequence of events is set in motion.



2. A meeting is held with the executive group, composed of department heads, to learn their objectives in terms of time, cost, techniques, and distribution. Only in this way can the industrial designer be sure that his ideas jibe with the practical facts of business life.



3. A thorough study is made of the market. The industrial designer assembles photographs of competitive lines. Often rival products are purchased and operated. Although the client, naturally, is cognizant of his competition, the designer sees it through different eyes.



4. Time is allocated to the study of factory methods and production facilities. This insures the industrial designer's becoming acquainted with any limitations that may exist, so he won't project a product that cannot be manufactured efficiently.



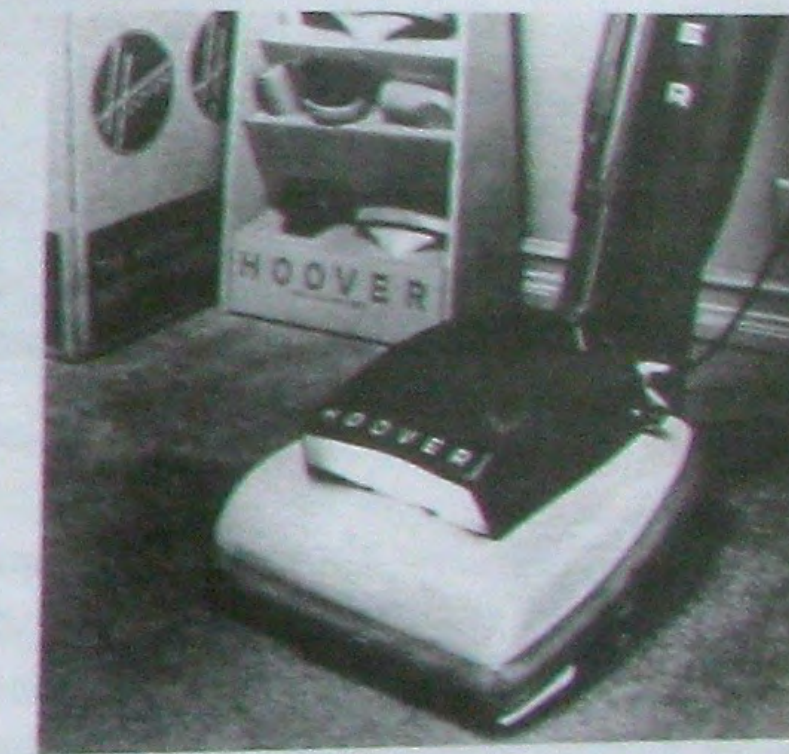
5. The industrial designer enters into close co-operation with the client's engineering personnel. Their offices become as one. Together they go over countless sketches, working drawings, and blueprints. Three-dimensional models are developed in clay, plaster, wood, or plastic.



6. The final model—a working one, if possible—is presented to the entire client group by the industrial designer and the client engineers. The presentation is designed to show management what they will get, when they will get it, and what it will sell for.



7. Agreement on a final working model is a milestone, but the industrial designer's work is far from done. He continues to work with the engineers and toolmakers, making every effort to integrate changes if they will improve the product or the price picture.

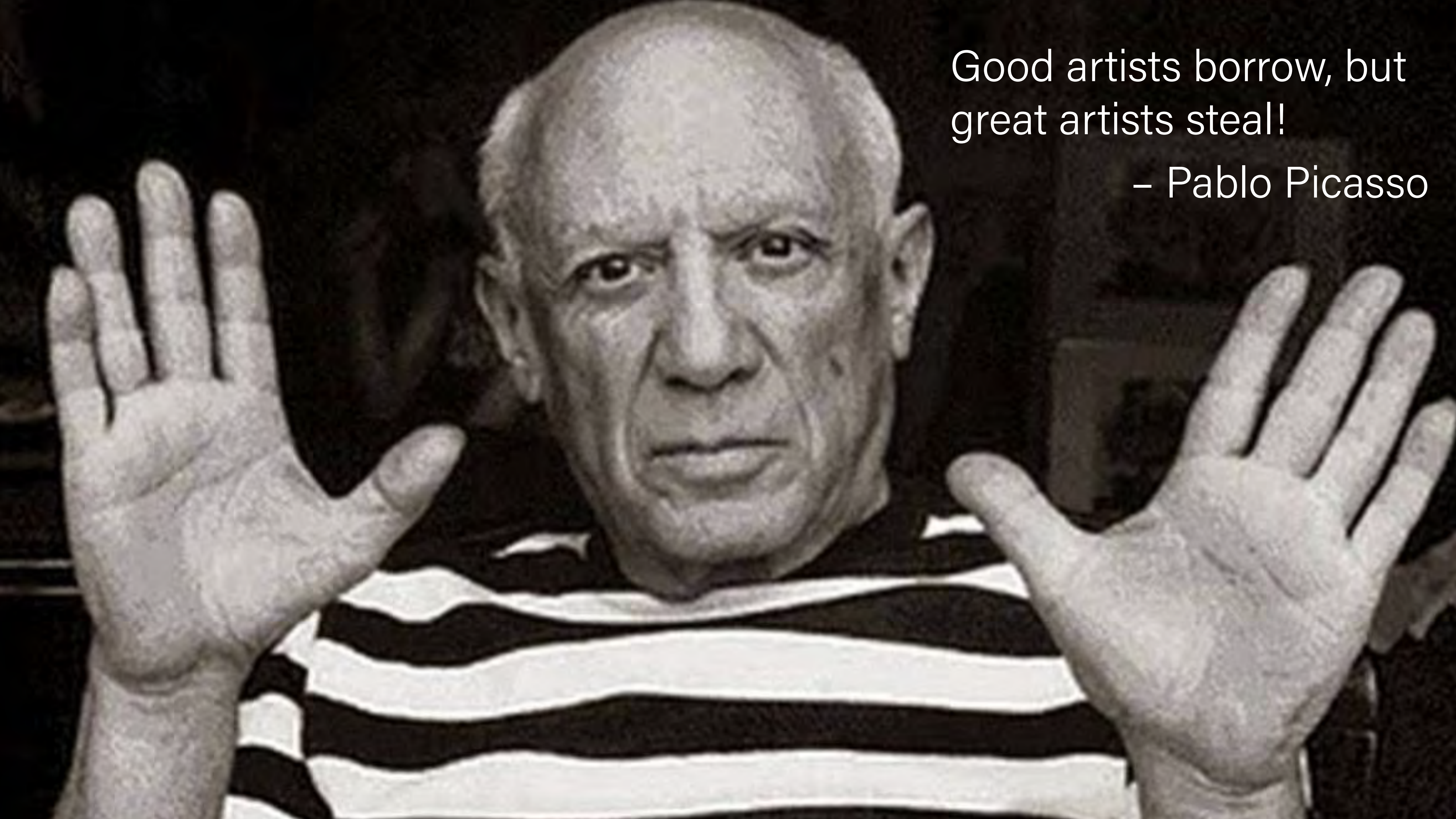


8. If the product is to be packaged, the industrial designer goes to work on the container, carton, and price tags. He interests himself in these matters because they complement the product. Often they create the invaluable first impression in the mind of the customer.

the successful competitor must be a man of many hats, as is shown by



SIMPLICITY AND ELEGANCE



Good artists borrow, but
great artists steal!

– Pablo Picasso

SIMPLICITY

Simple, minimalist, designs are often most effective



ELEGANCE

Reduction: Only include essential elements

Regularization: Use one set of shapes, colors, forms etc.

Leverage: Use elements in multiple roles



BENEFIT: APPROACHABILITY

Visual elements rapidly understood - invite further exploration



BENEFIT: RECOGNIZABILITY

Less visual clutter makes it easier to recognize what is there

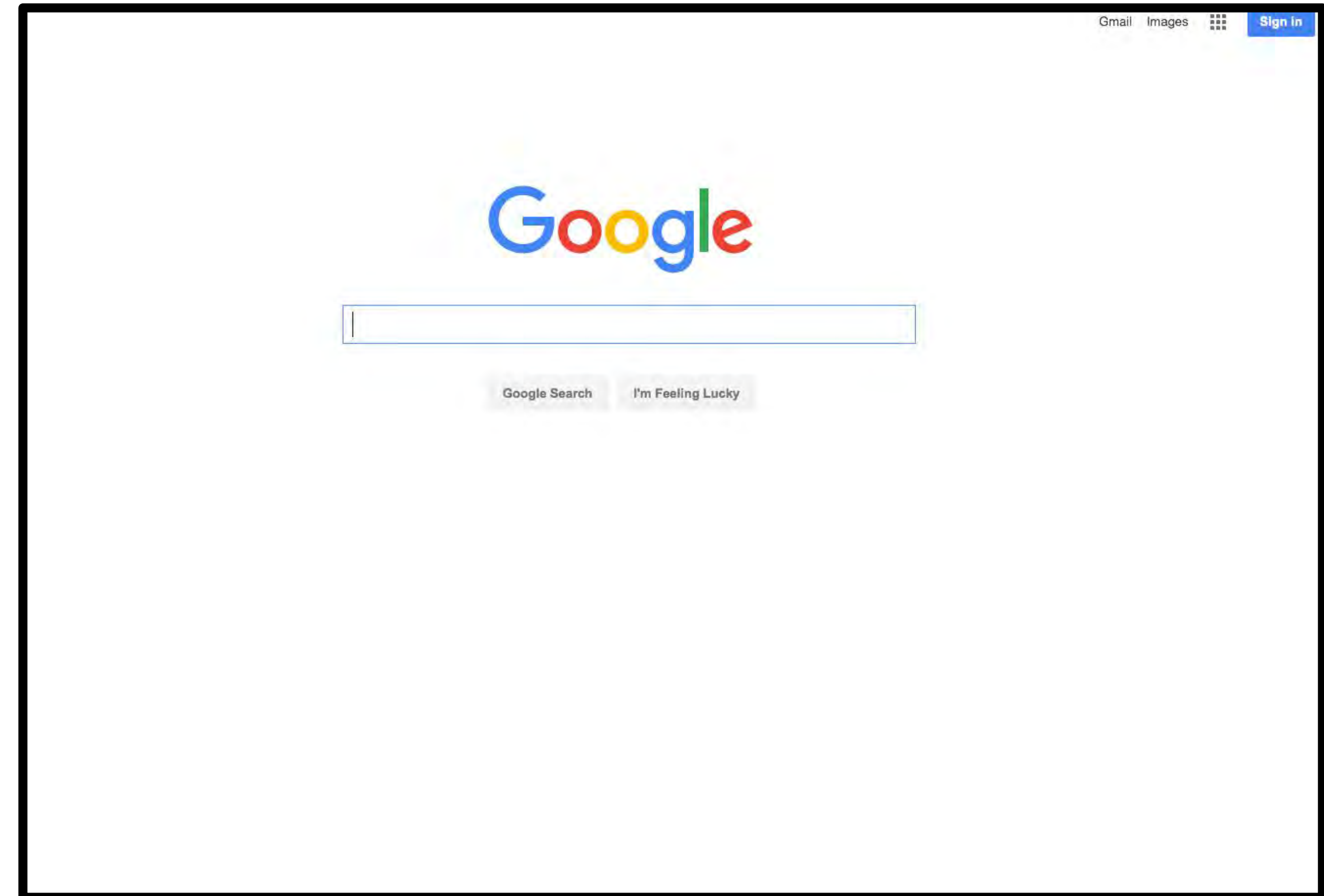




BENEFIT: IMMEDIACY

Eye is immediately drawn to important visual elements

Details that remain are more prominent

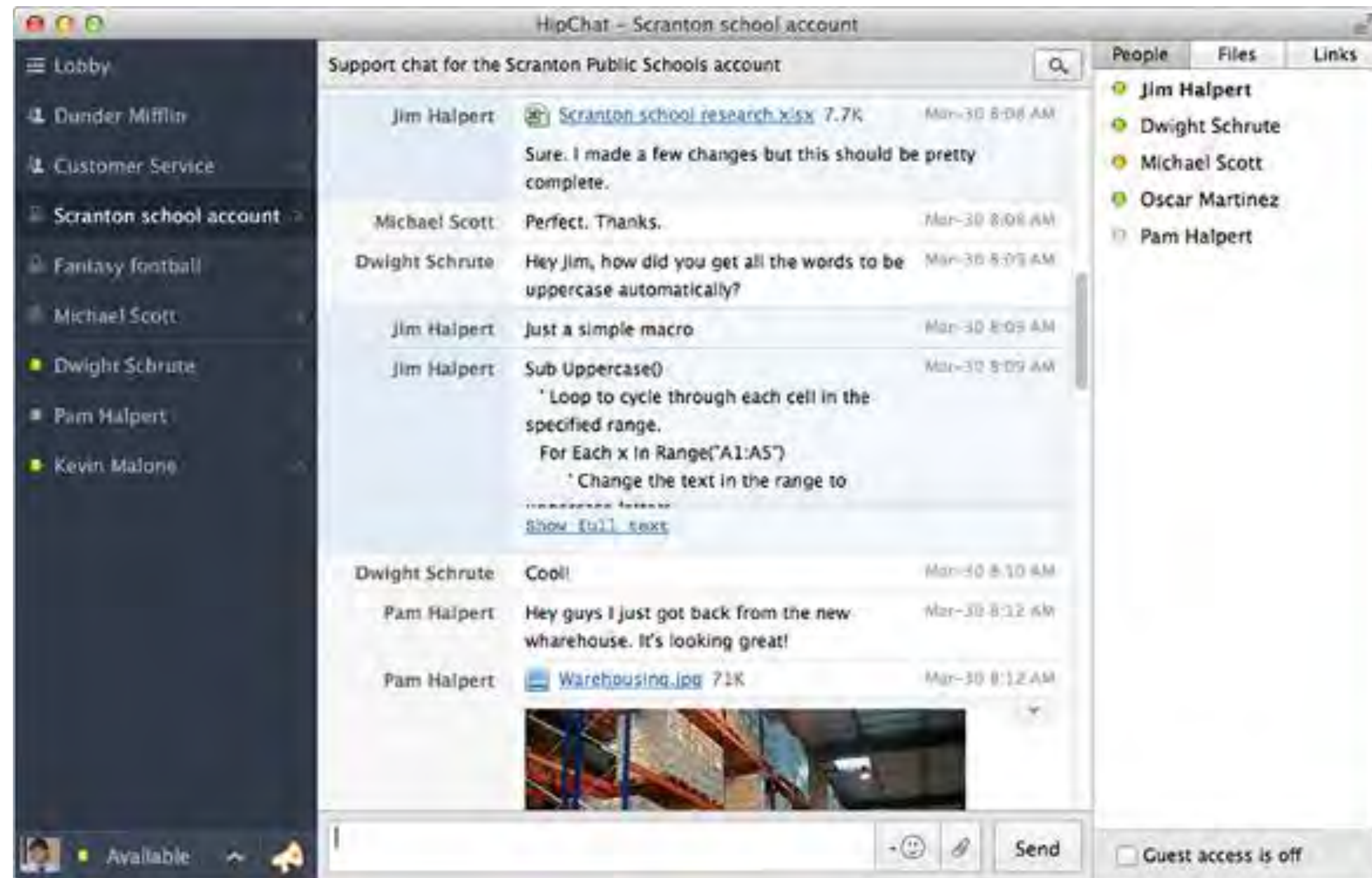


EMOTION AND MOOD

Which would you rather use?

They both do exactly the same thing, but one feels dull and the other feels electric and playful.

Why?



EMOTION AND MOOD

“We gave it the color scheme of a video game, not an enterprise collaboration product.”

“Slack acts like your wise-cracking robot sidekick, instead of the boring enterprise chat tool it would otherwise be.”



UNITY

One path to simplicity & elegance is through unifying themes:

Forms, colors, components with like qualities

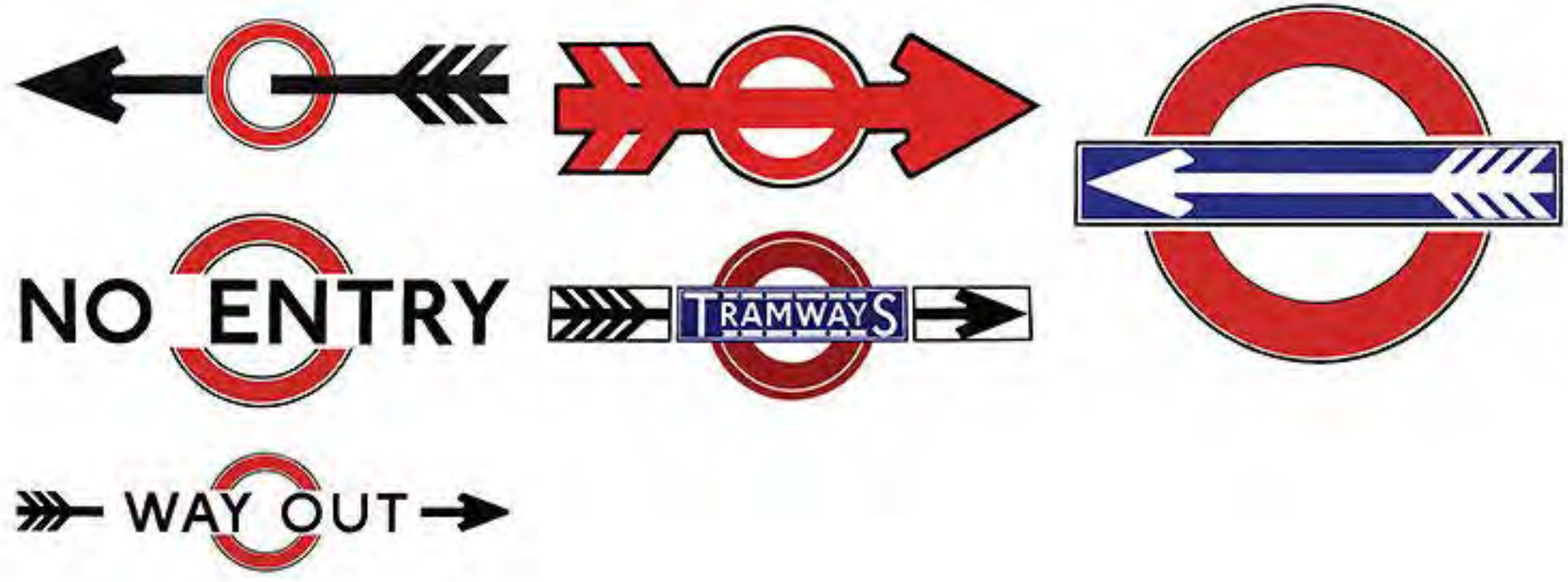


DESIGN LANGUAGE

A **design language** or **design vocabulary** is an overarching scheme or style that guides the design of a complement of products or architectural settings. Designers wishing to give their suite of products a unique but consistent look and feel define a design language for it, which can describe choices for design aspects such as materials, colour schemes, shapes, patterns, textures, or layouts. They then follow the scheme in the design of each object in the suite.



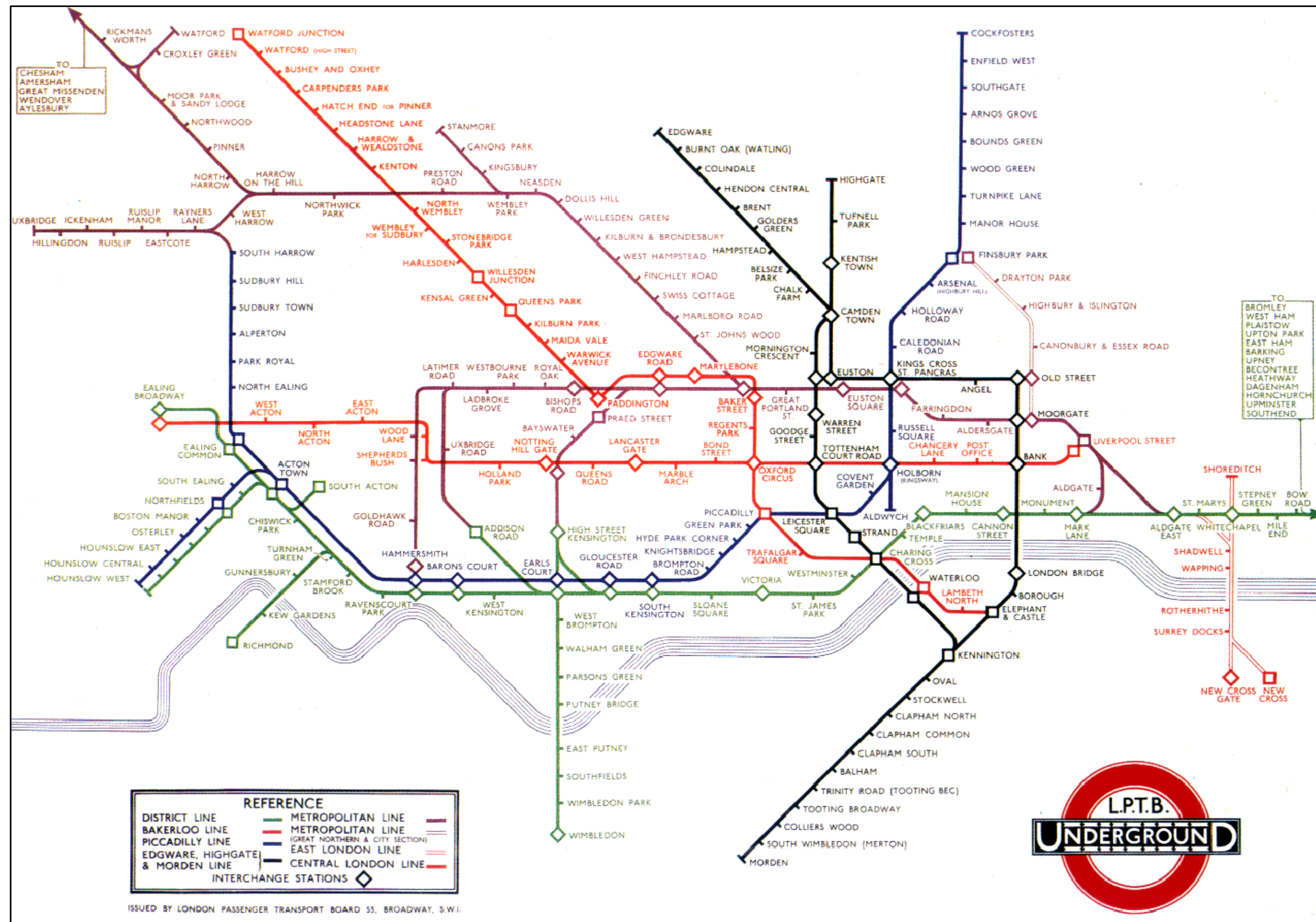
DESIGN LANGUAGE



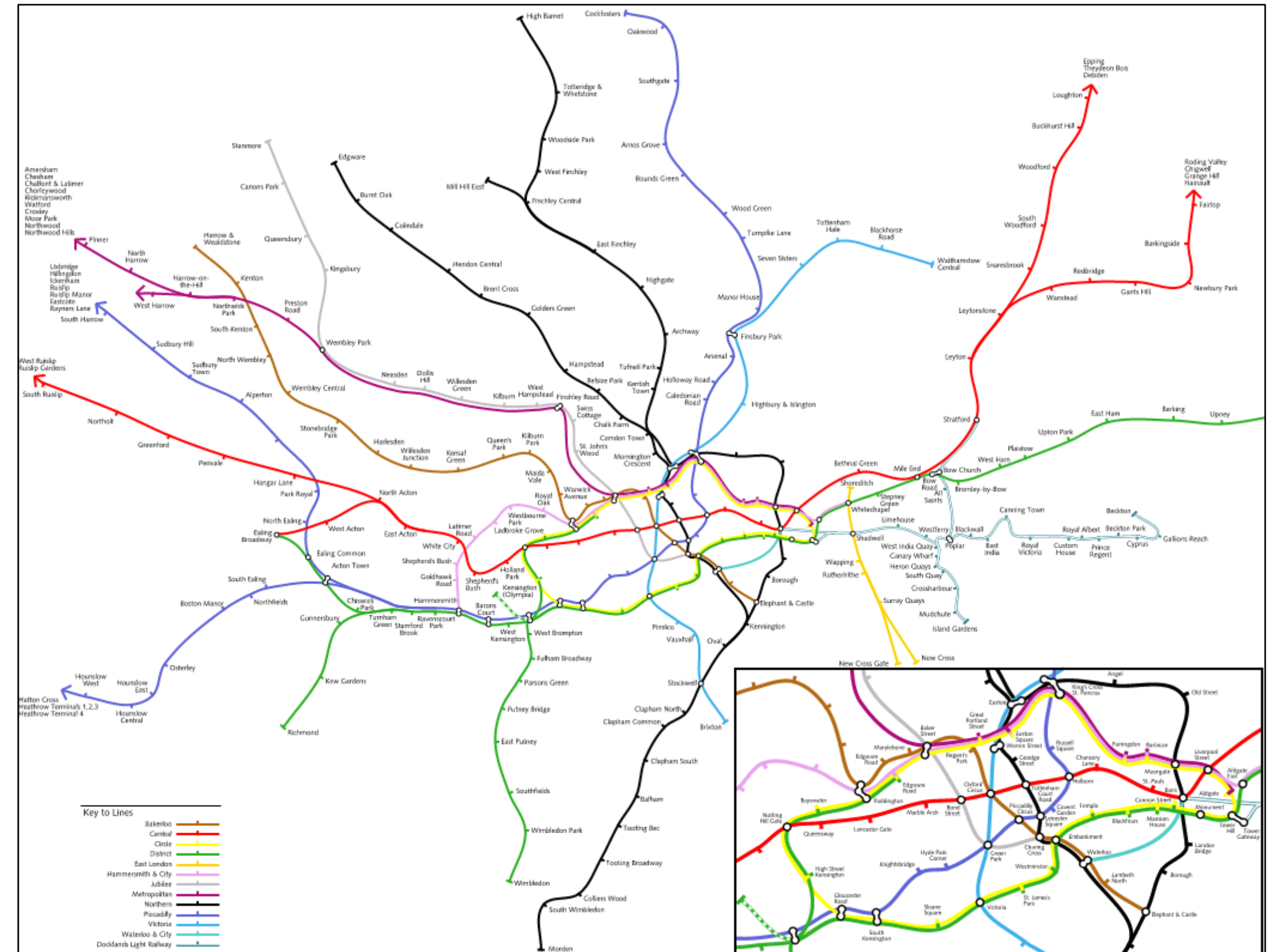
REFINEMENT

Draw viewers' attention to essential information

Straighten subway lines to emphasize sequence of stops

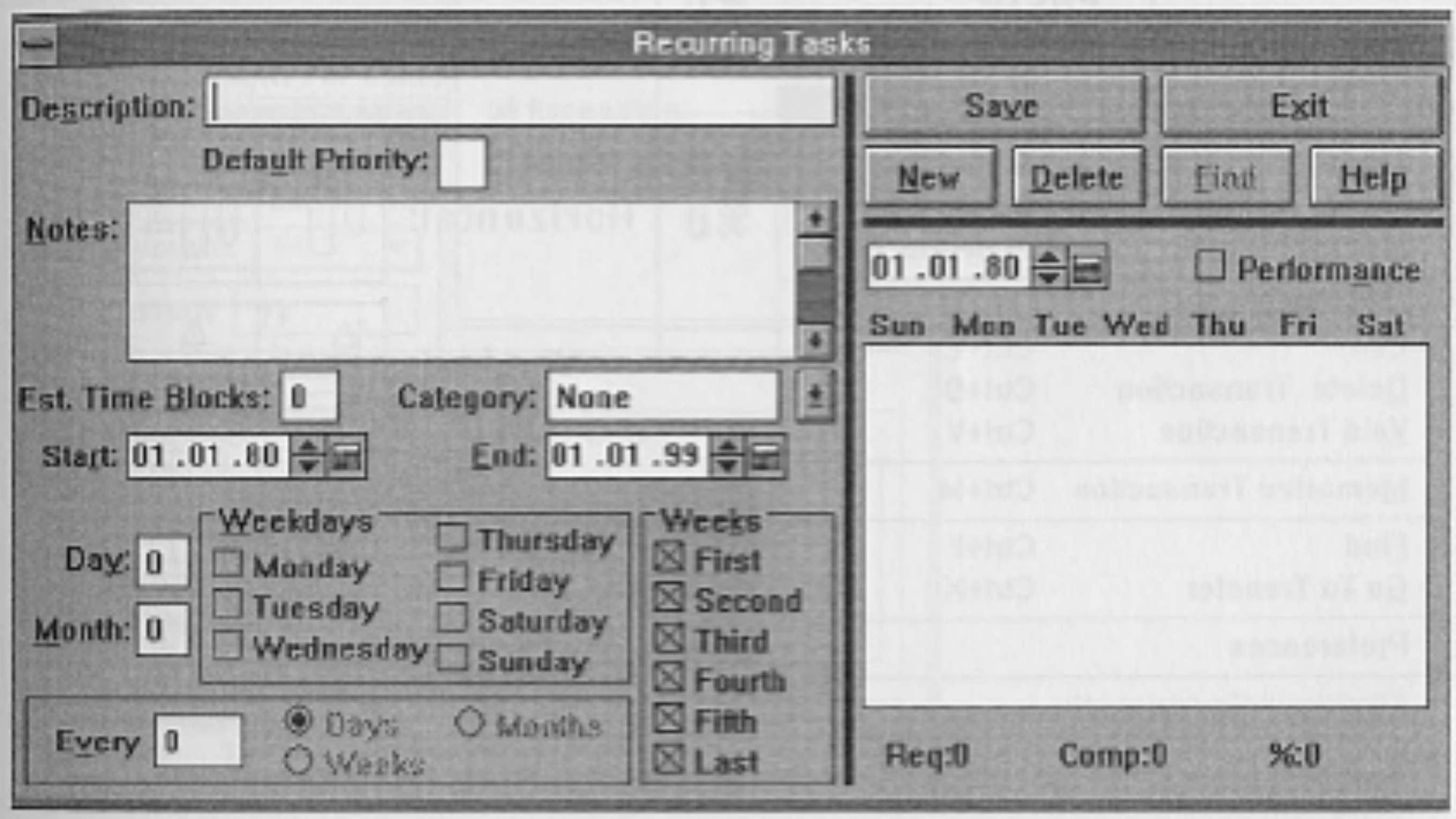
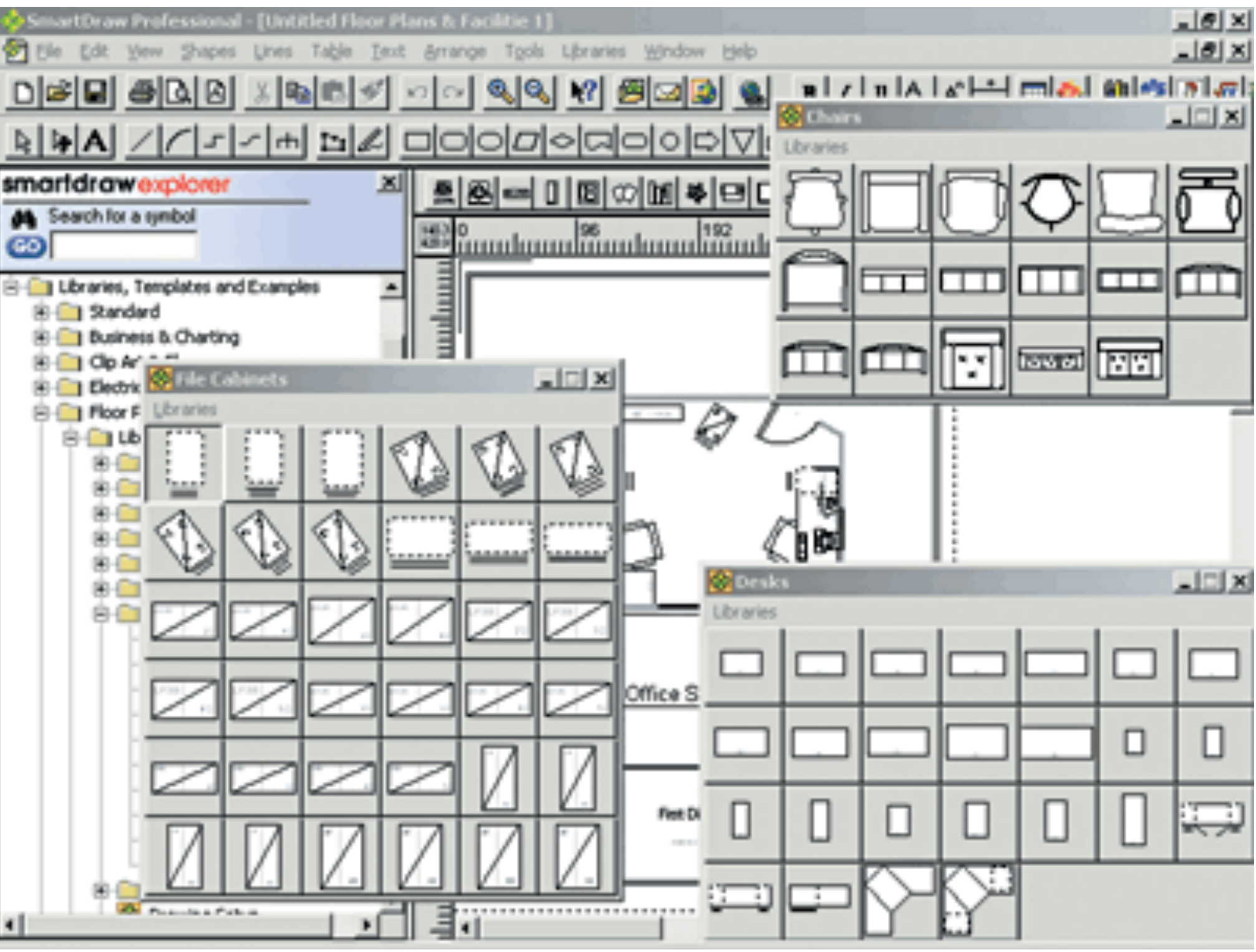


London Underground [Beck 33]

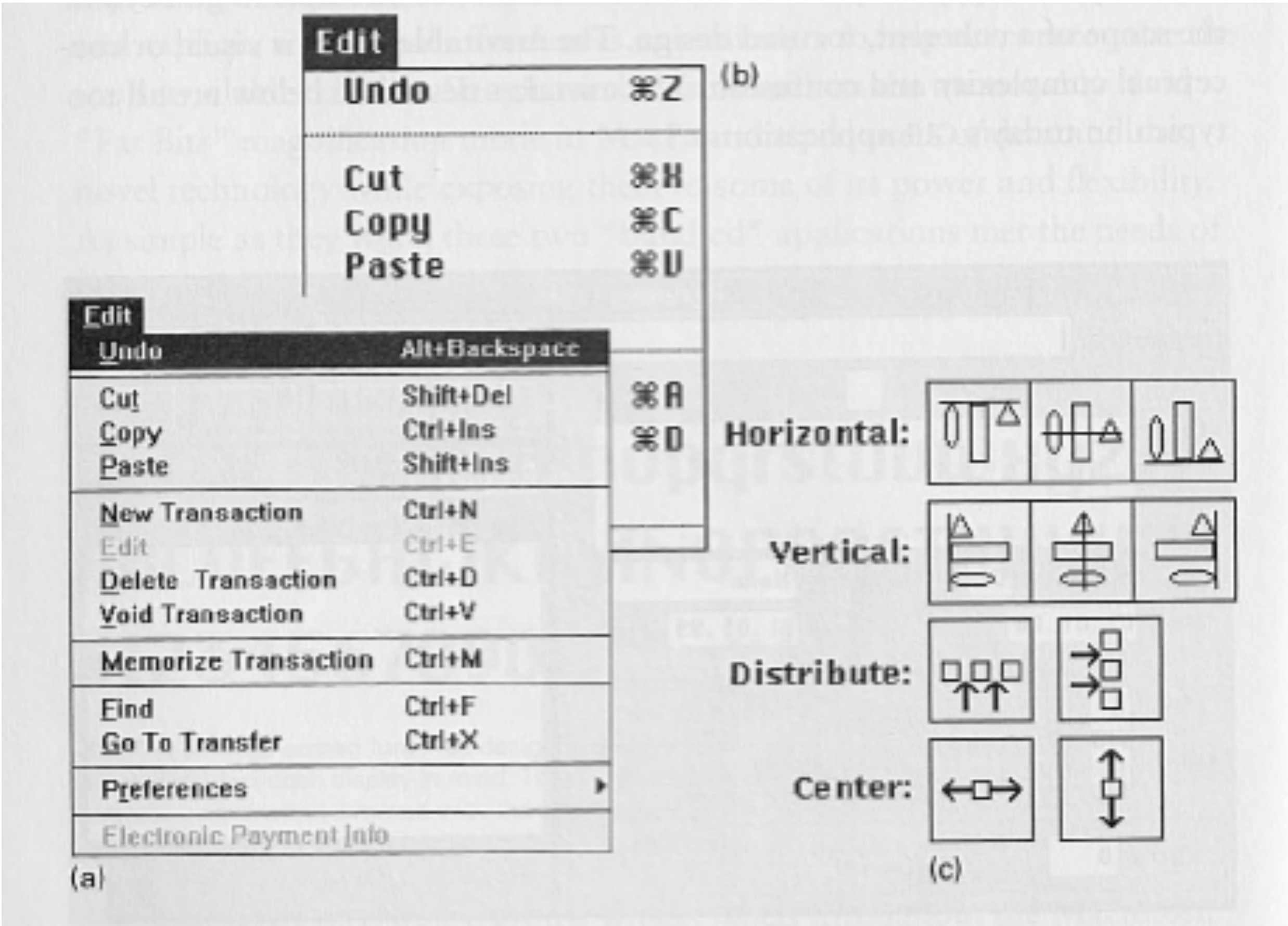


Geographic version of map

MISTAKES: CLUTTER & NOISE



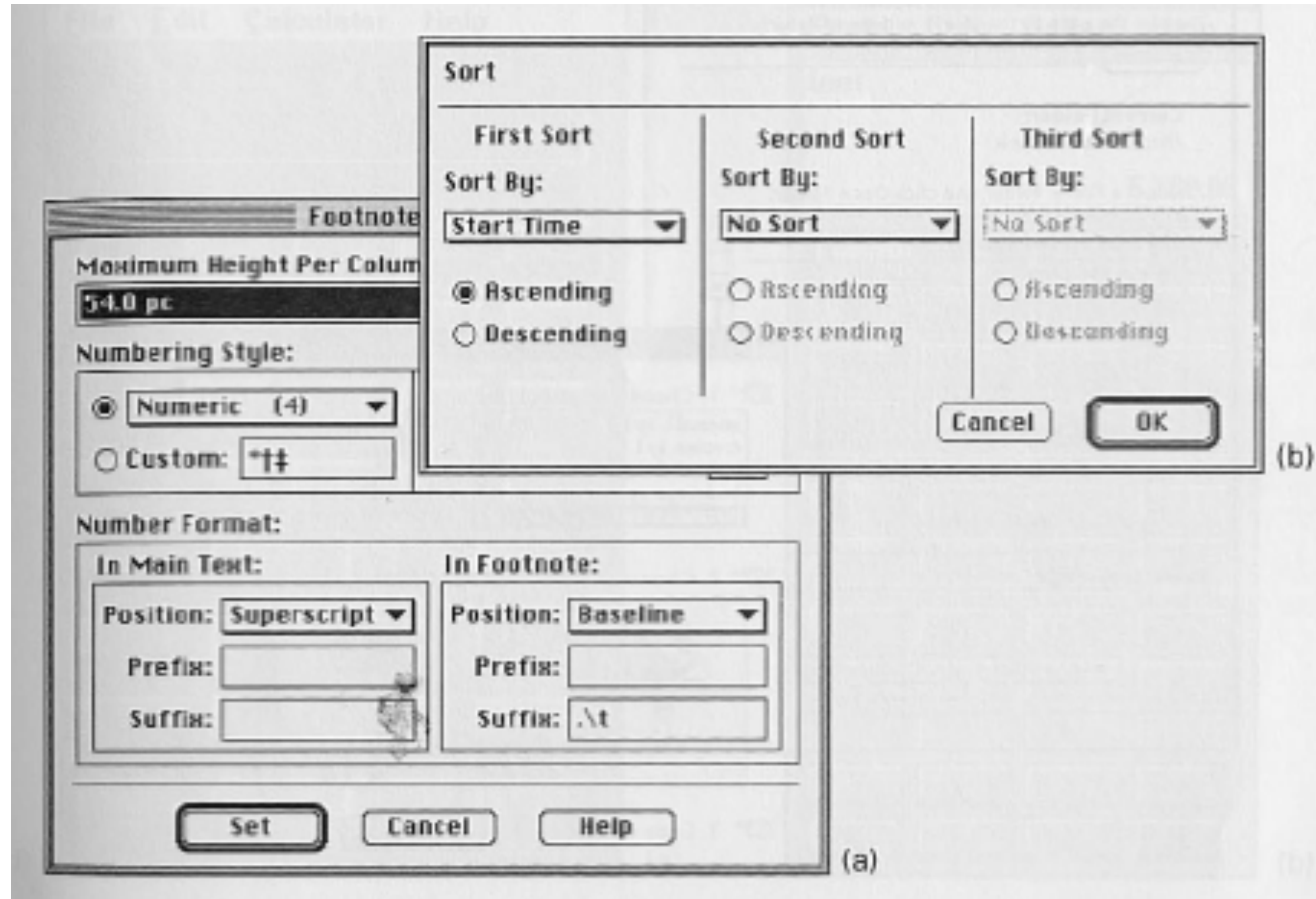
MISTAKES: INTERFERENCE



Shortcuts interfere with menu labels in (a) not in (b).

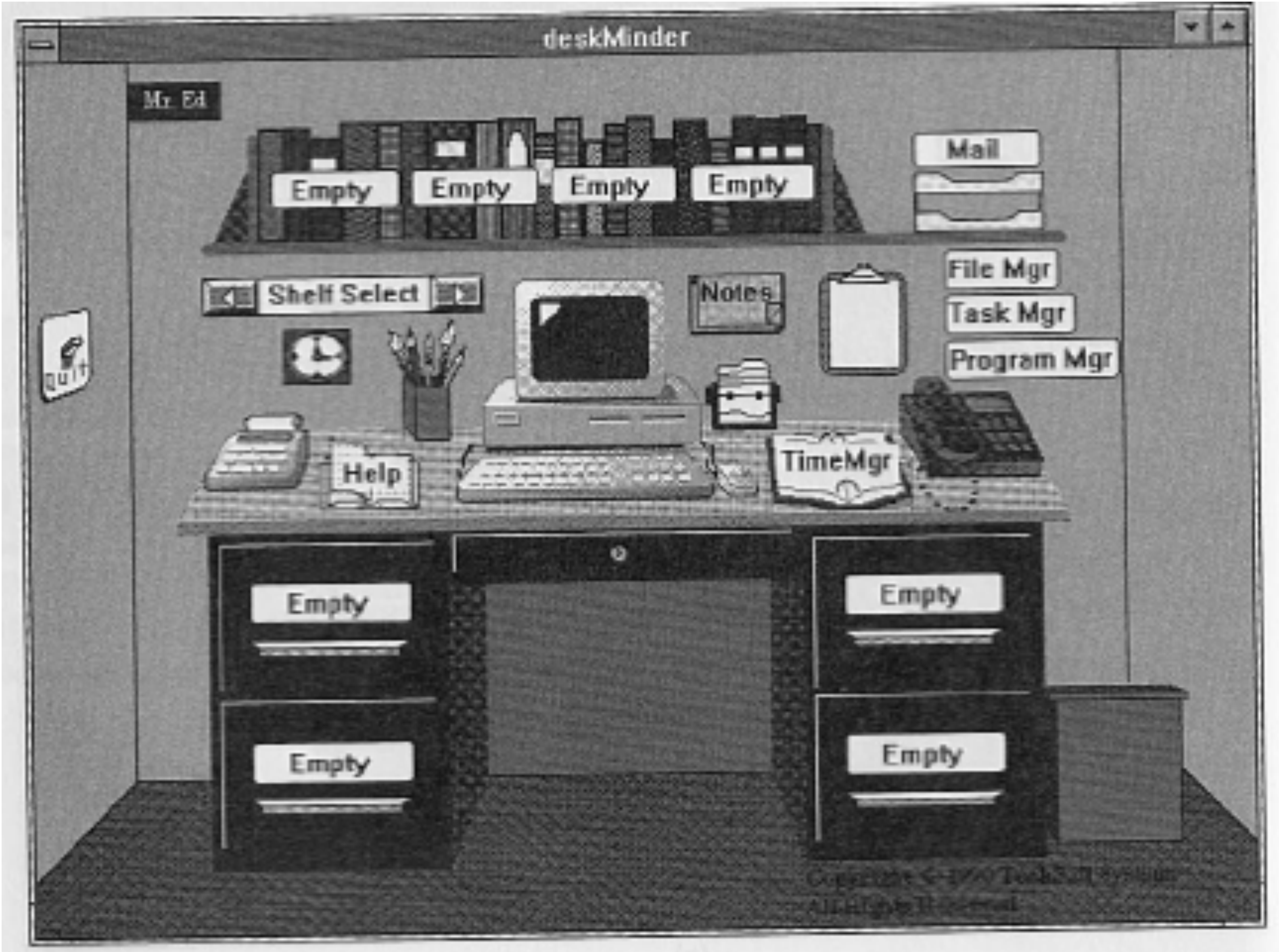
Different shapes cause confusion in alignment tools

MISTAKES: TOO MUCH STRUCTURE

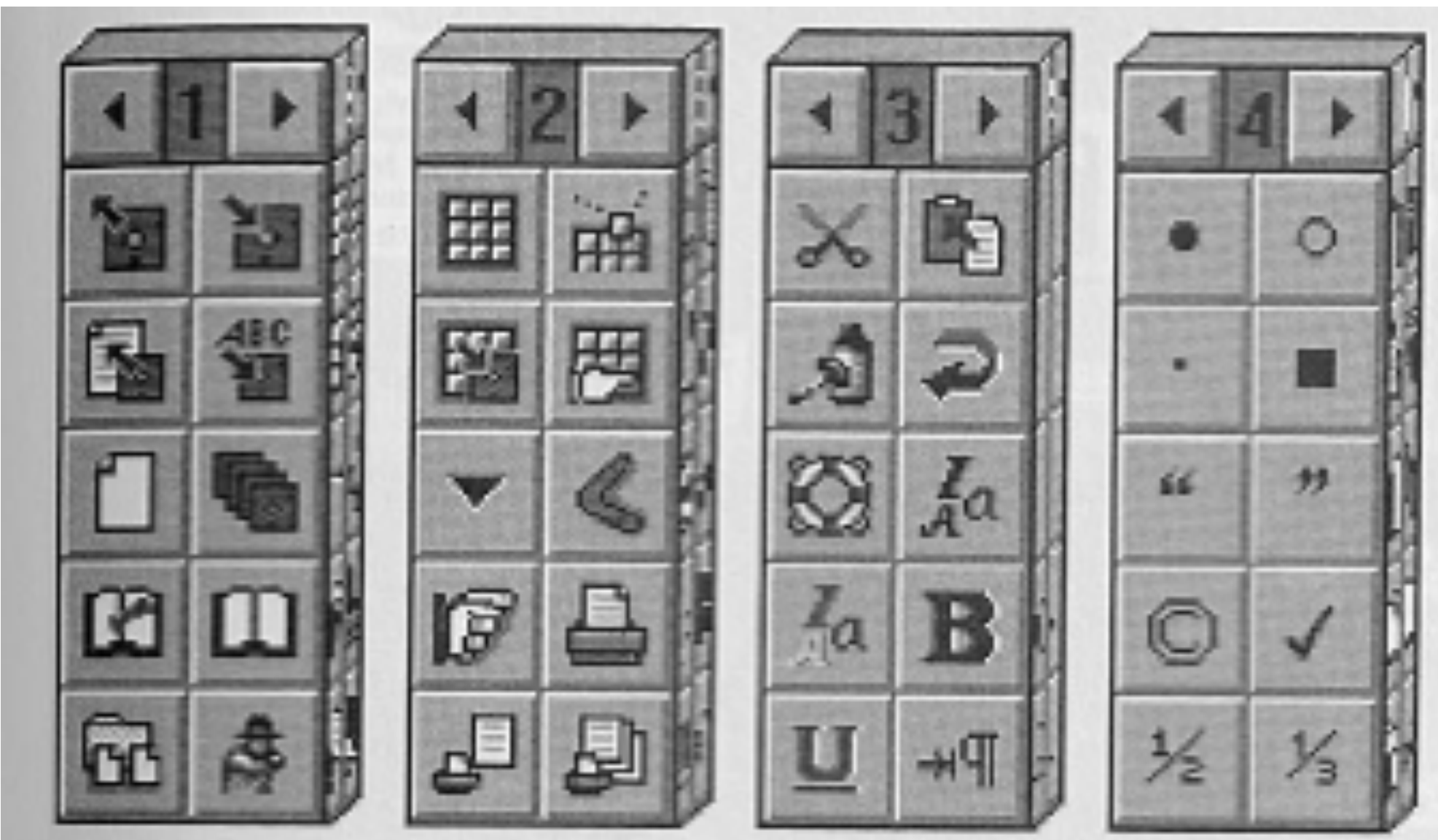
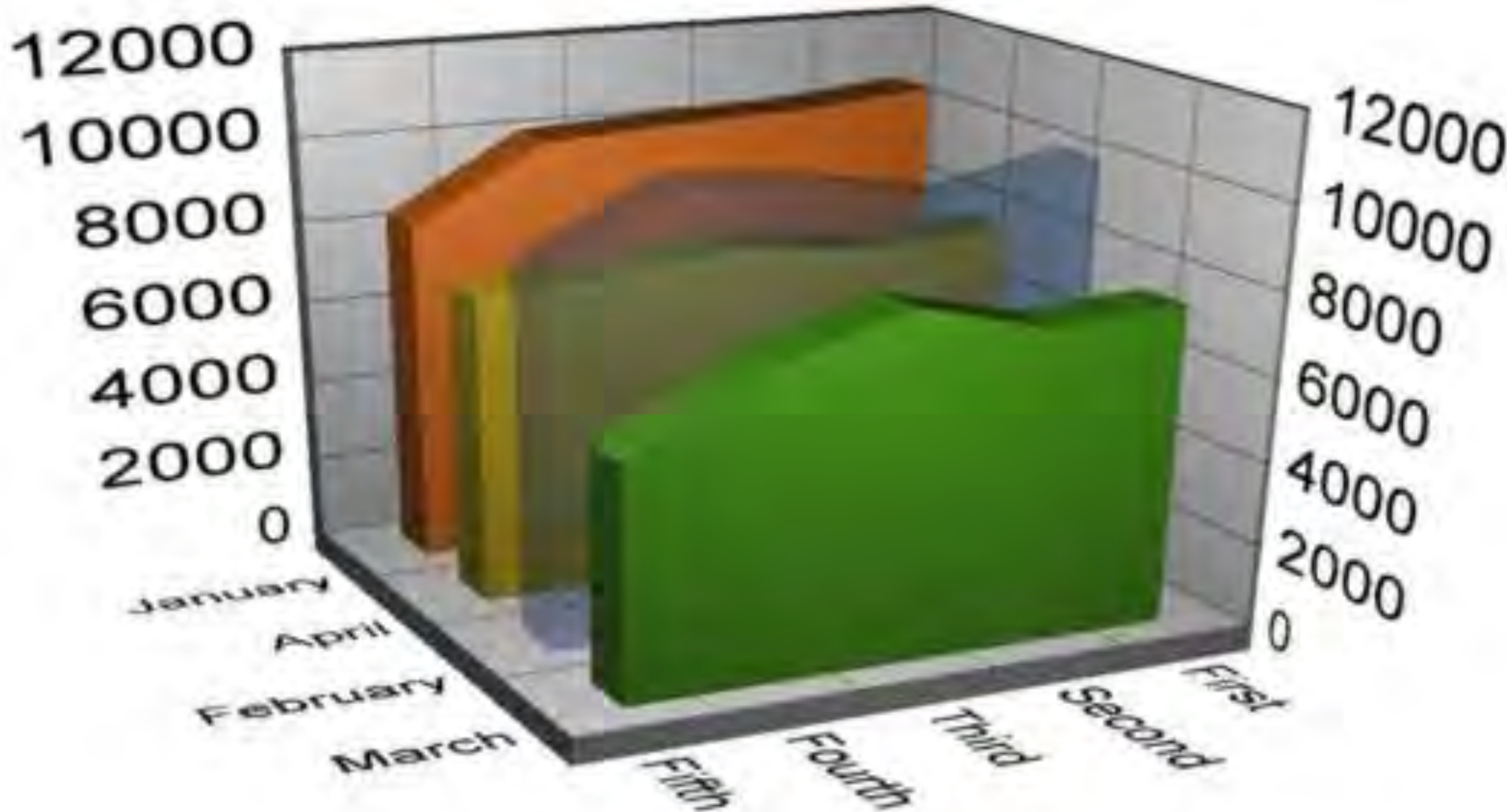


Bounding boxes in (a) adds unnecessary structural information
Simpler structure in (b) using space rather than lines is better

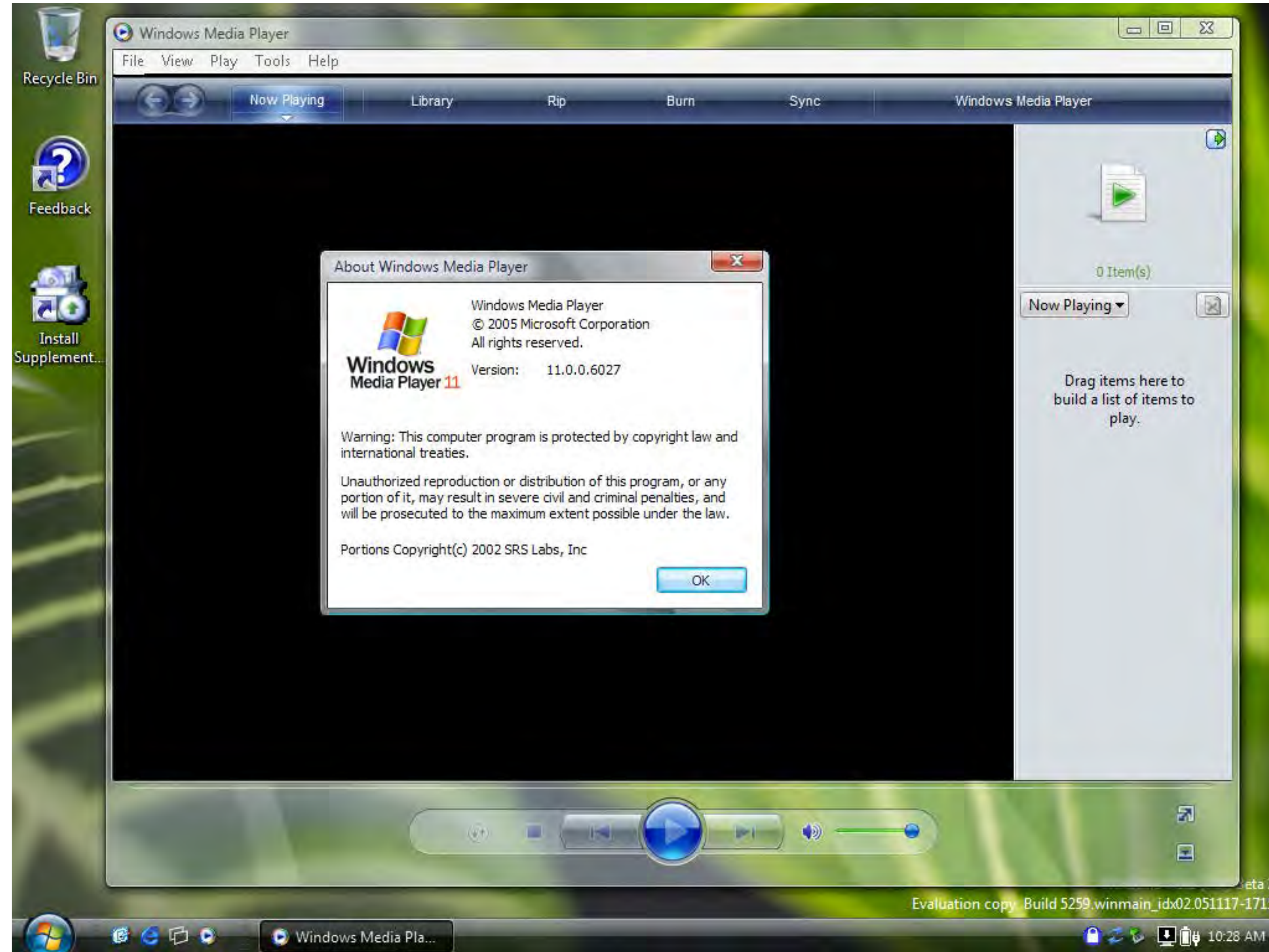
MISTAKES: BELABORING THE OBVIOUS



MISTAKES: GRATUITOUS USE OF 3D



MISTAKES: EXCESSIVE EMBELLISHMENT

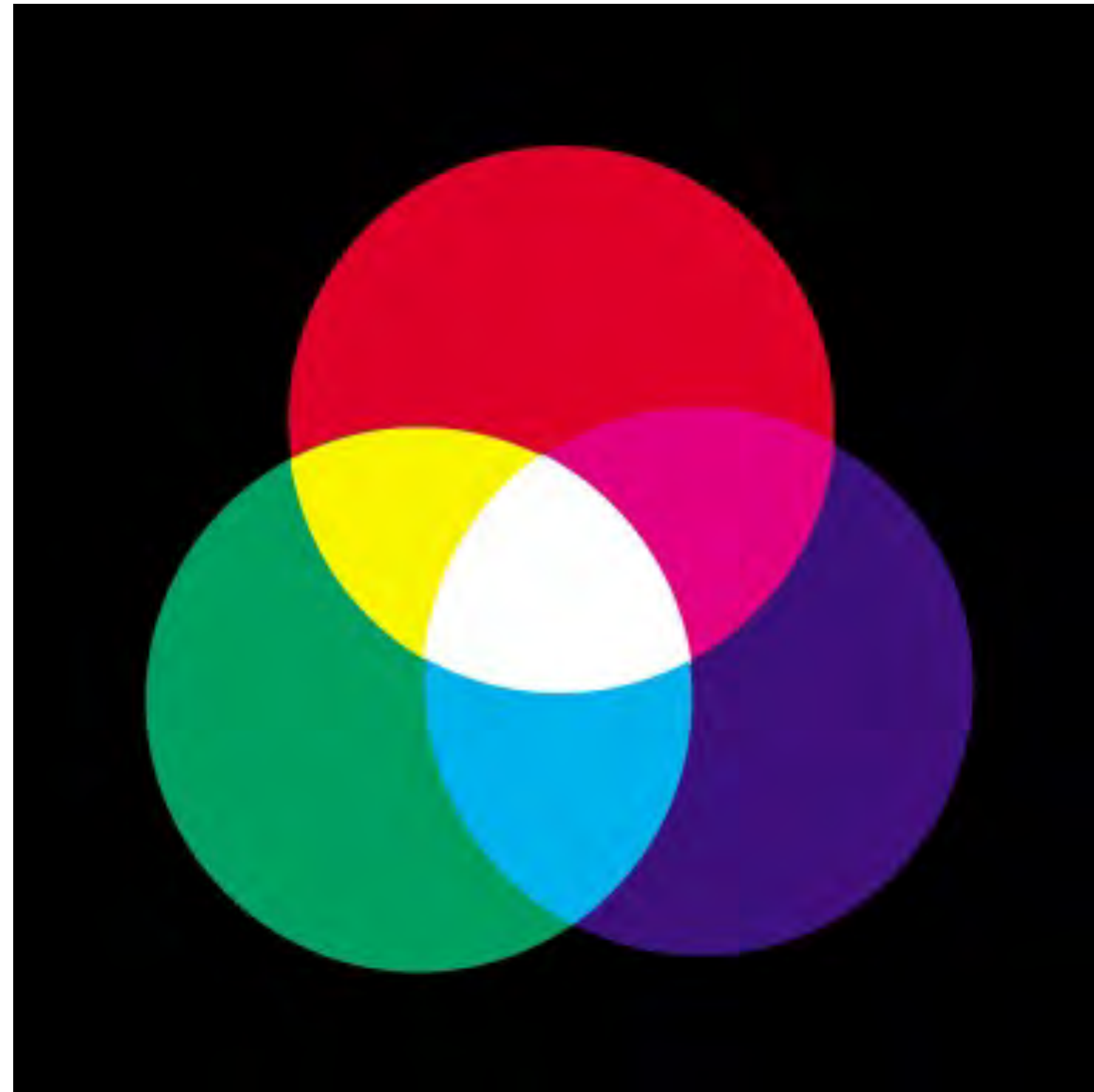


Minimalists hate it, but sometimes users like embellishment



COLOR

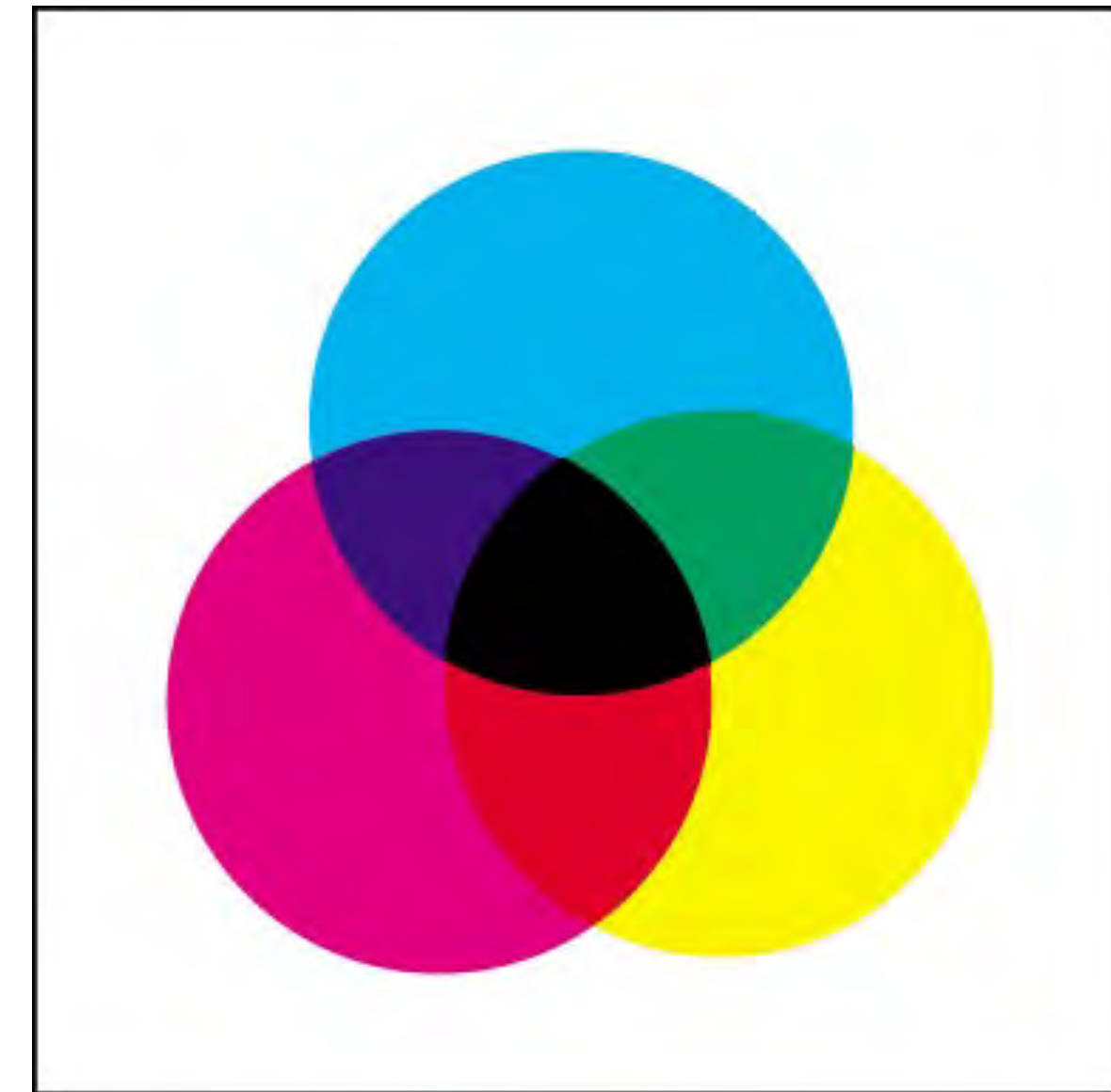
COLOR SPACES



RGB

Additive

Electronic Media



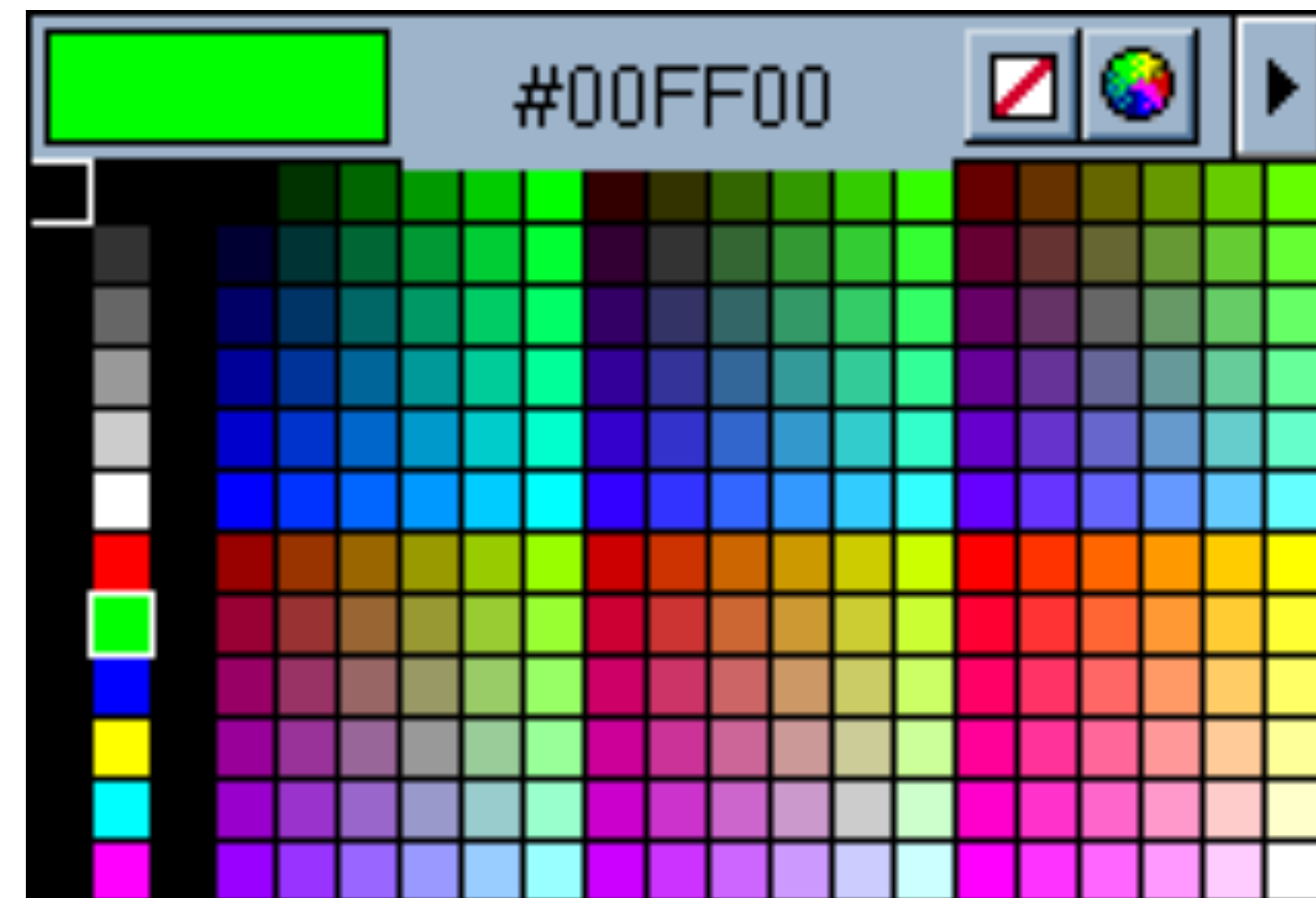
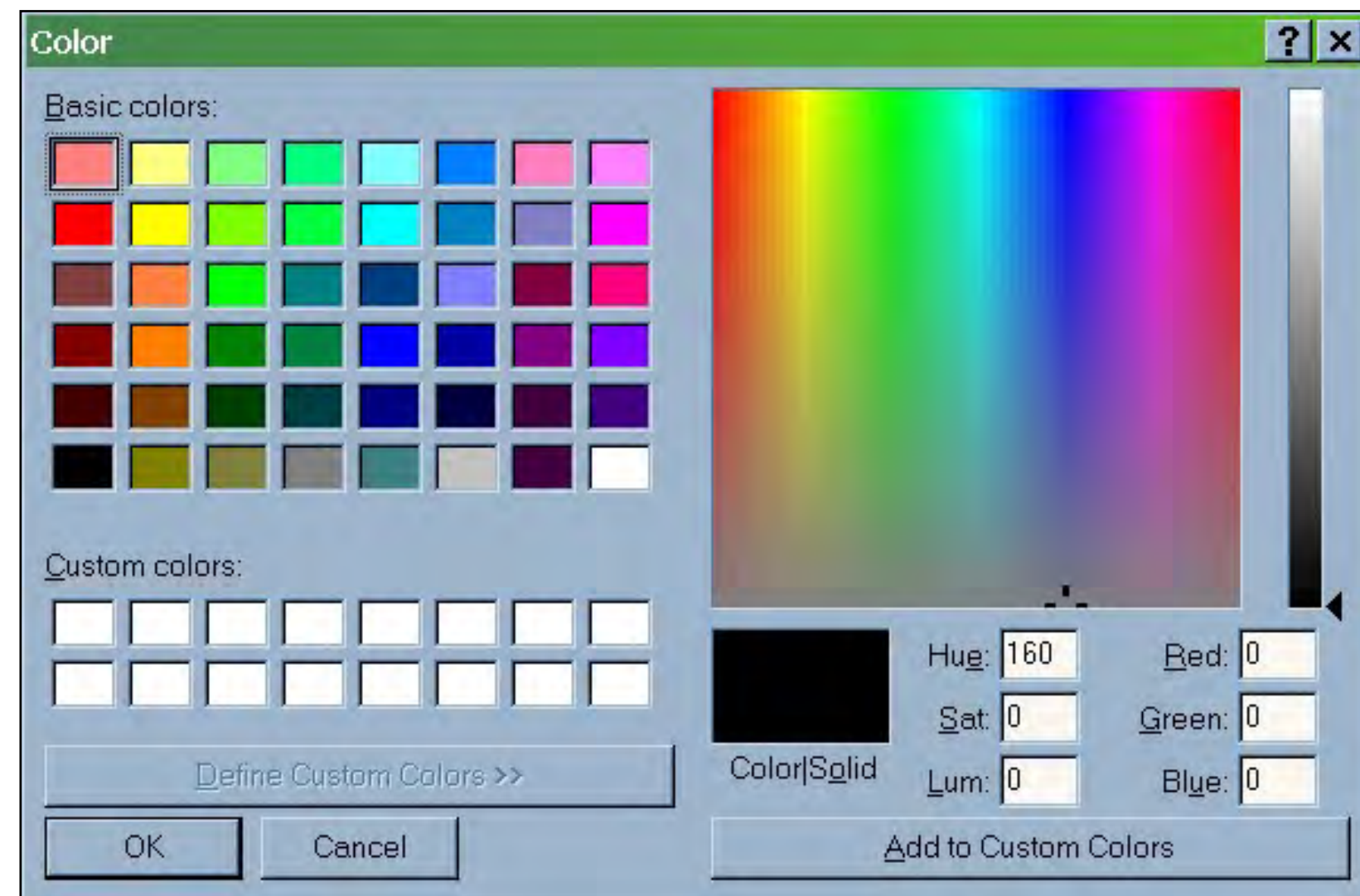
CMY

Subtractive

Printed Media

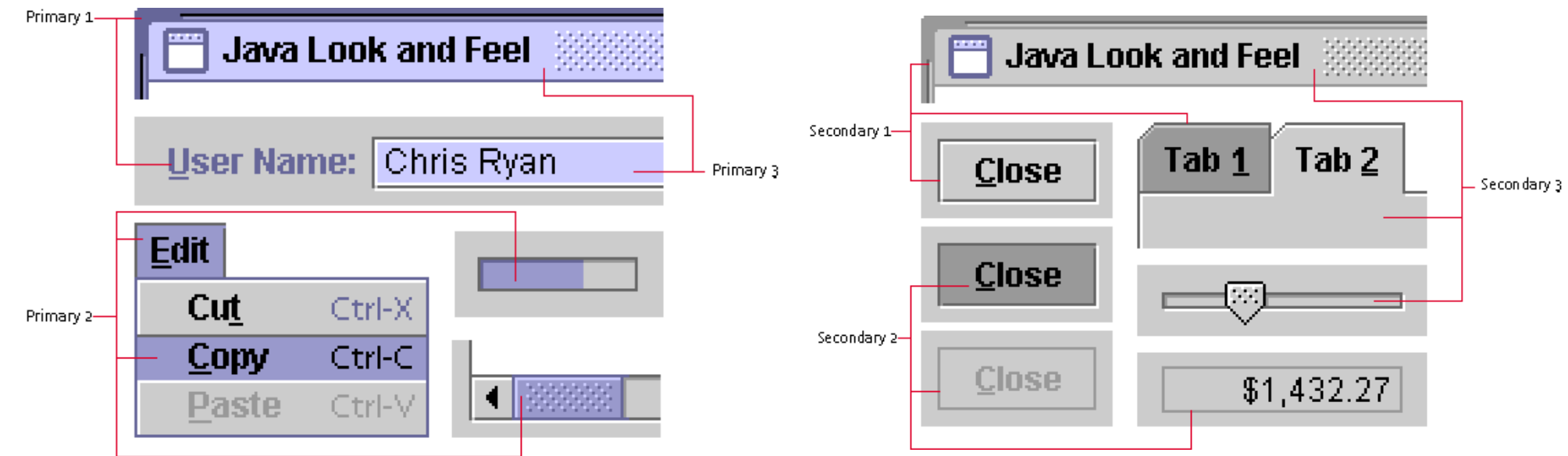
Parameters of color space driven by technology

TECHNOLOGY-CENTERED COLORS



TIPS FOR PICKING COLORS

Use a limited palette
(e.g., 6 colors in Java look and feel)



Don't rely on fully saturated colors



Ensure good color contrast for text



ADOBE COLOR

Adobe Color CREATE EXPLORE TRENDS MY LIBRARIES ★ 🌙 🌈 ? 🗨️ 🗨️ Sign In ☰ 🔄

Color Wheel Extract Theme Extract Gradient Accessibility Tools New

Apply Color Harmony ?
Rule

- Analogous
- Monochromatic
- Triad
- Complementary
- Split Complementary
- Double Split Complementary
- Square
- Compound
- Shades
- Custom

A B C D E

	A	B	C	D	E
Hex	#FE340A	#E60F09	#FC036B	#E609D3	#C60AFE
R	254	230	252	230	198
G	52	15	3	9	10
B	10	9	107	211	254
Lightness	100	90	99	90	100

Color Mode: RGB

Sign into Creative Cloud to save this Color Theme, created from color wheel or image.

You can then use your saved color themes, in Adobe products (Photoshop, Illustrator, Fresco etc.), via Adobe color theme panel or CC Libraries.

Save

COLOR TERMS

Hue: what color something is, like blue or red

Chroma: how pure a color is; the lack of white, black or gray added to it

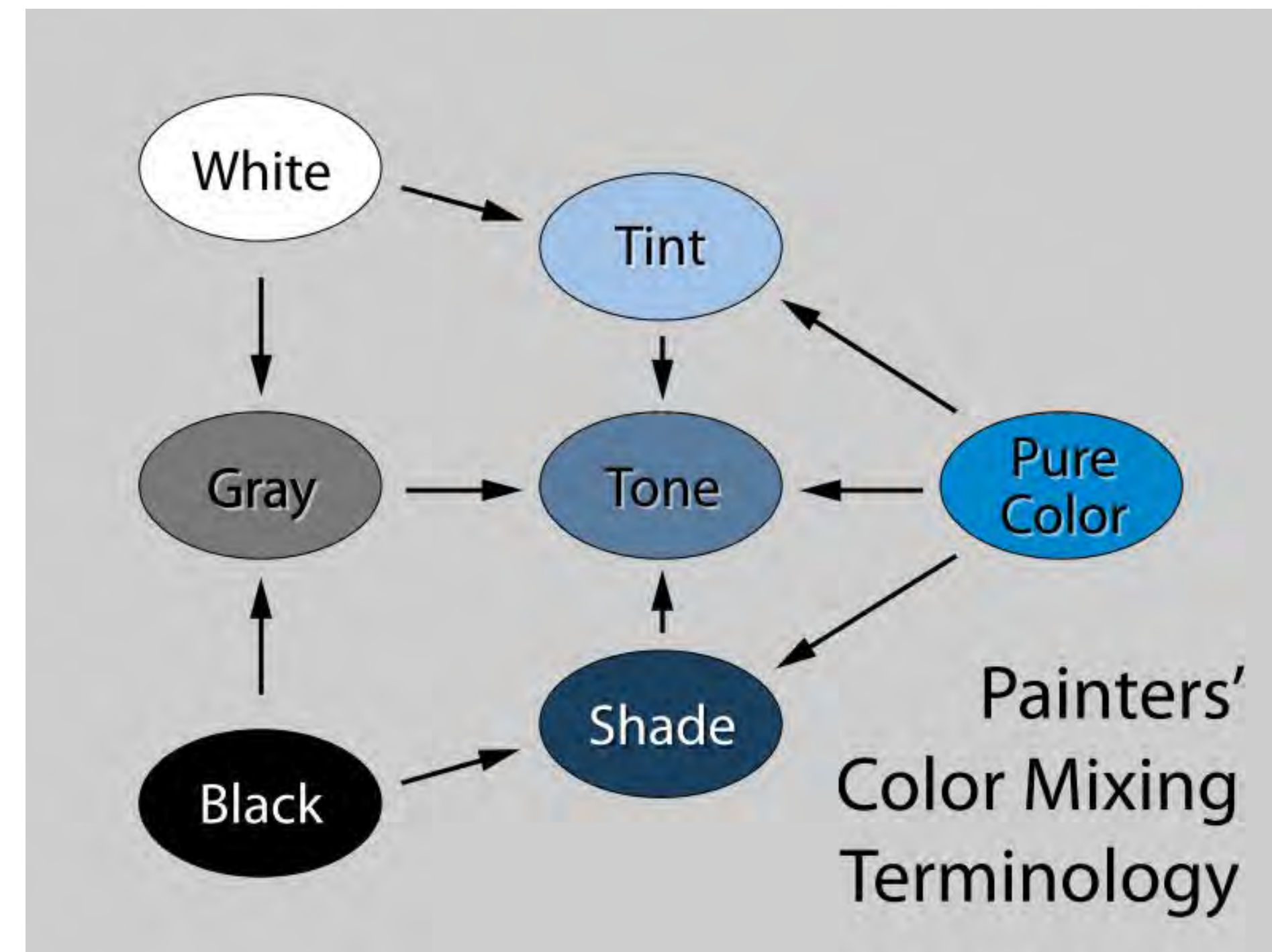
Saturation: the strength or weakness of a color

Value: how light or dark a color is

Tone: created by adding gray to a pure hue

Shade: created by adding black to a pure hue

Tint: created by adding white to a hue



Color Schemes



MONOCHROMATIC



ANALOGOUS



COMPLEMENTARY



SPLIT COMPLEMENTARY



TRIAD



TETRAD

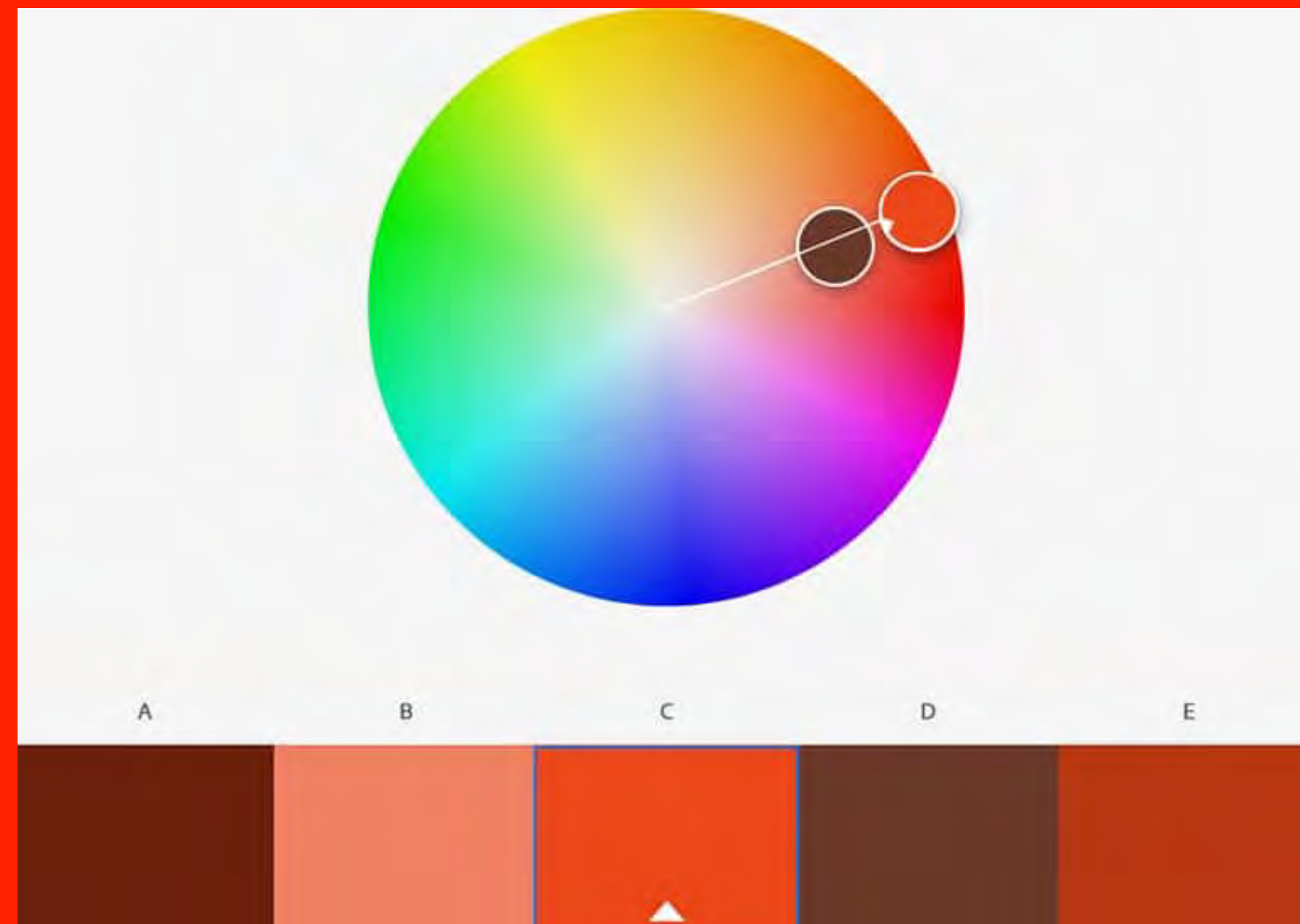


SQUARE

COLOR PALETTE: MONOCHROMATIC

Be Bold with your Manifesto!

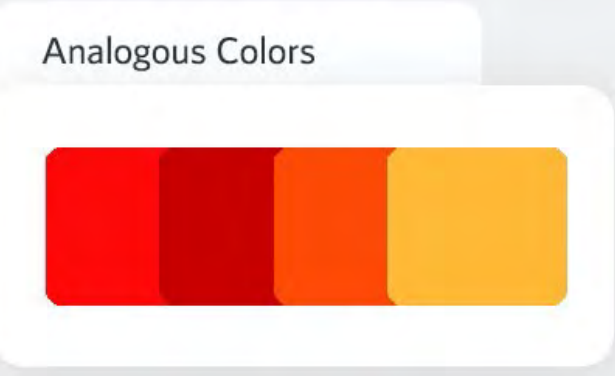
Now is the time to code!



COLOR PALETTE: ANALOGOUS



COLOR HARMONIES

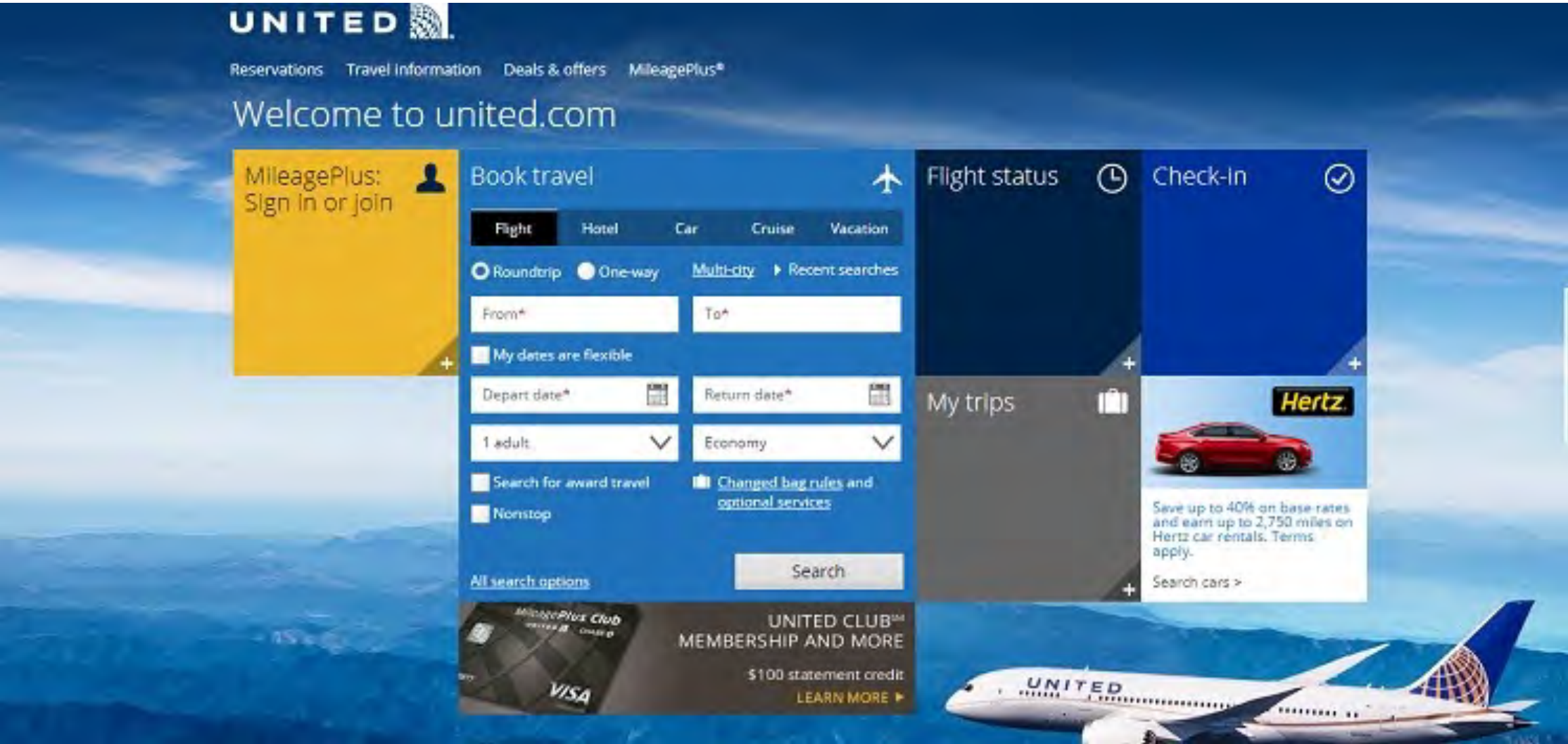
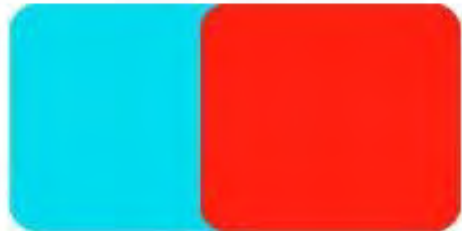


COLOR PALETTE: COMPLEMENTARY



COLOR HARMONIES

Complementary Colors





GESTALT PRINCIPLES

PRINCIPLES

FIGURE/GROUND

PROXIMITY

SIMILARITY

SYMMETRY

CONNECTEDNESS

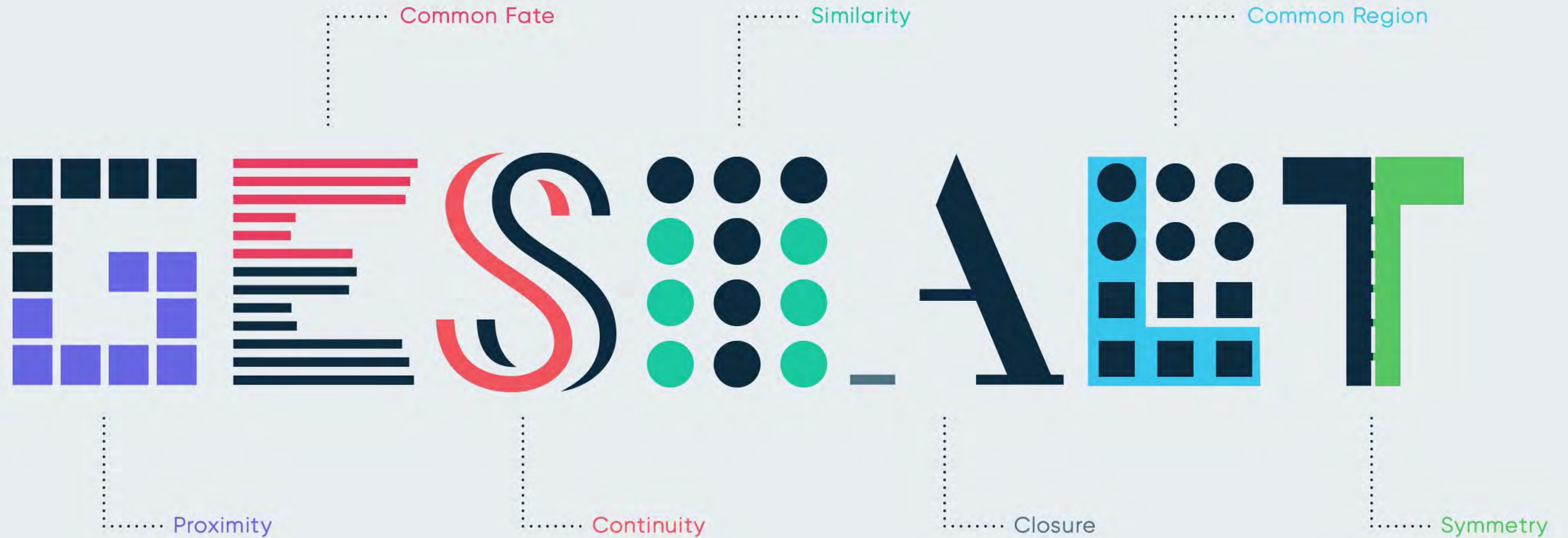
CONTINUITY

CLOSURE

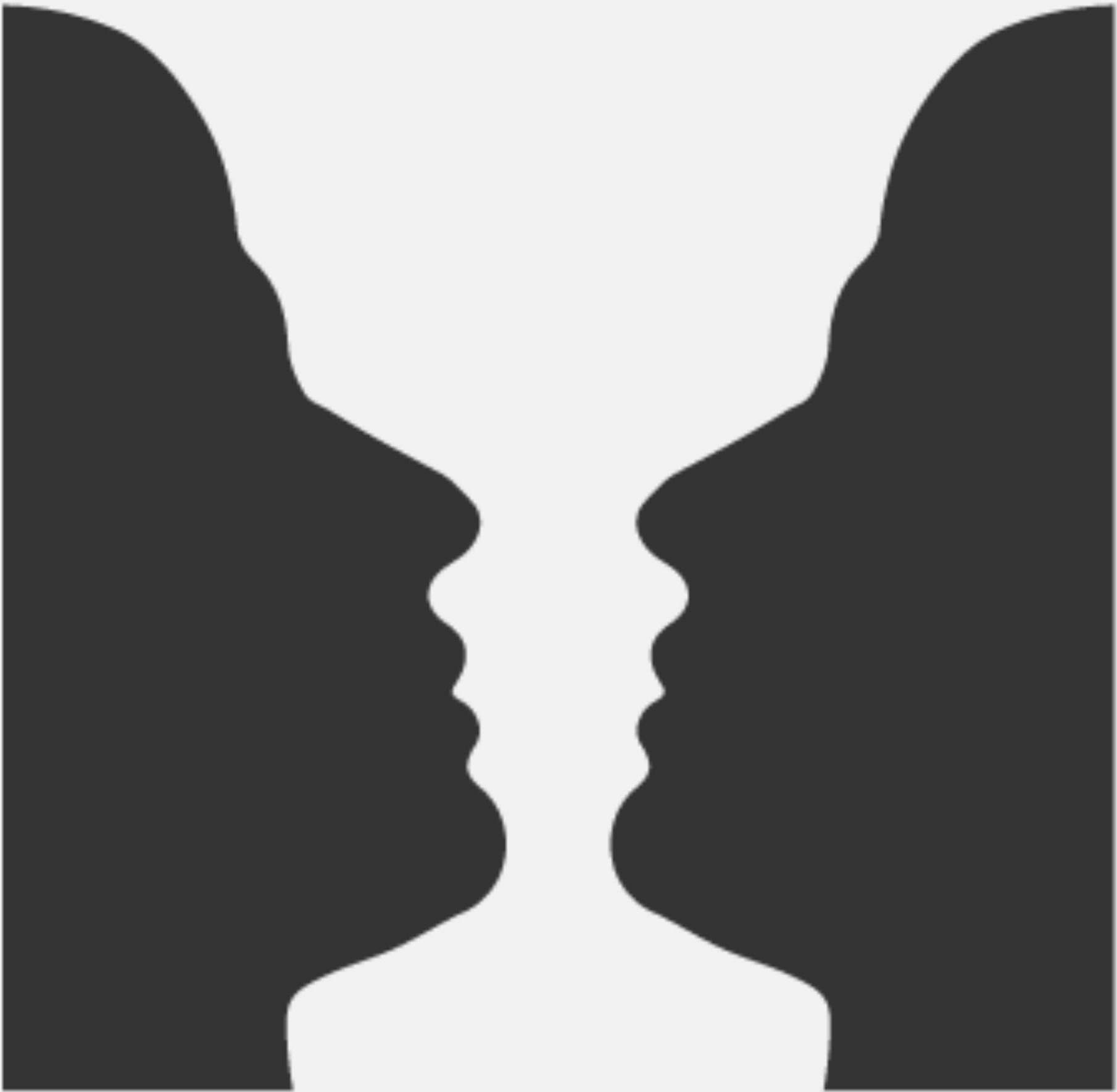
COMMON FATE

TRANSPARENCY

PRINCIPLES



FIGURE/GROUND



FIGURE/GROUND



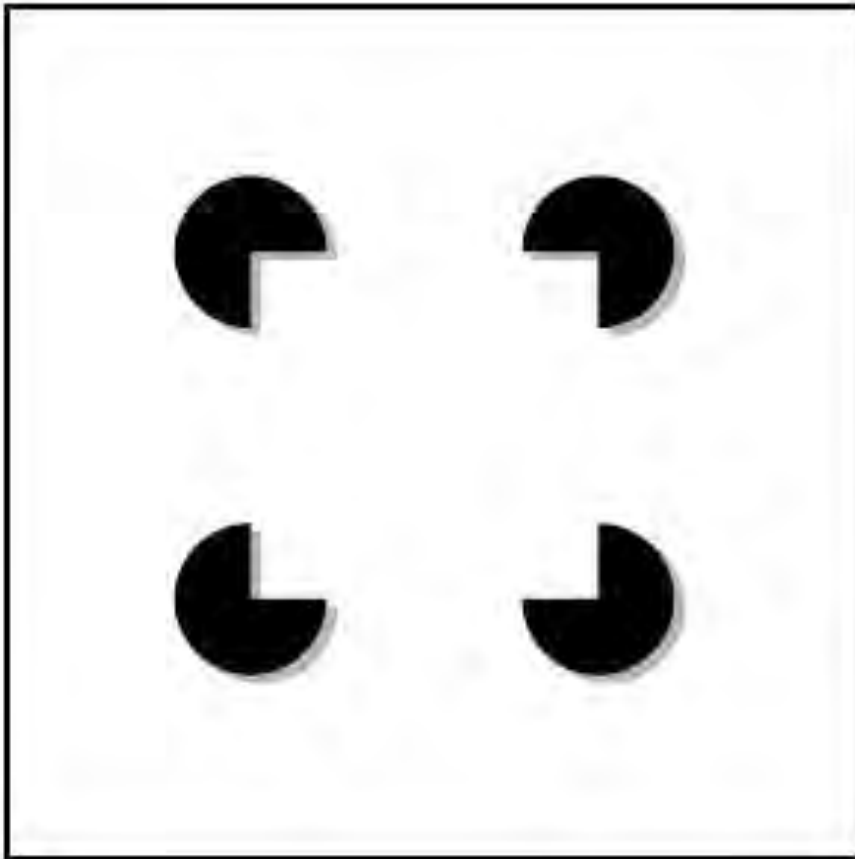
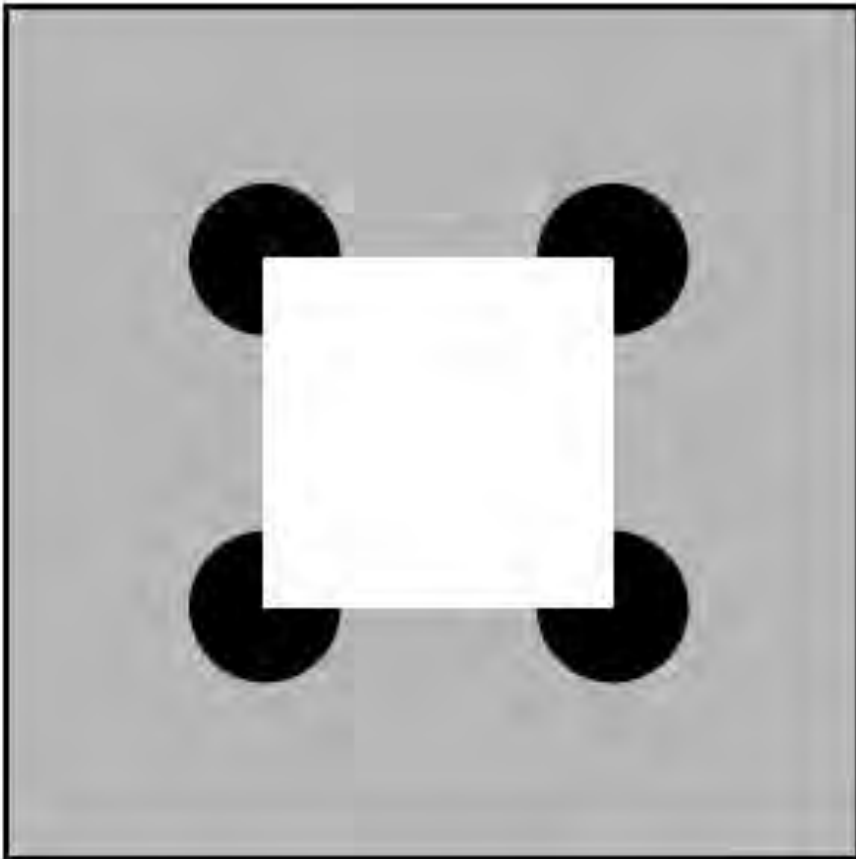
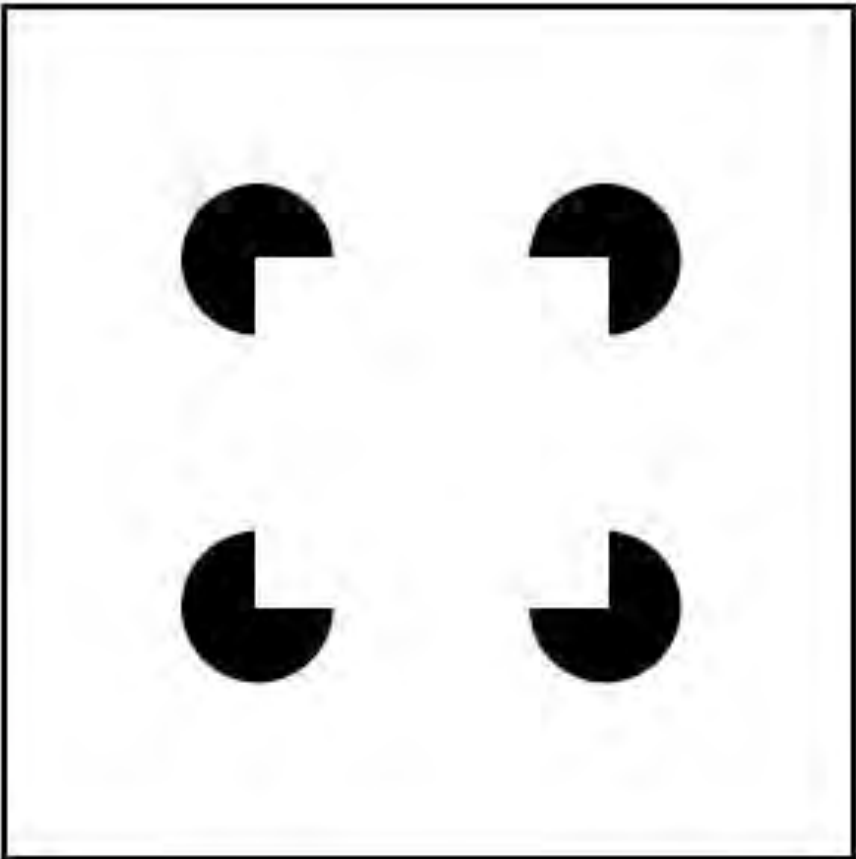
FIGURE/GROUND - SURROUNDNESS

The image shows the Basecamp 3 homepage. At the top left is the Basecamp 3 logo. At the top right are navigation links: [Features](#), [Pricing](#), [Using Basecamp with Teams](#), [About us](#), and [Support](#), along with [Sign up](#) and [Log in](#) buttons. Below the navigation is a cartoon character of a green mountain with a smiling face and a blue sky, holding a large orange pencil. The main heading reads: "Working with other people? Struggling to keep everyone on the same page?". Below this is a hand-drawn illustration of a group of people with various icons (calendar, mail, phone, etc.) and speech bubbles containing questions like "DID WE GET THAT DONE YET?", "WAIT, WHO MADE THAT DECISION?", "WHEN IS THIS DUE?", "WHERE DO I PUT THAT?", "NO ONE TOLD ME THAT!", "WHO SENT THIS TO THE CLIENT?", and "THIS IS EXHAUSTING!". To the right of the illustration is a sign that says "Sign up now for free below" with an arrow pointing to a sign-up form. The sign also includes the text "Just last week, 10,772 companies got started with Basecamp 3!" and a "Sign up using Google" button. The sign-up form has fields for "Your Name", "Your Email", and "Company/Organization", and a "Sign up" button.

CLOSURE



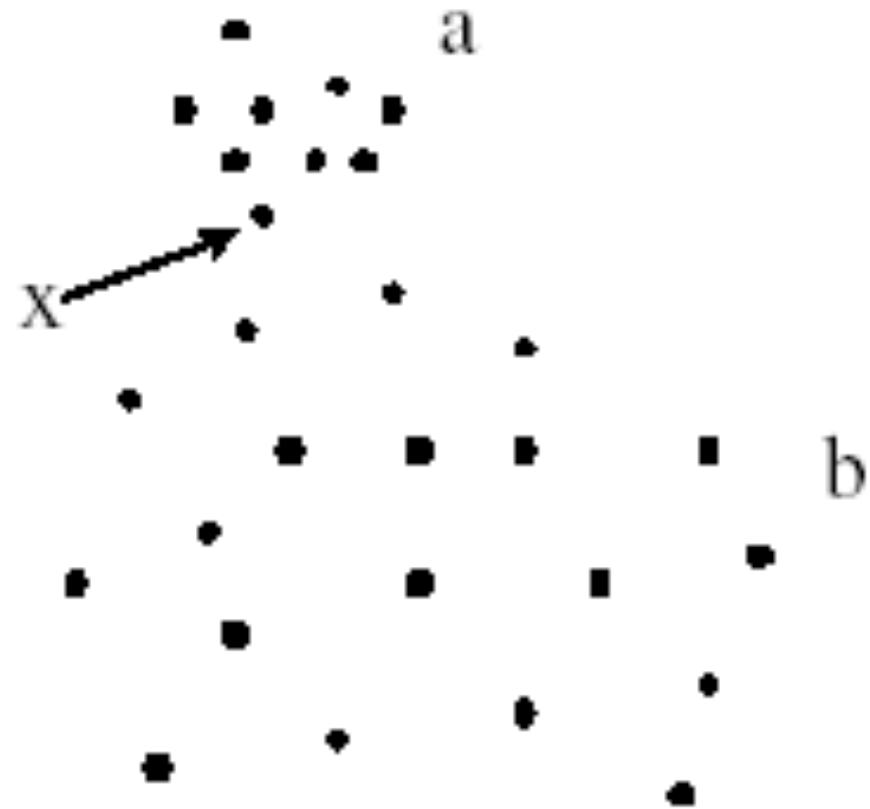
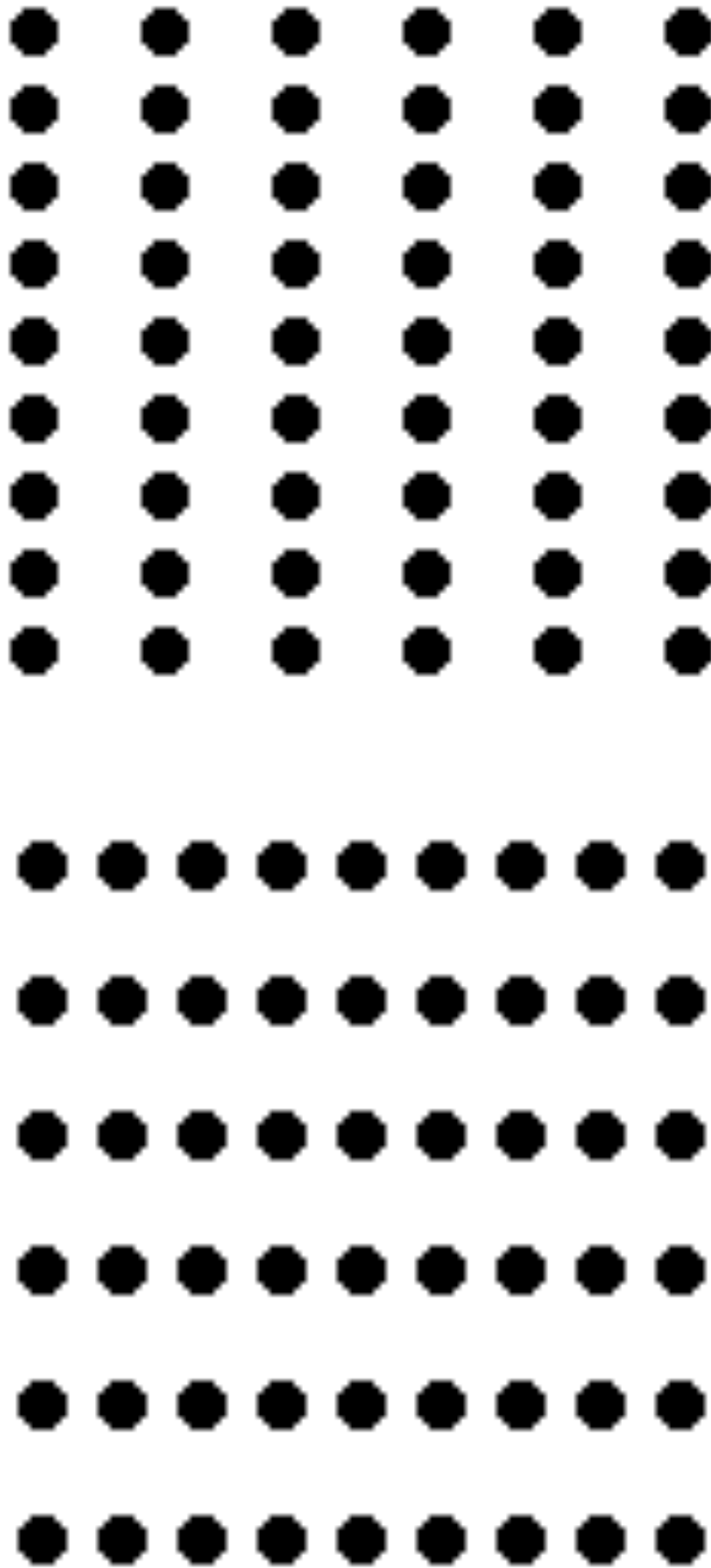
We see a circle behind a rectangle, not a broken circle



Illusory contours

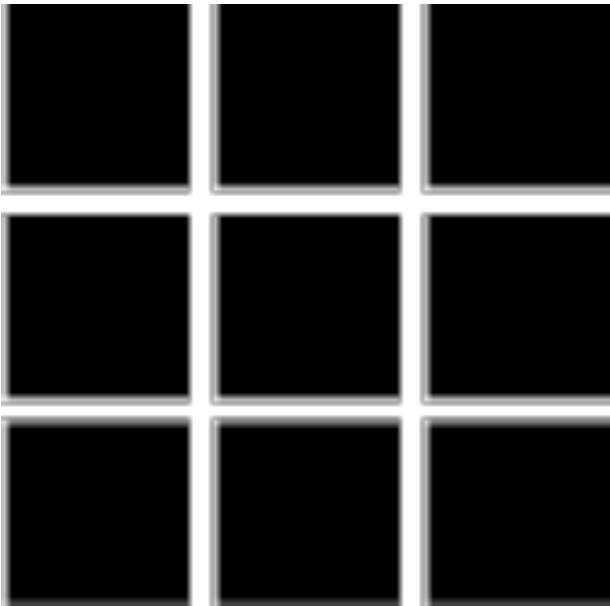
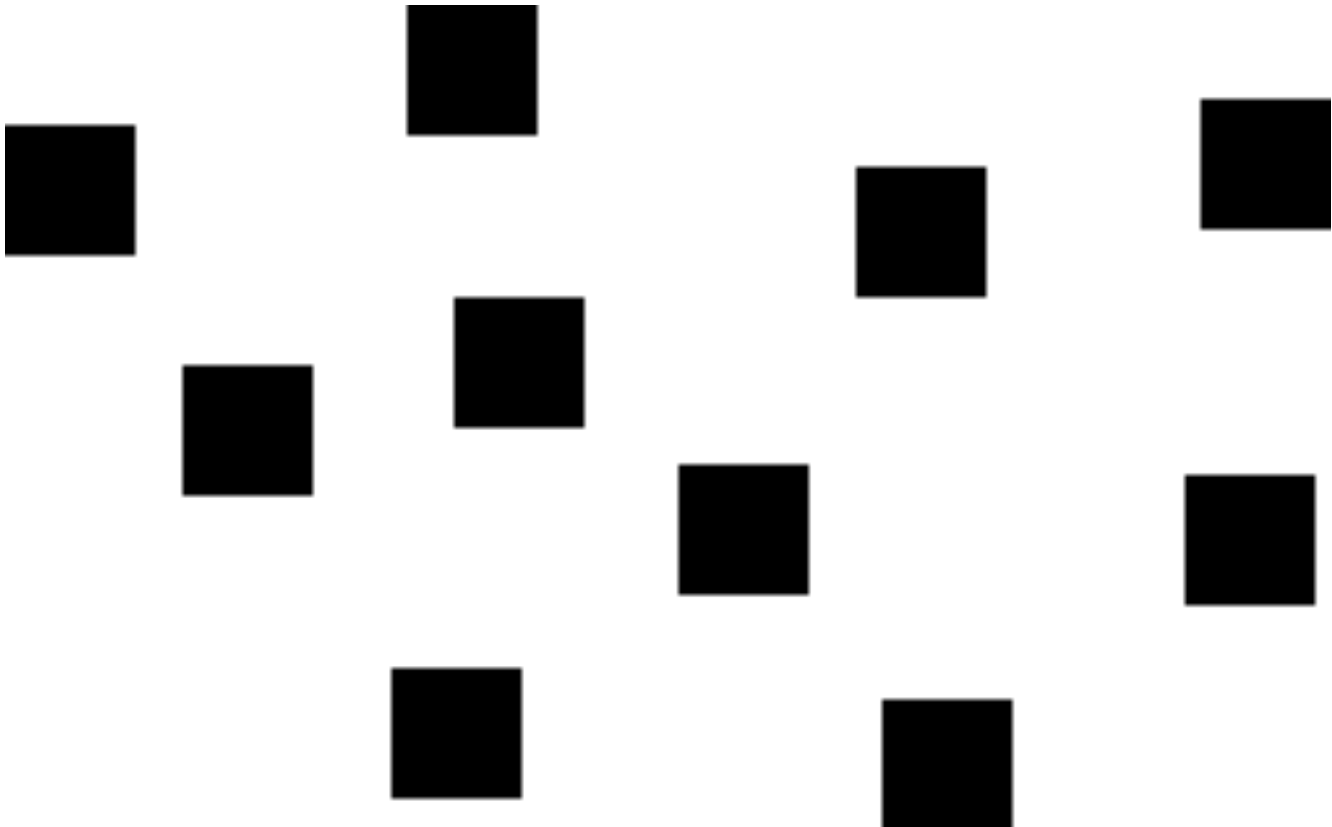


PROXIMITY



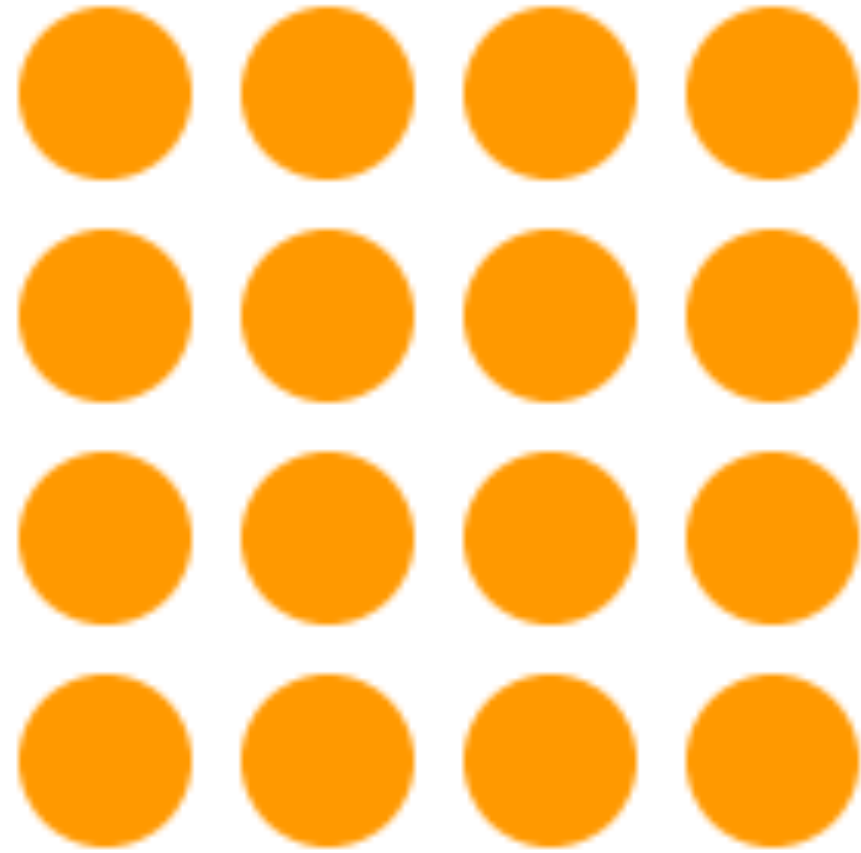
Dots that are near one another are grouped
Dots that are concentrated are grouped

PROXIMITY

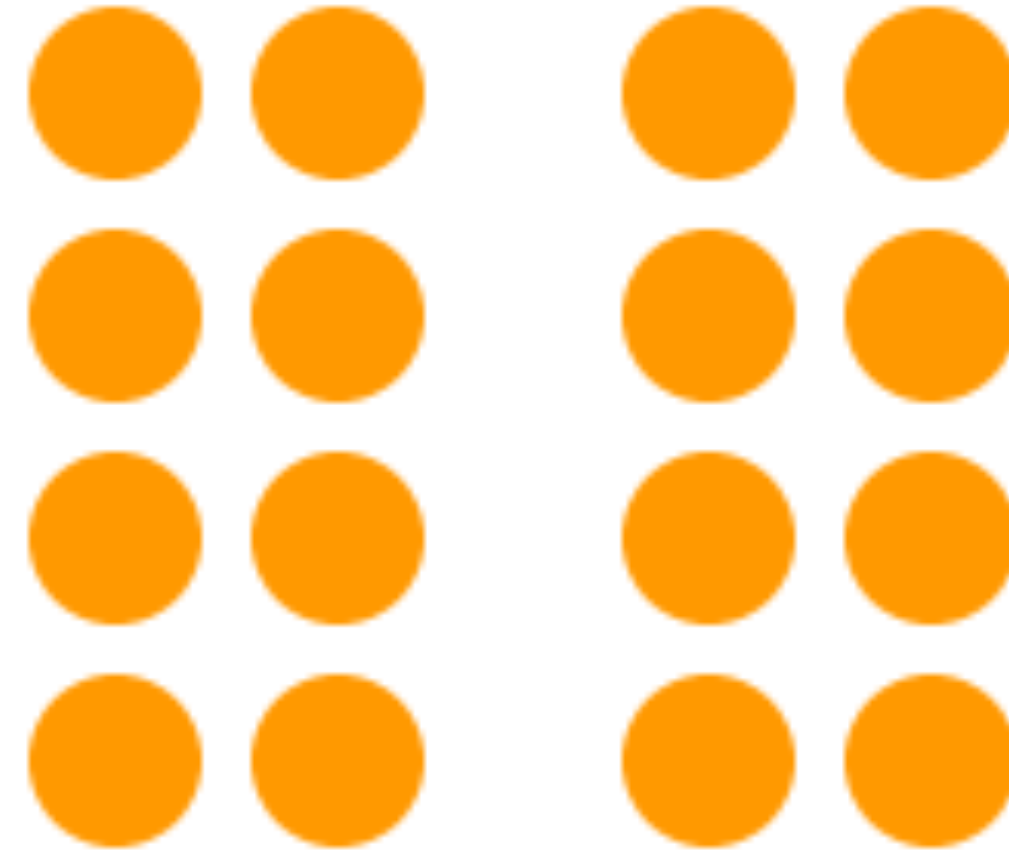


PROXIMITY

This is perceived to be one group and the components somehow related to each other.



We perceive two groups here, and understand that there are differences between them.



PROXIMITY



PROXIMITY



Vallejo Lowe's >

Opens at 6AM tomorrow

washer

clear



Shop

Ideas

Savings

Services

Order Status

Lowe's Credit Cards

Weekly Ad

Appliances > Washers & Dryers



Top-Load Washers



Front-Load Washers



Electric Dryers



Gas Dryers



Stackable Washers & Dryers



Popular Washer & Dryer Sets



Stacked Laundry Centers



Smart Washers & Dryers



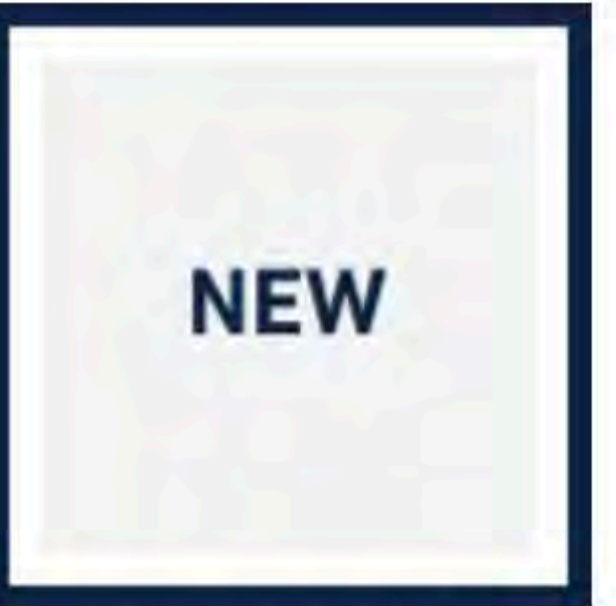
Portable Washing Machines



Combination Washers & Dryers



Small Washing Machines

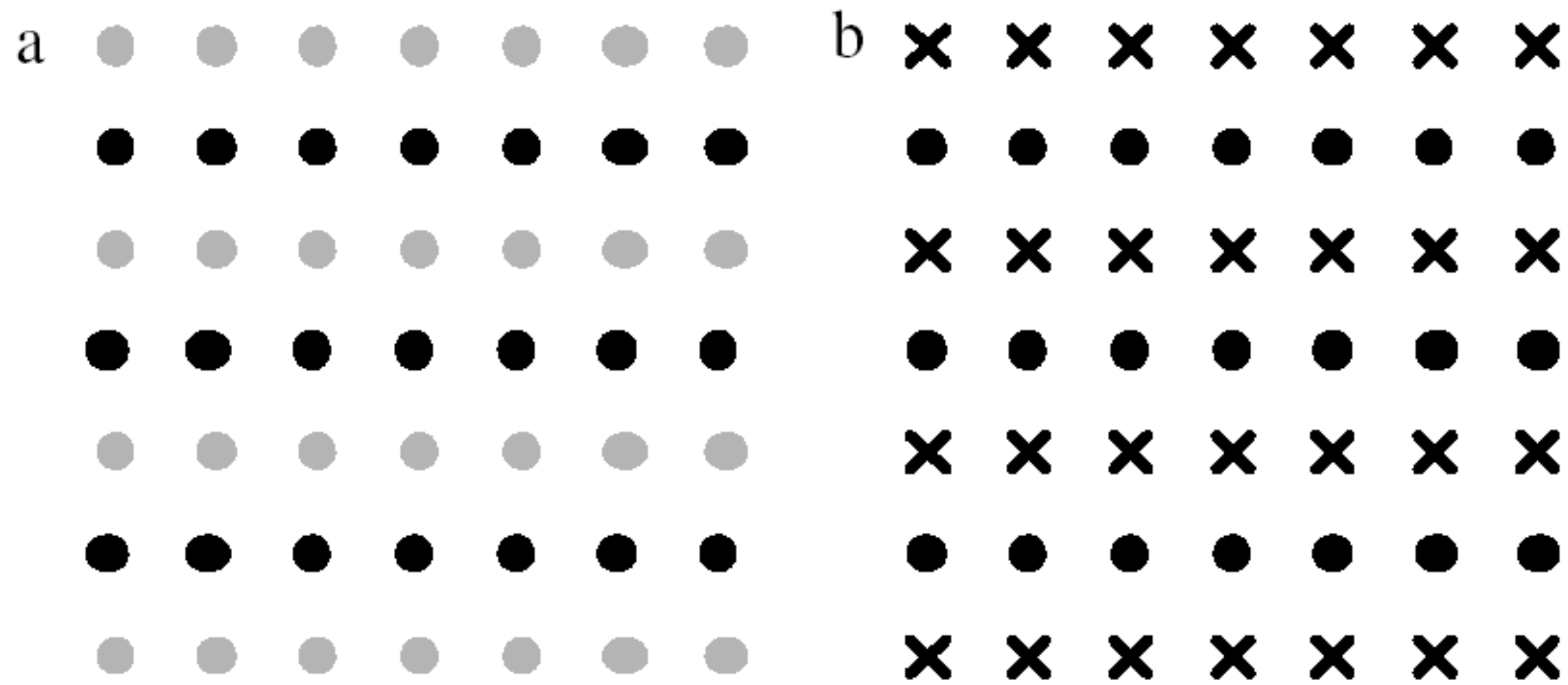


New Arrivals

PROXIMITY



SIMILARITY

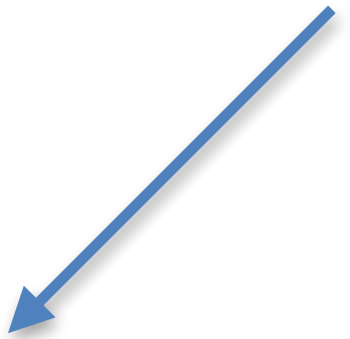


Rows dominate due to similarity

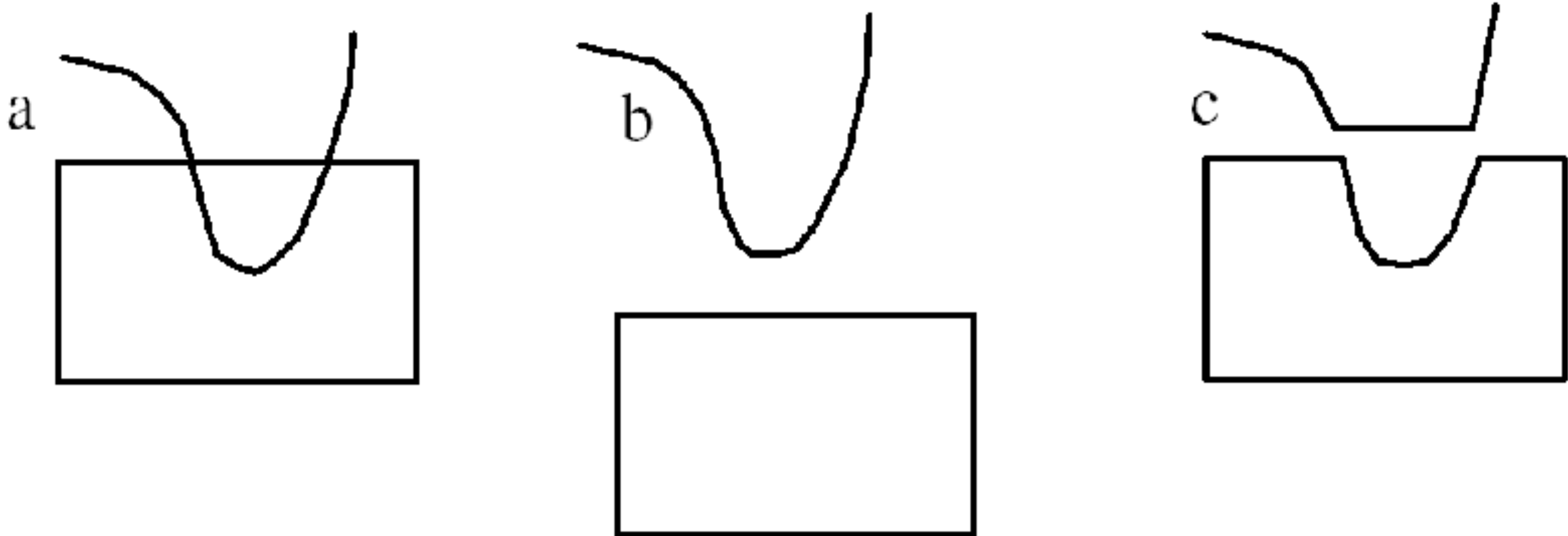
SIMILARITY



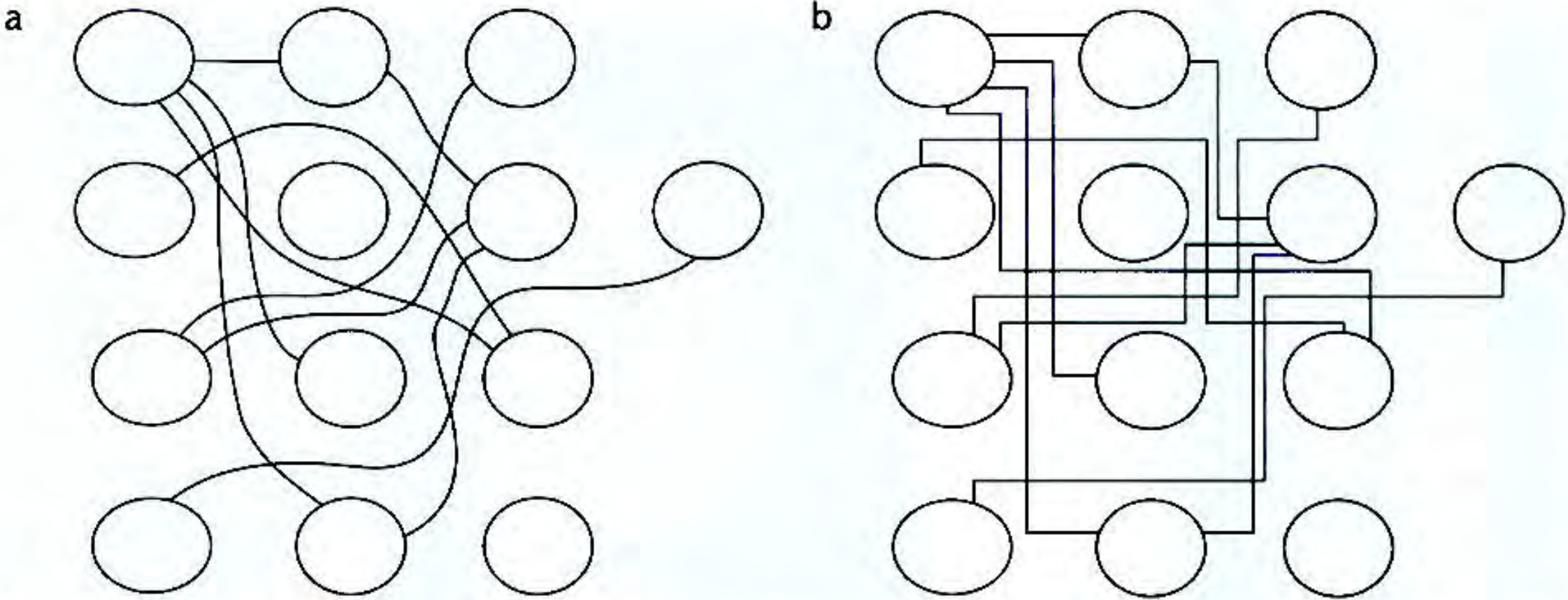
and closure



CONTINUITY



We prefer smooth not abrupt changes



Connections are clearer with smooth contours

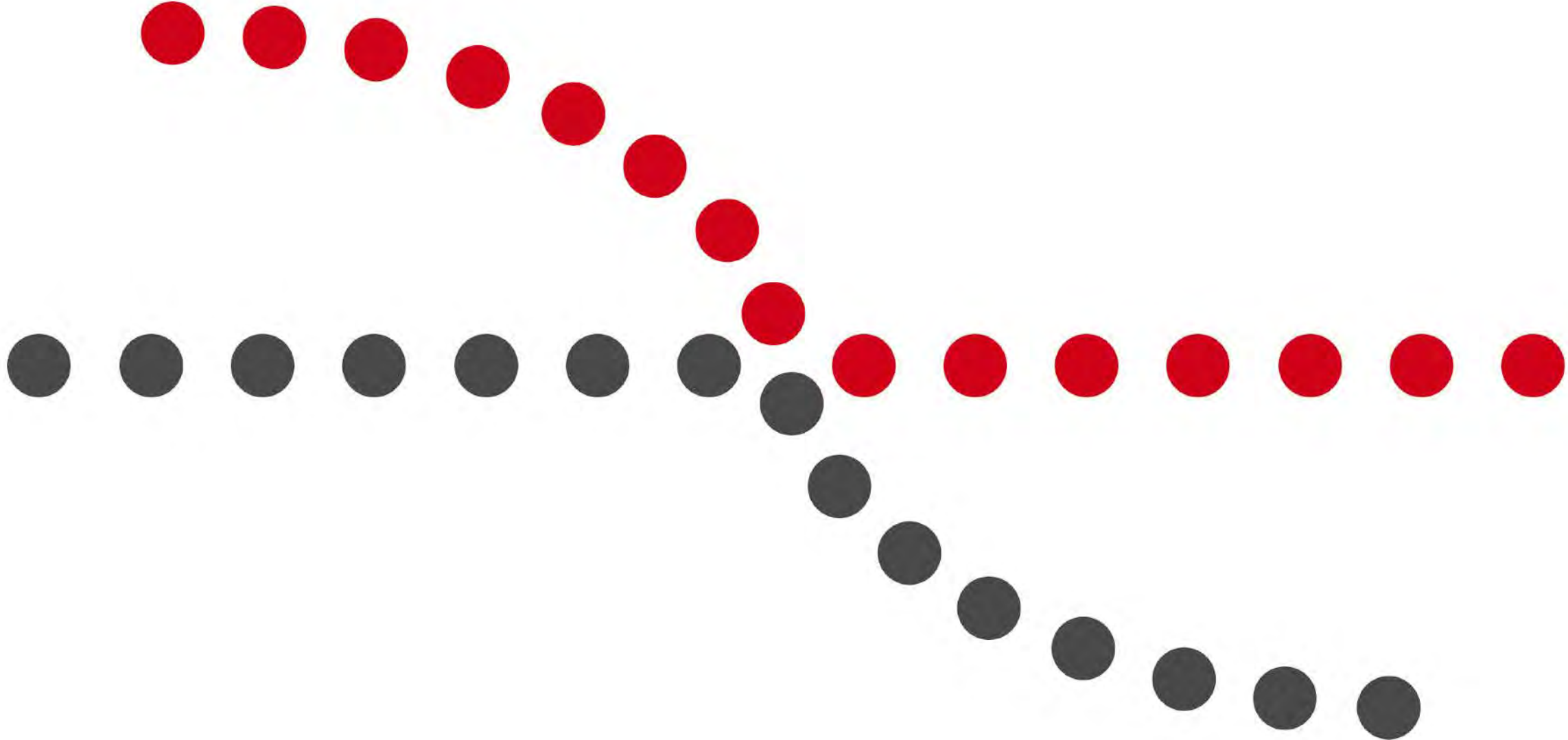


CONTINUITY

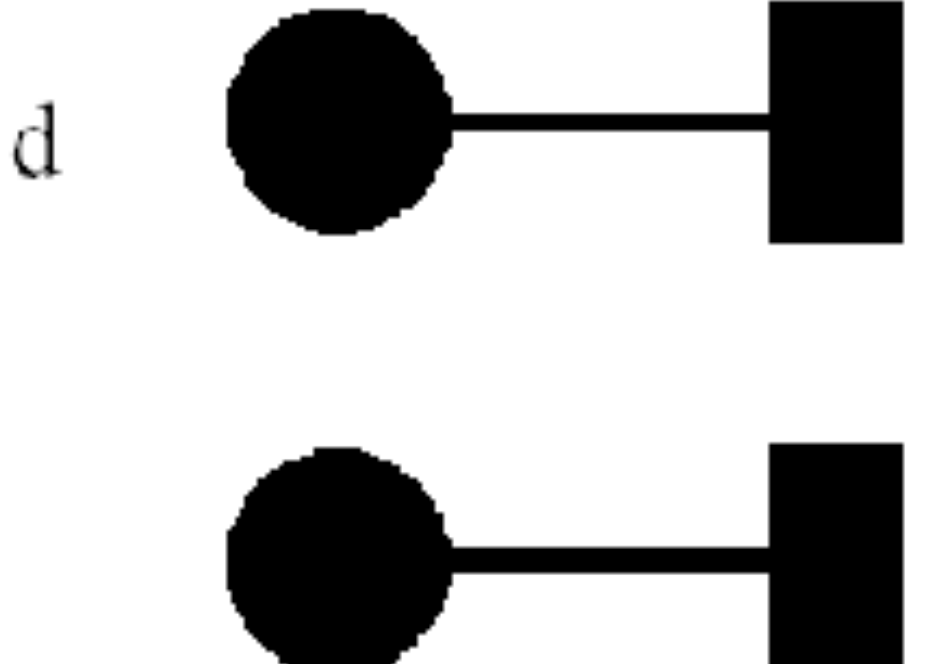
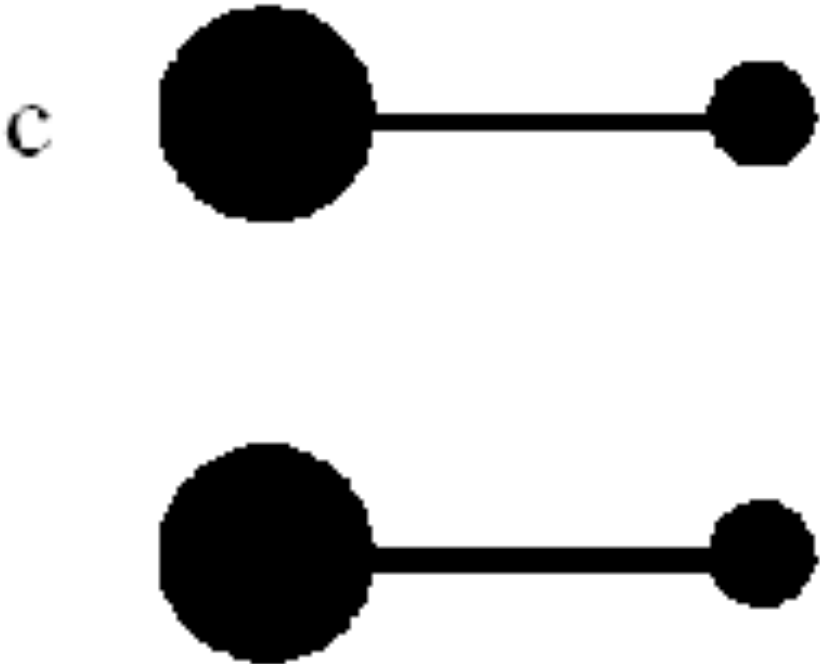
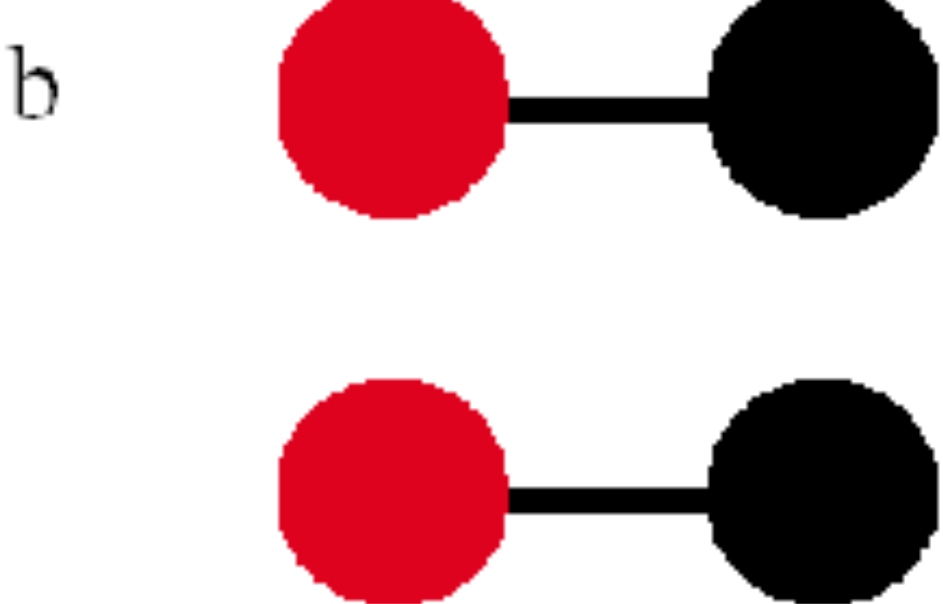
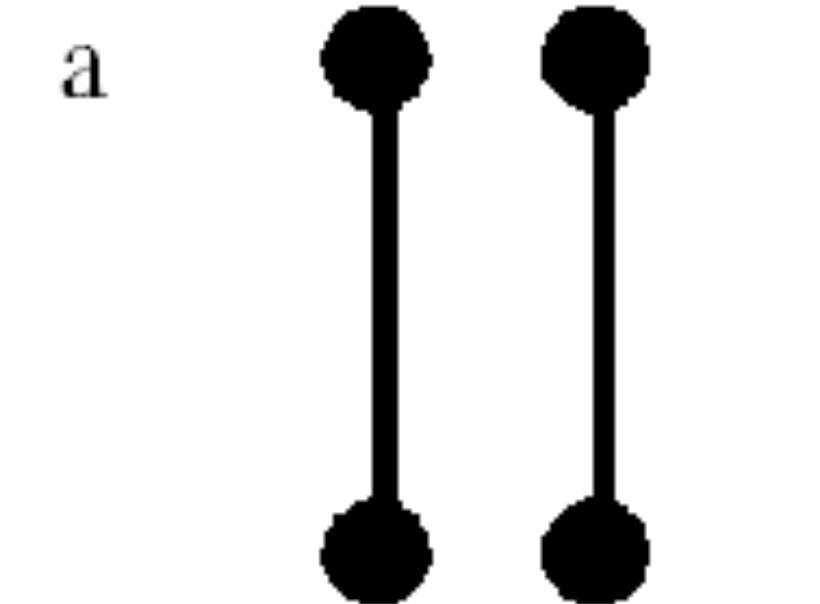


Customers Who Bought This Item Also Bought

Crossing the Chasm, 3rd Edition: Marketing and Selling Disruptive Products by Geoffrey A. Moore ★★★★★ 72 Paperback \$12.35 Prime	The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to by Eric Ries ★★★★★ 1,062 Hardcover \$16.68 Prime	The Innovator's Dilemma: The Revolutionary Book That Will Change the Way That Will Change the Way by Clayton M. Christensen ★★★★★ 209 #1 Best Seller in Industrial Management... Paperback \$10.08 Prime	The Innovator's Solution: Creating and Sustaining Successful Growth by Clayton M. Christensen ★★★★★ 22 Hardcover \$18.33 Prime	How Will You Measure Your Life? by Clayton M. Christensen ★★★★★ 583 Hardcover \$15.86 Prime



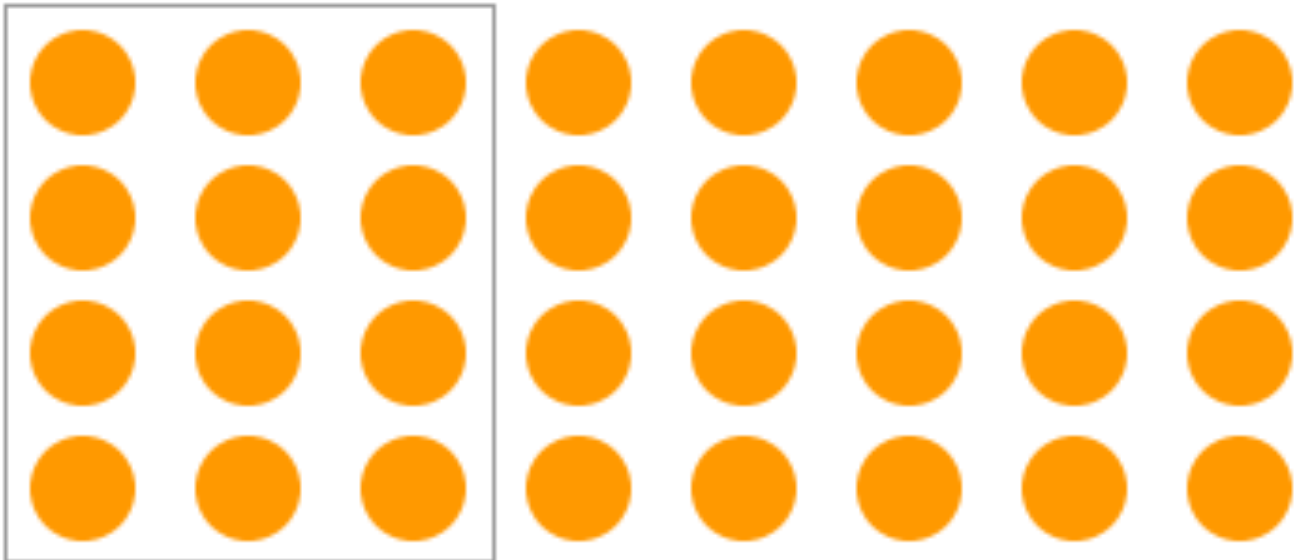
CONNECTEDNESS



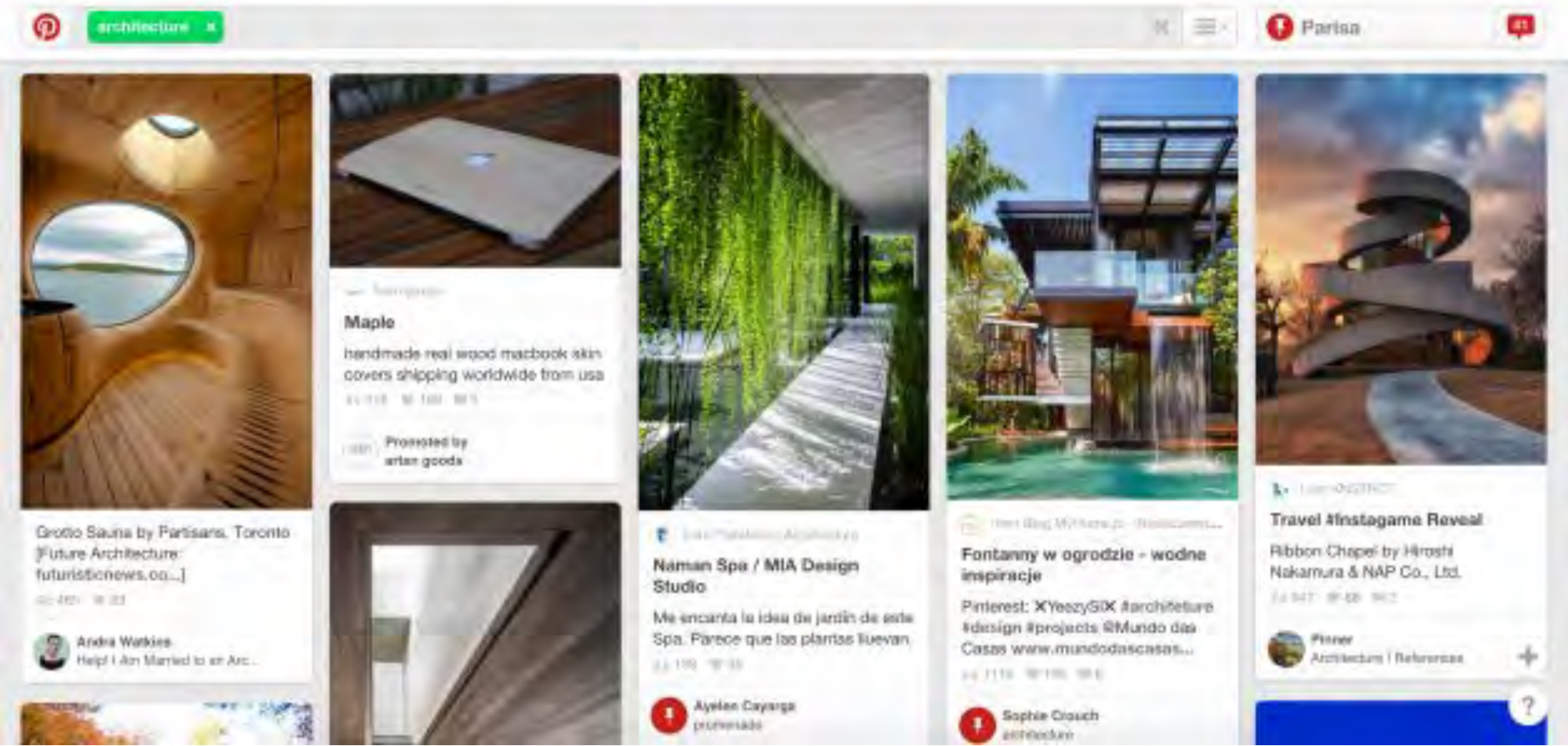
Connectedness overrules proximity, size, color shape

CONNECTEDNESS + COMMON REGION

Here, even though the spacing and color is consistent within this collection of elements, those inside of the connecting lines are perceived to be more related than the rest:



...as are the ones connected by lines:



Tuesday, November 3

Election Day

An American Menu \$75

Caesar salad with anchovies, egg, and
parmesan cheese

Clam chowder with Main lobster and pancetta

Grilled chicken with house-made barbecue
sauce with potato purée and greens

Apple and raspberry pecan crisp with vanilla
ice cream

PROXIMITY

Tuesday, November 3

Election Day

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PROXIMITY

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Clam chowder with Maine lobster and pancetta

Grilled chicken with house-made barbecue
sauce with potato purée and greens

Apple and raspberry pecan crisp with vanilla
ice cream

SIMILARITY

TUESDAY, NOVEMBER 3 — ELECTION DAY

AN AMERICAN MENU \$75

Caesar salad

with anchovies, egg, and parmesan cheese

Clam chowder

with Main lobster and pancetta

Grilled chicken

*with house-made barbecue sauce with potato purée
and greens*

Apple and raspberry pecan crisp

with vanilla ice cream

SUMMARY

Design is about communication, form and function

Simplicity and elegance are keys to good design

Minimalism constrains you and reduces chances of bad design

Use a small palette of colors

Human vision is organized by Gestalt Principles

Be aware of these principles as you design the visual look

Avoid common layout mistakes by using grid-based design

The background of the image is a composite of two faces. The left side shows a close-up of a white person's face, with a prominent blue eye looking directly at the viewer. The right side shows a close-up of a brown person's face, also looking forward. The two faces are separated by a vertical, torn-paper-like edge. The overall tone is somber and investigative.

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MAKING

— A —
MURDERER

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- Divorce & Custody
- Personal Injury
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- Contact



Attorney Ken Kratz

- *Former Wisconsin District Attorney
- *Over 25 Years of Legal Experience
- *Successfully tried one of the largest and most complex homicide cases in Wisconsin history (*State of Wisconsin v. Steven Avery*)



What they "forgot" to tell you

- OnMilwaukee.com
- People Mag.
- The New Yorker
- Maxim
- NY Times

- ABC News
- FOX News
- CBS News
- Texting Scandal
- Conspiracy?

Experience Matters

The best criminal defense attorney you can find has the most experience. Period.

Ideally, it is also an attorney who knows BOTH sides of the criminal justice system.

Ken Kratz has over 25 years experience as a trial lawyer in Wisconsin, most of that time spent as an elected DA near Appleton, WI.

MORE

Why do I feel so overwhelmed?

Being charged with a criminal offense can be one of the most stressful experiences in a person's life. The uncertainty of future events, including the VERY REAL possibility of going to jail or prison, can cause some people to become "stuck" after being charged with a crime, and unable to continue their normal lives.

This feeling is very natural, and will likely remain until a competent lawyer is retained. Why wait?

MORE

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FOR A FREE CONSULTATION

(715) 718-0759

Address
1507 Tower Avenue, Suite 414
Superior, WI 54880

Email
kratzlawfirm@gmail.com

News Articles



June 11, 2007
APPLETON POST-CRESCENT
By: John Lee

Kratz has made a name for himself as prosecutor

CHILTON - Ken Kratz had planned on getting a master's degree in business administration when he graduated from the University of Wisconsin-Whitewater and never thought about becoming a lawyer.

But that changed when his faculty advisor, who also taught business law, told him he could use a law degree in business, so Kratz took the law school admissions test and headed to Marquette University.

[Read More...](#)

Testimonials from Former Clients



More Client Testimonials

IMAGE



LOGO



BACKGROUND



What they'

OnMilwaukee

Maxim

Experienc

FONT SELECTION(S)



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KRATZ LAW FIRM

Home Do I need a lawyer Criminal & Traffic Divorce & Custody Personal Injury Fees Contact



Attorney Ken Kratz

- *Former Wisconsin District Attorney
- *Over 25 Years of Legal Experience
- *Successfully tried one of the largest and most complex homicide cases in Wisconsin history (*State of Wisconsin v. Steven Avery*)



What they "forgot" to tell you

OnMilwaukee.com People Mag. The New Yorker
Maxim NY Times ABC News FOX News CBS News Texting Scandal Conspiracy?

Experience Matters

The Best Criminal defense attorney you can find has the most experience. Period. Ideally, it is also an attorney who knows BOTH sides of the criminal justice system. Ken Kratz has over 25 years experience as a trial lawyer in Wisconsin, most of that time spent as an elected DA near Appleton, WI.

MORE

Why do I feel so overwhelmed?

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A natural for the legal system
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Read More...

Testimonials from Former Clients



More Client Testimonials

The Kratz Law Firm serves clients in Superior, Wisconsin, and surrounding counties including Douglas, Ashland, Bayfield, Burnett, Sawyer and Washburn.

CONSISTENCY

Not a link

Links

Not a link

These are all links

Not a link

*Successfully tried one of the largest and most complex homicide cases in Wisconsin history (*State of Wisconsin v. Steven Avery*)

The New Yorker

ABC News FOX News CBS News

Texting Scandal

Conspiracy?

Really? You just have a button titled "Texting Scandal"? And another one titled "Conspiracy"?

CONSISTENCY (AGAIN!)

NETFLIX

What they "forgot" to tell you

OnMilwaukee.com **People Mag.** *The New Yorker*

Maxim *NY Times*

*Succ
most o
histor



THE VALUE OF PROTOTYPING

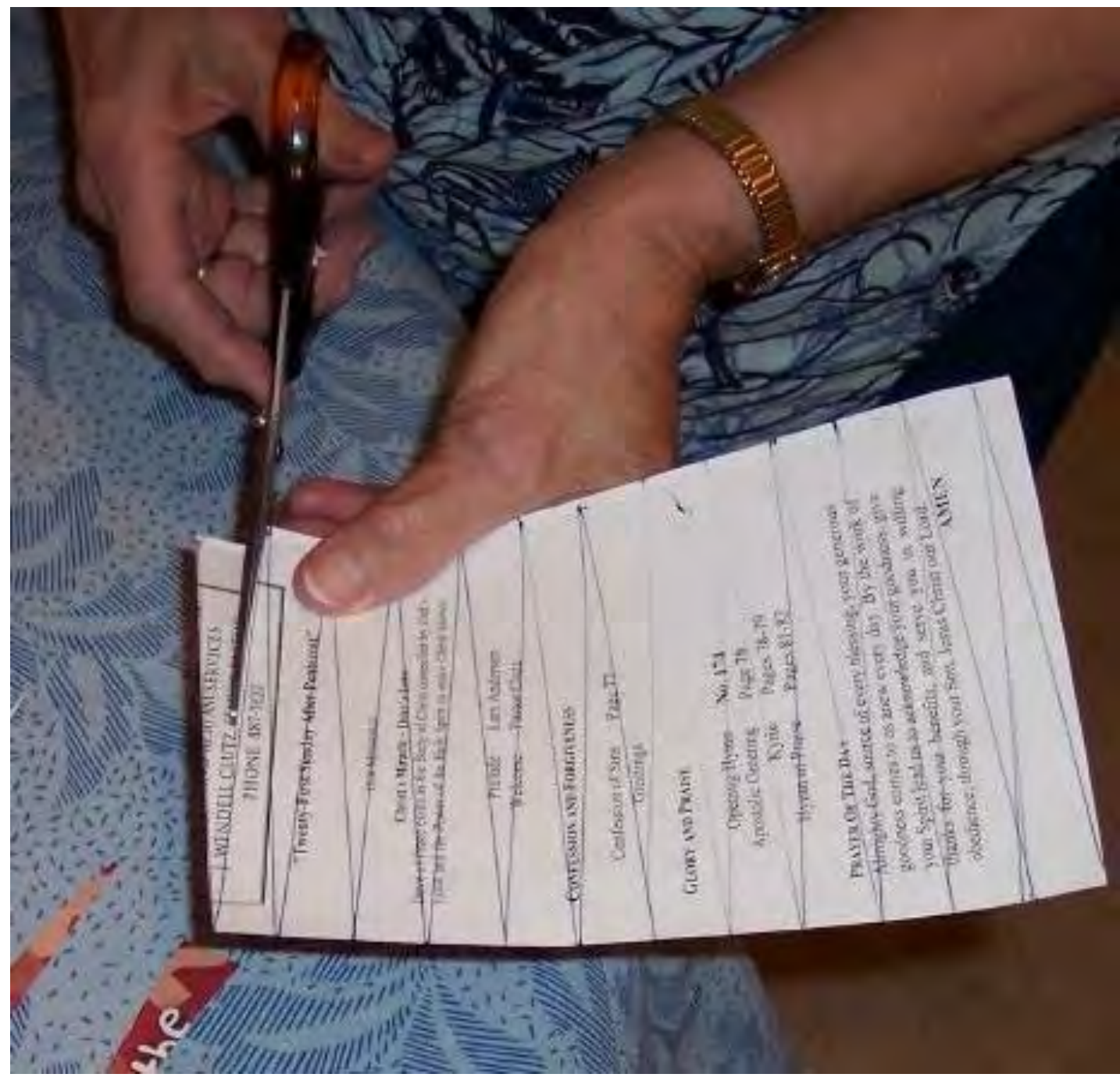
BENEFITS OF PROTOTYPING

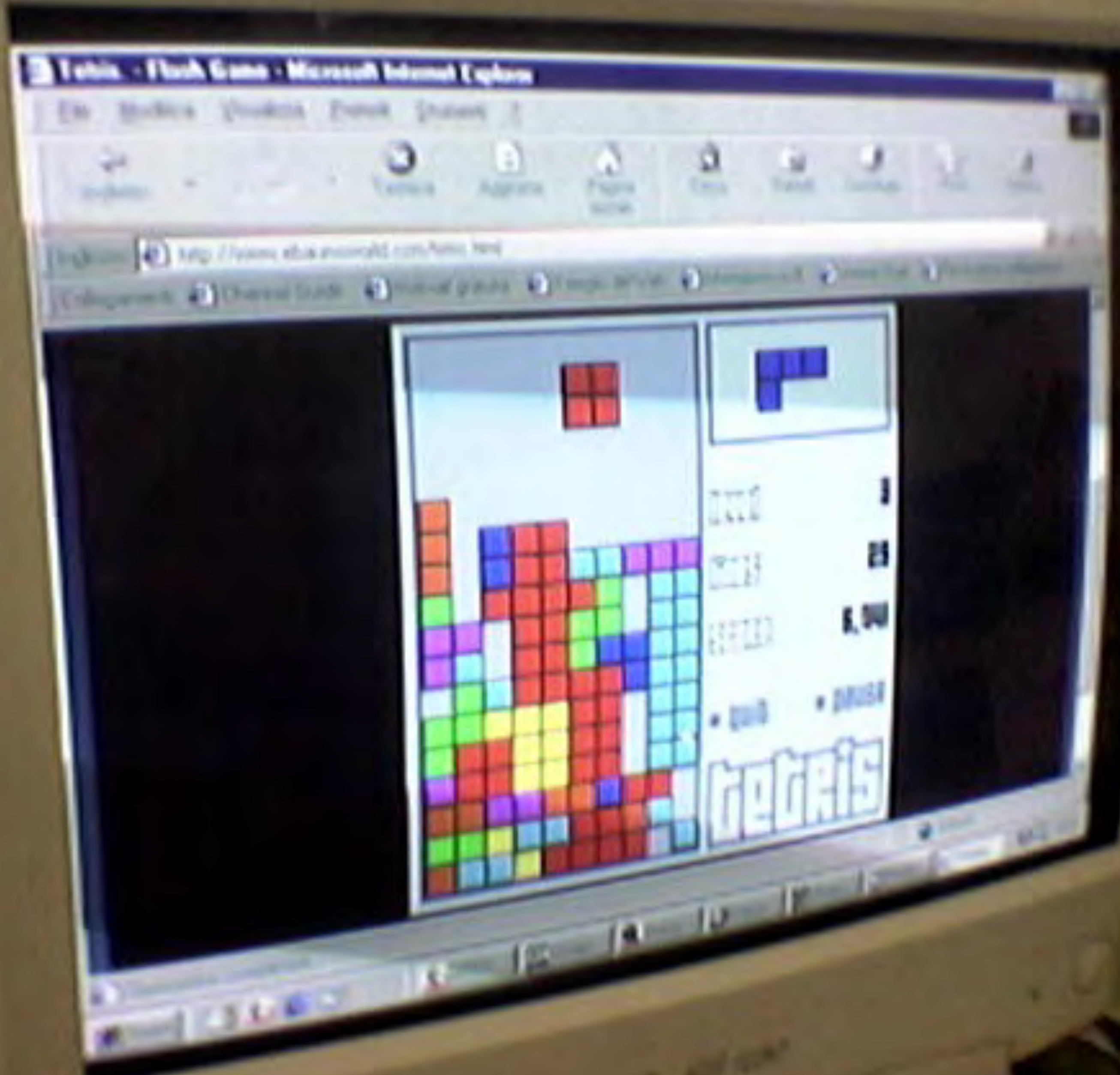
We know more than we can tell

Actions in the world outperform mental operations

The value of surprise

TACIT KNOWLEDGE



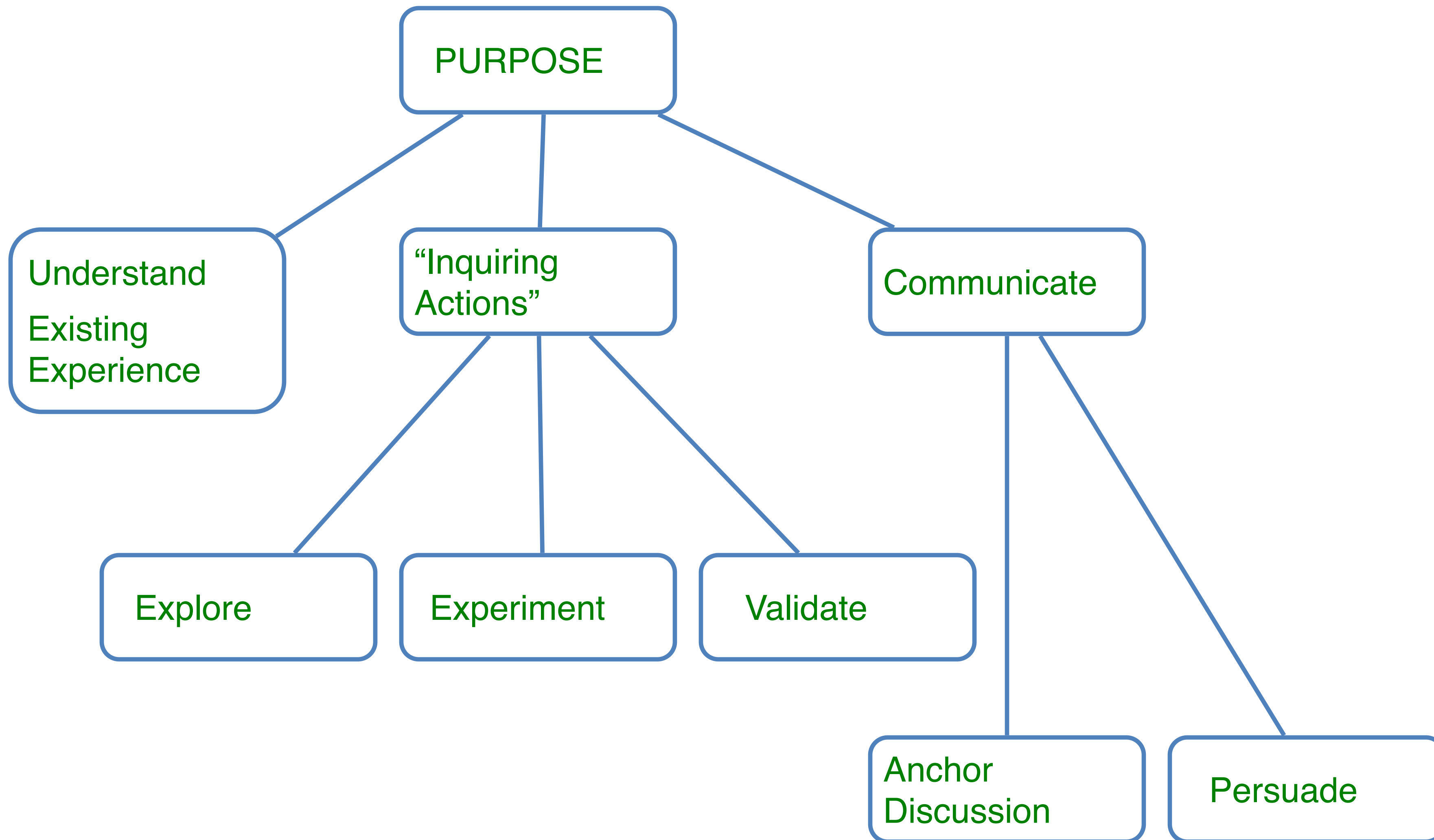




THE PURPOSE OF PROTOTYPING

What questions do prototypes answer?

When and how should they be constructed?



UNDERSTAND EXISTING EXPERIENCE

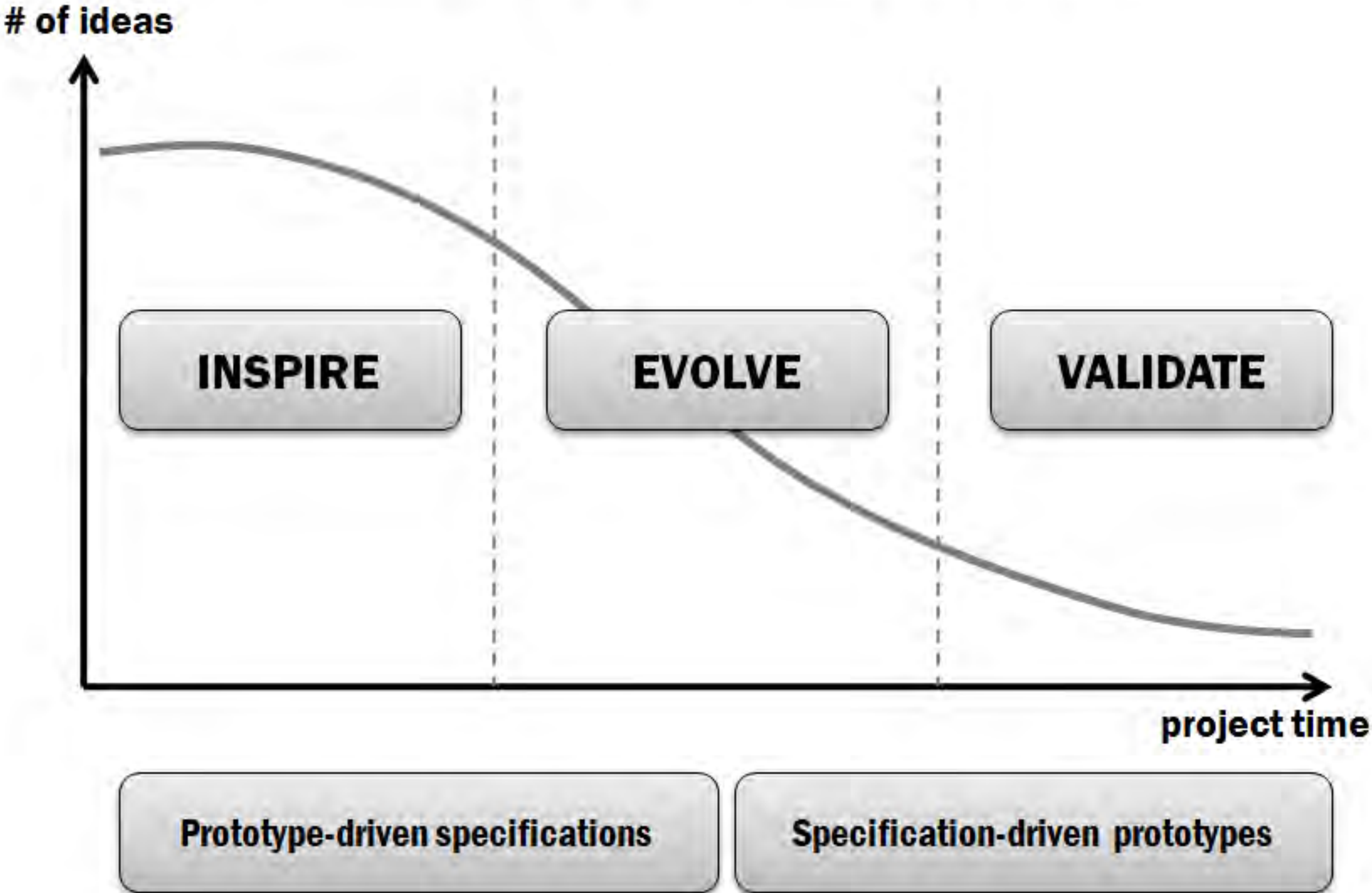




Figure 2: Experiencing a train journey.

INQUIRING ACTIONS

Three Stages of Prototyping (IDEO)







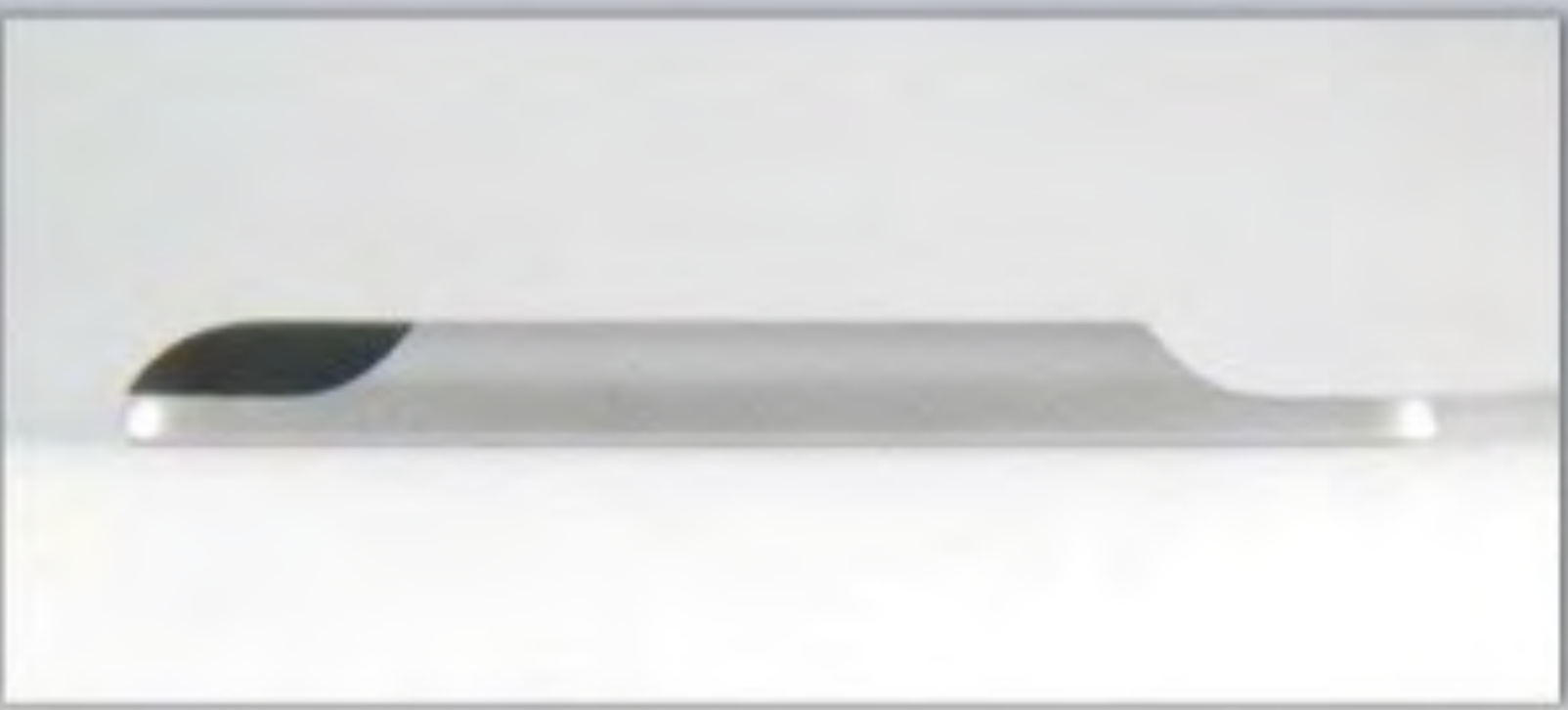


















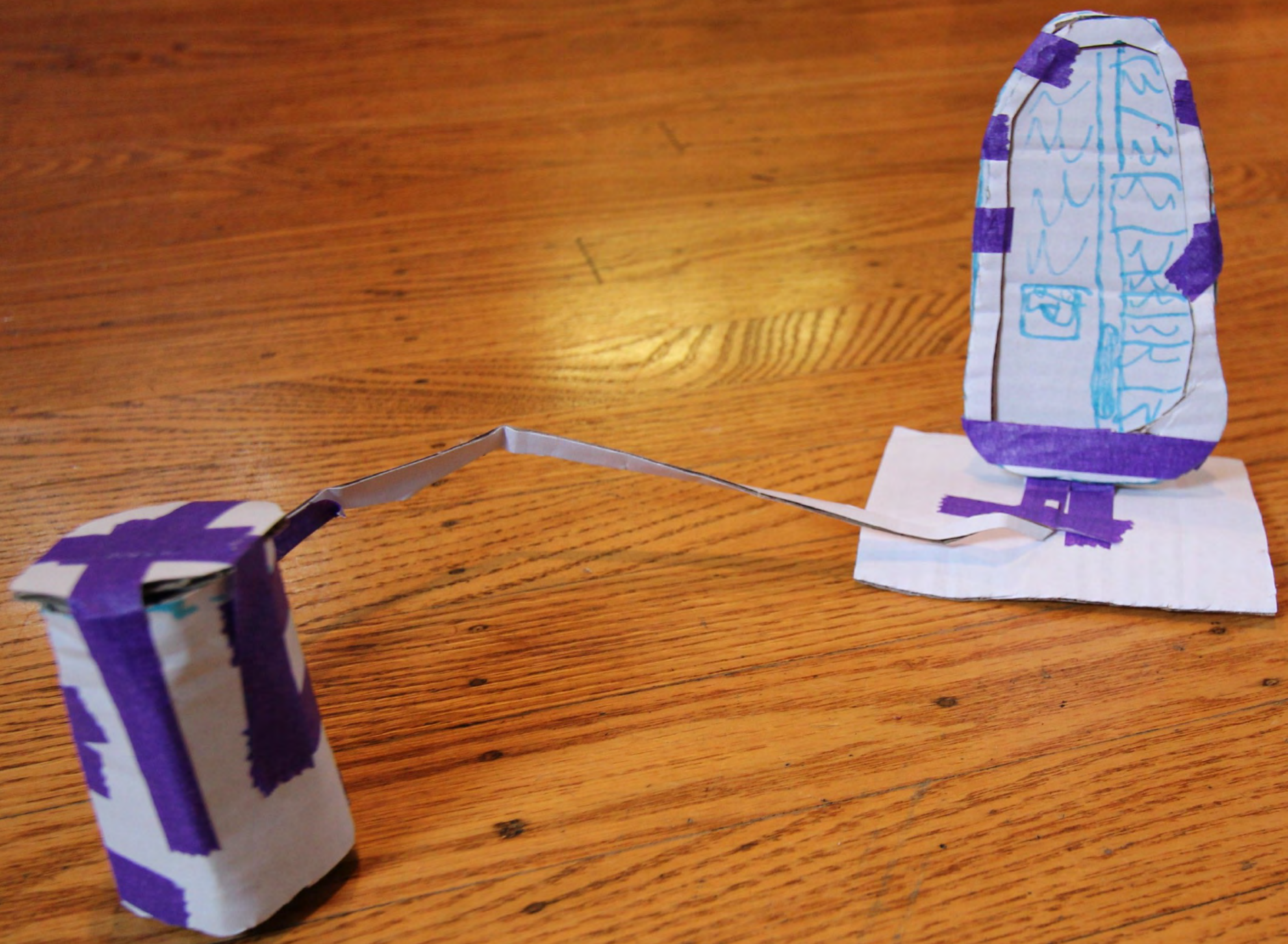


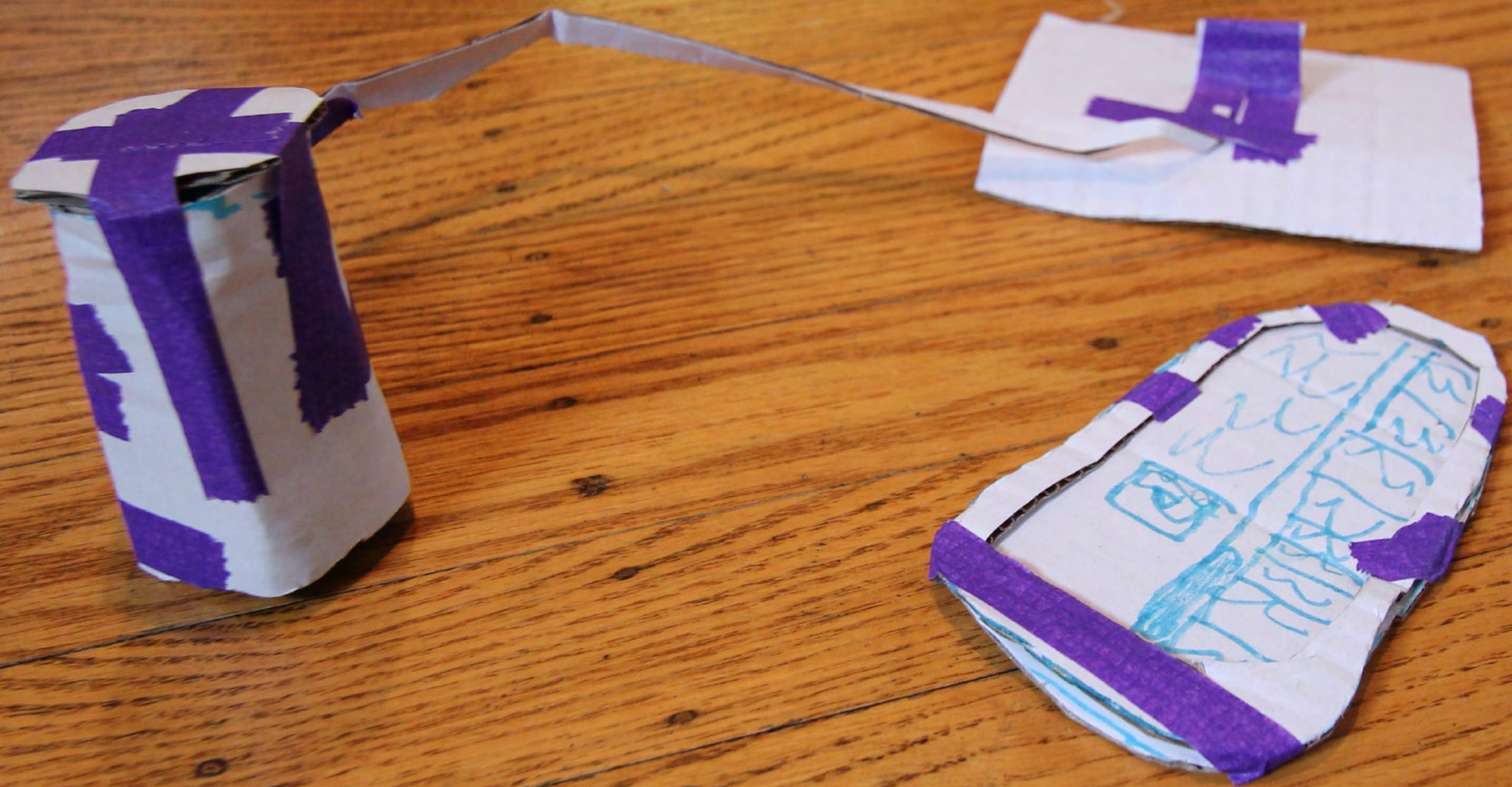
Prototypes for the
Microsoft mouse
From Moggridge,
Designing Interactions, Ch2



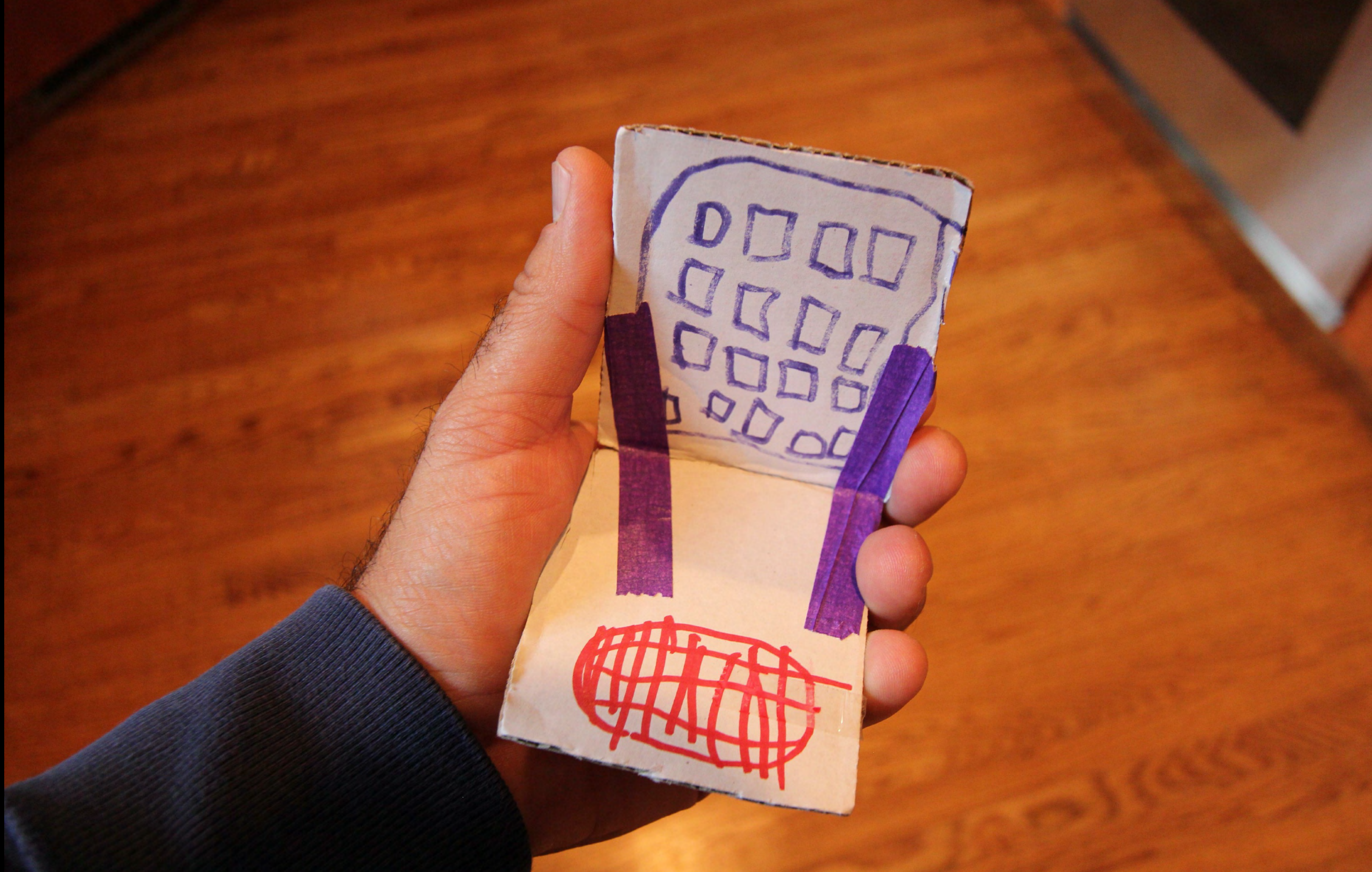
PAPER PROTOTYPING

Towards Wizard of Oz Studies











MATERIALS

Large, heavy, white paper (11 x 17)

5x8 in. index cards

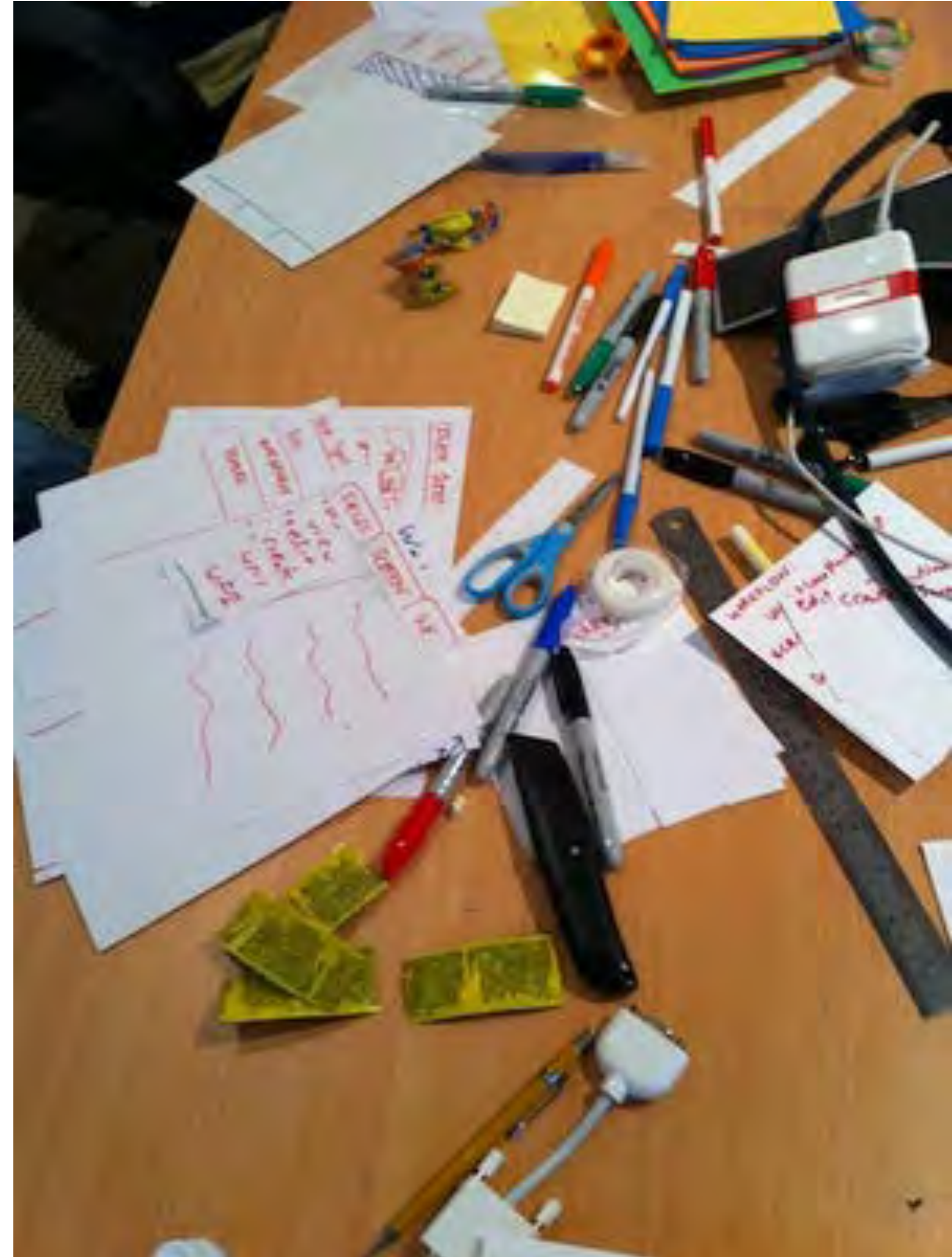
Post-it notes

Tape, stick glue, correction tape

Pens & markers (colors & sizes)

Transparencies (including colored)

Scissors, X-acto knives, etc.





Only 1 day

Day: _____

Month: _____

Year: _____

OK

Document

Title: _____

Subject: _____

Author: _____

OK Post Cancel

Change Name

Current Job Title: _____

New Job Title: _____

Current ID: _____

New ID: _____

OK Cancel

WARNING!

OK

Cancel

OK

Start to Transfer

File to be moved: _____

Description: _____

OK Cancel

Find Value

What: _____

Description: _____

Search Cancel Return Selected

Help

ID	Name	Position	Salary	Grade
1001	John Doe	Software Engineer	10000	10
1002	Jane Smith	Product Manager	12000	12
1003	Bob Johnson	Marketing Specialist	8000	8

Cancel

Print Table

Export Report

Cancel Item

Comments

- File
- Edit
- View
- Tools
- Window
- Help

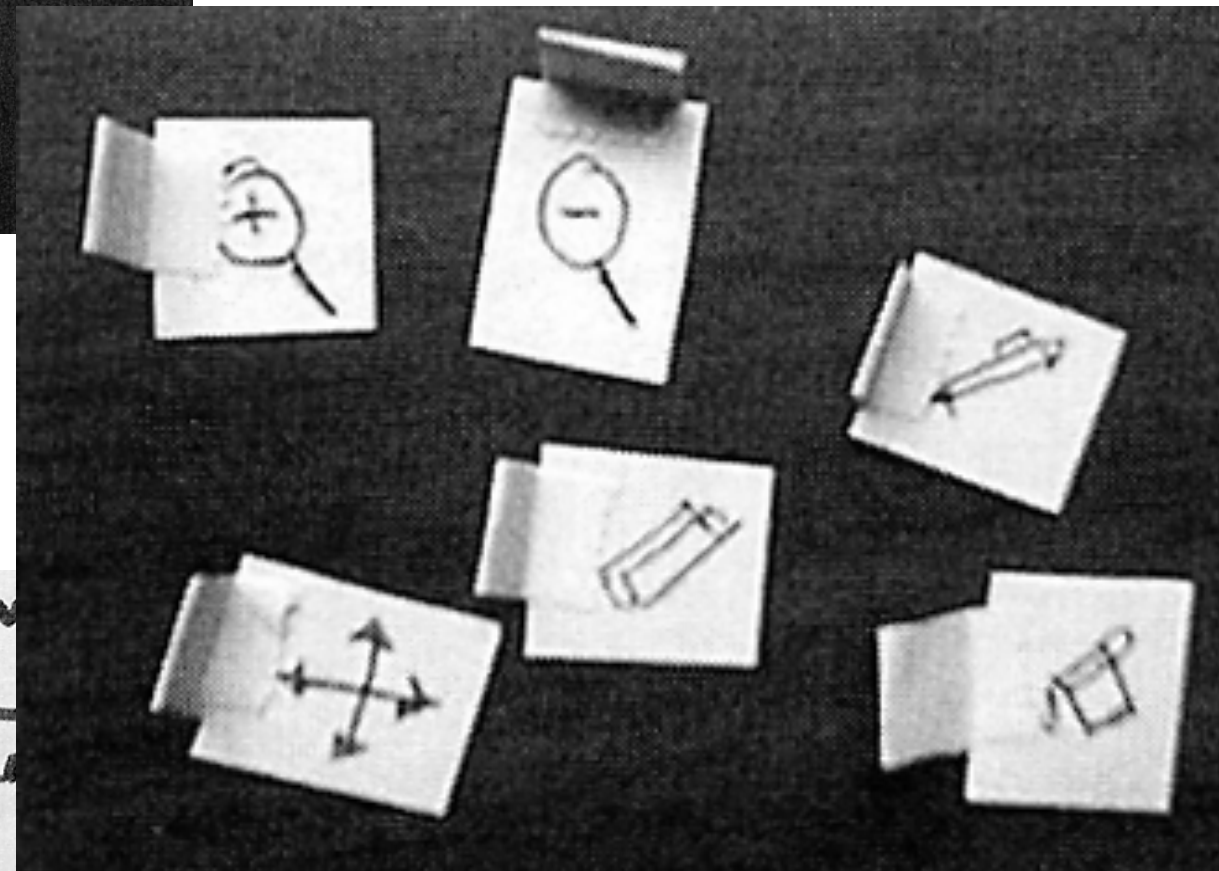
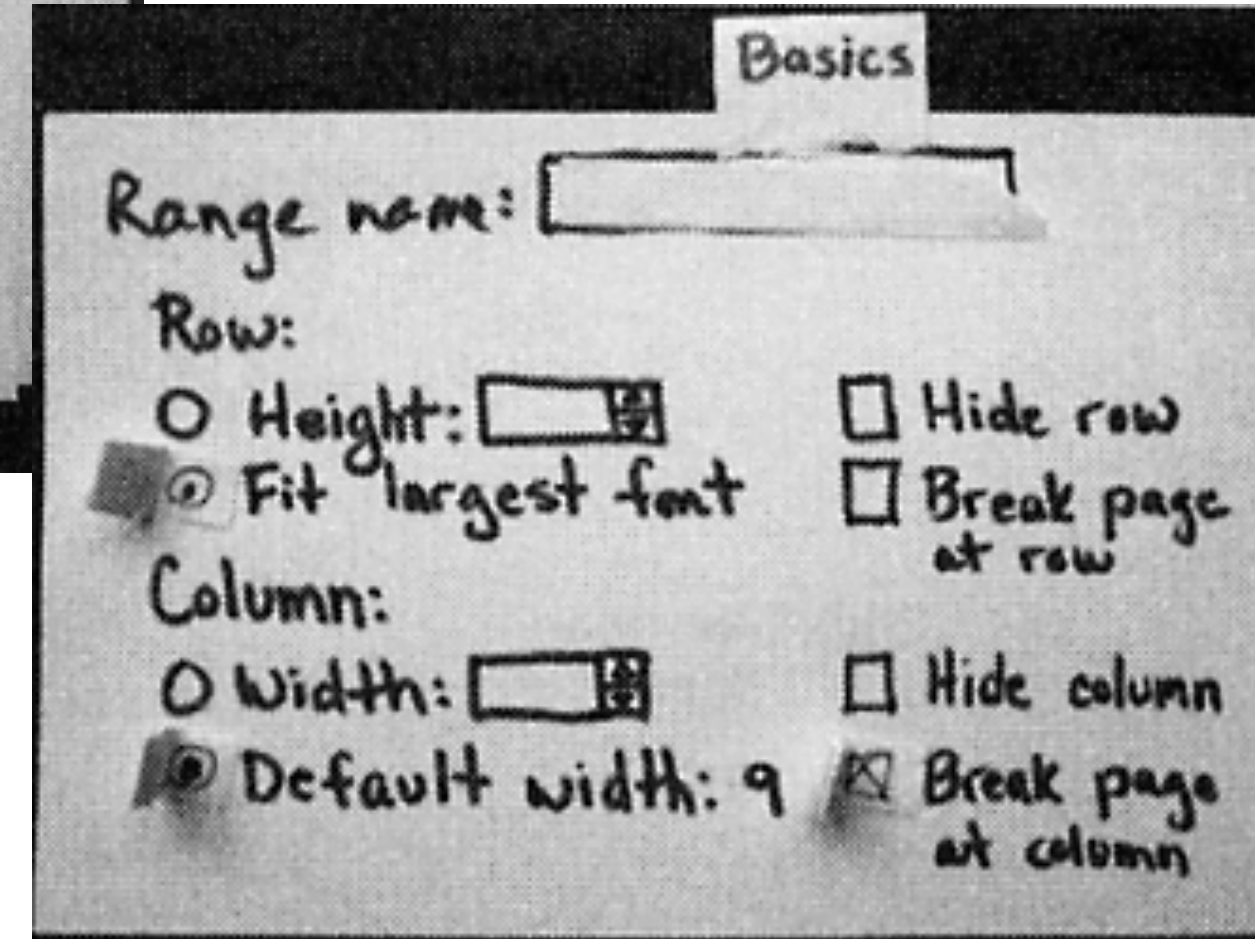
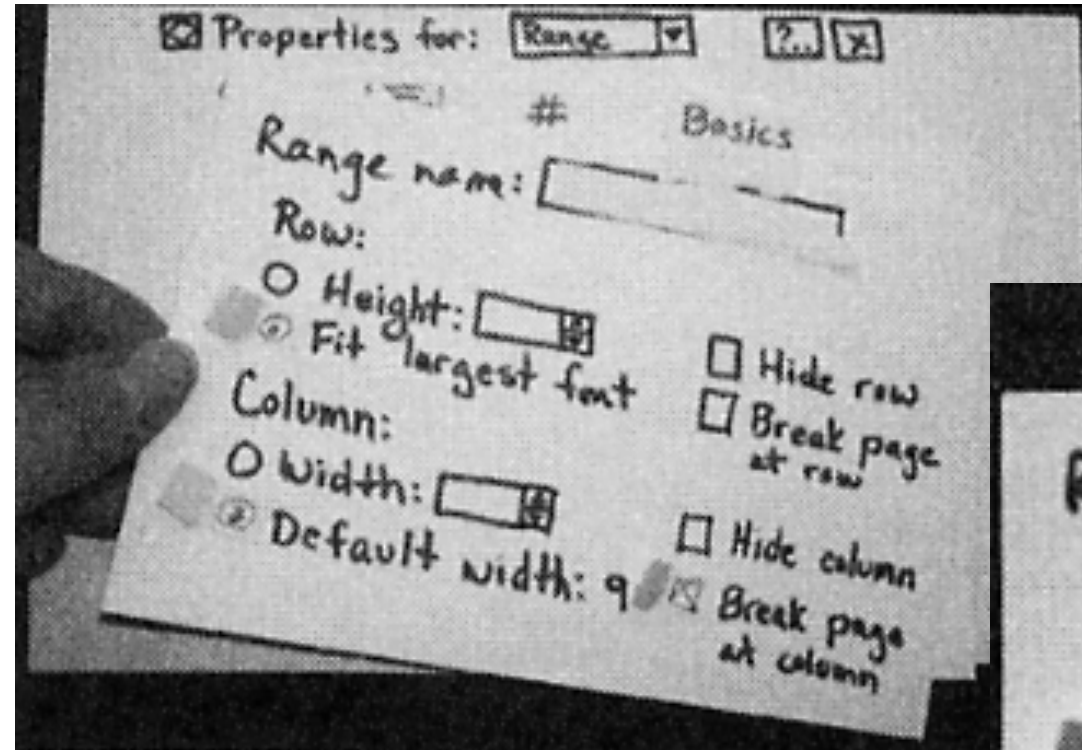
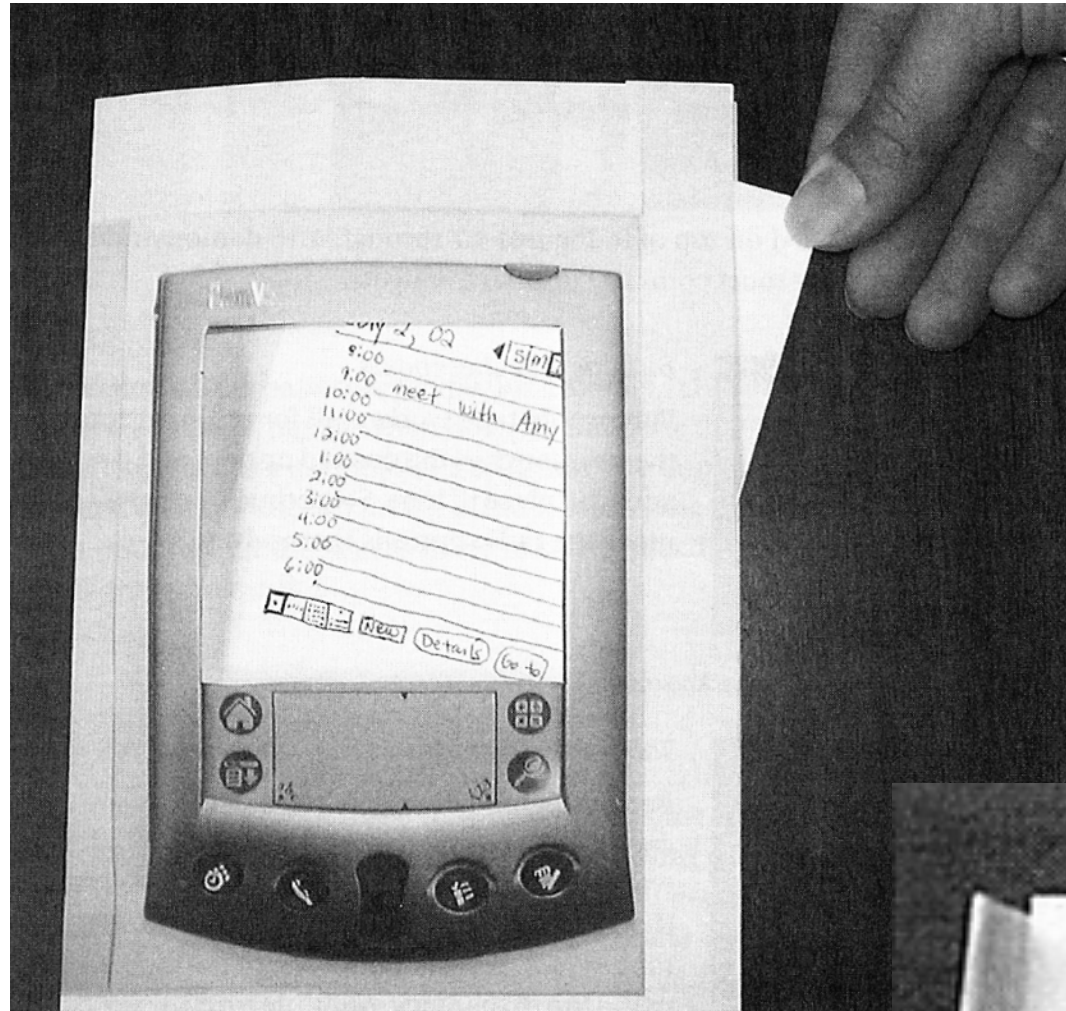
Description

ID	Description	Salary
1001	Software Engineer	10000
1002	Product Manager	12000
1003	Marketing Specialist	8000

OK Cancel

ID	Name	Position	Salary	Grade
1001	John Doe	Software Engineer	10000	10
1002	Jane Smith	Product Manager	12000	12
1003	Bob Johnson	Marketing Specialist	8000	8

INTERFACE ELEMENTS



2. Select the Actions for your rule

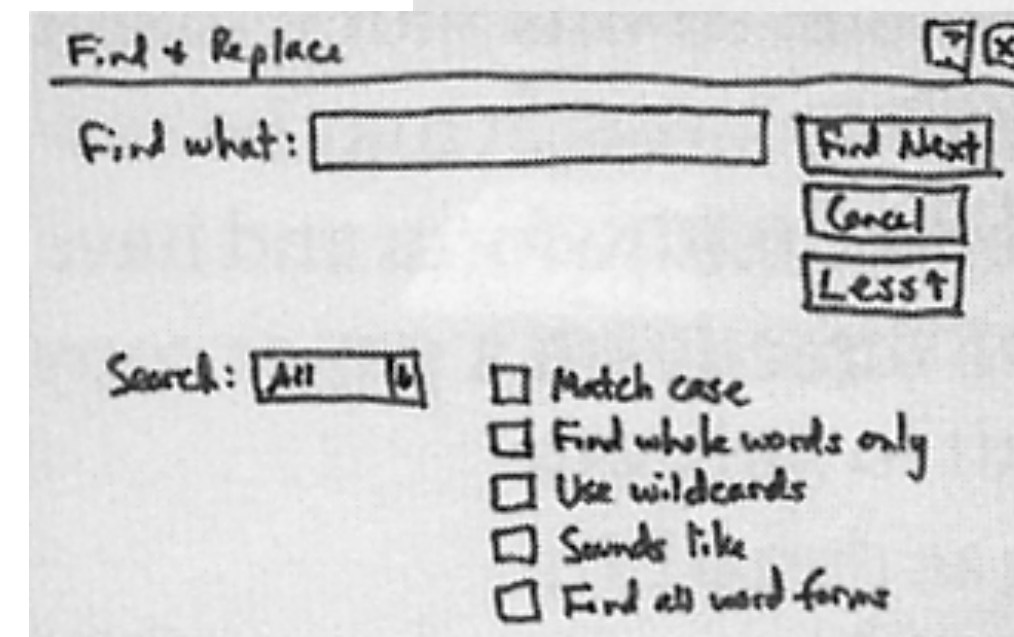
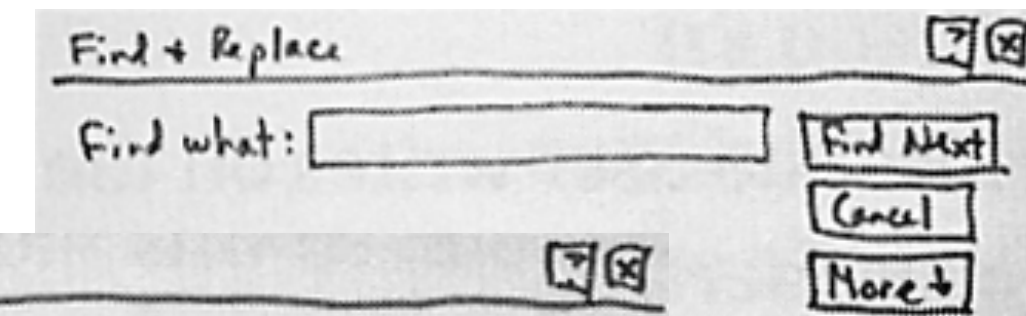
- Copy it to the specified folder
- Delete it
- Forward it to people
- Highlight it with color

3. Rule Description (click underlined value to edit):

Apply this rule after the message arrives

where the from line contains Craig Duncan

highlight it with color



WIZARD OF OZ TESTING

A Wizard of Oz experiment is a research experiment in which subjects interact with a computer system that subjects believe to be autonomous, but which is actually being operated or partially operated by an unseen or seen human being.





CONSTRUCTING THE PROTOTYPE

Set a deadline

Don't think too long - build it!

Draw a window frame on large paper

Draw at a large size, but use correct aspect ratio

Put different screen regions on cards

Anything that moves, changes, appears/disappears

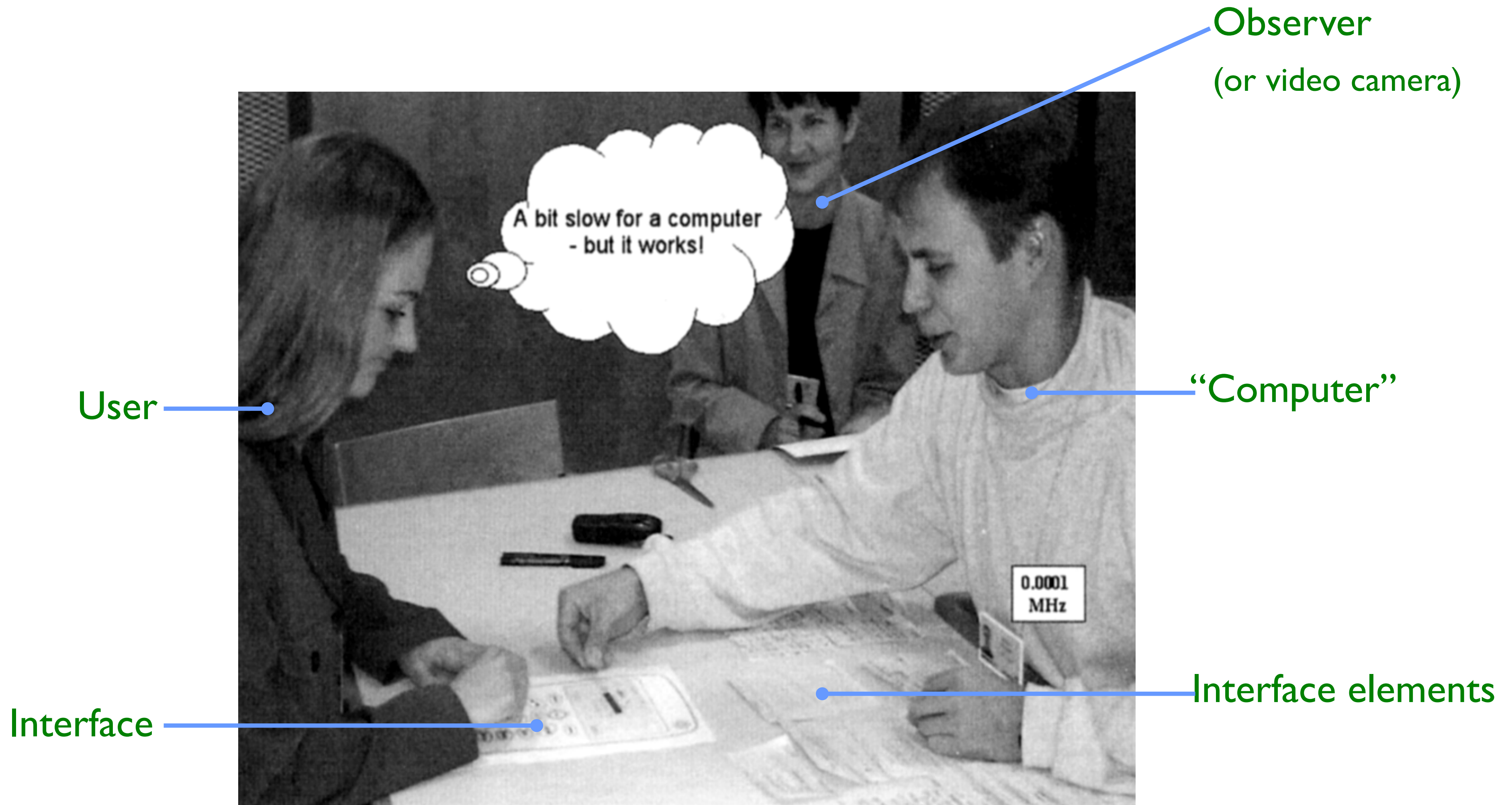
Use greeking to indicate text if necessary

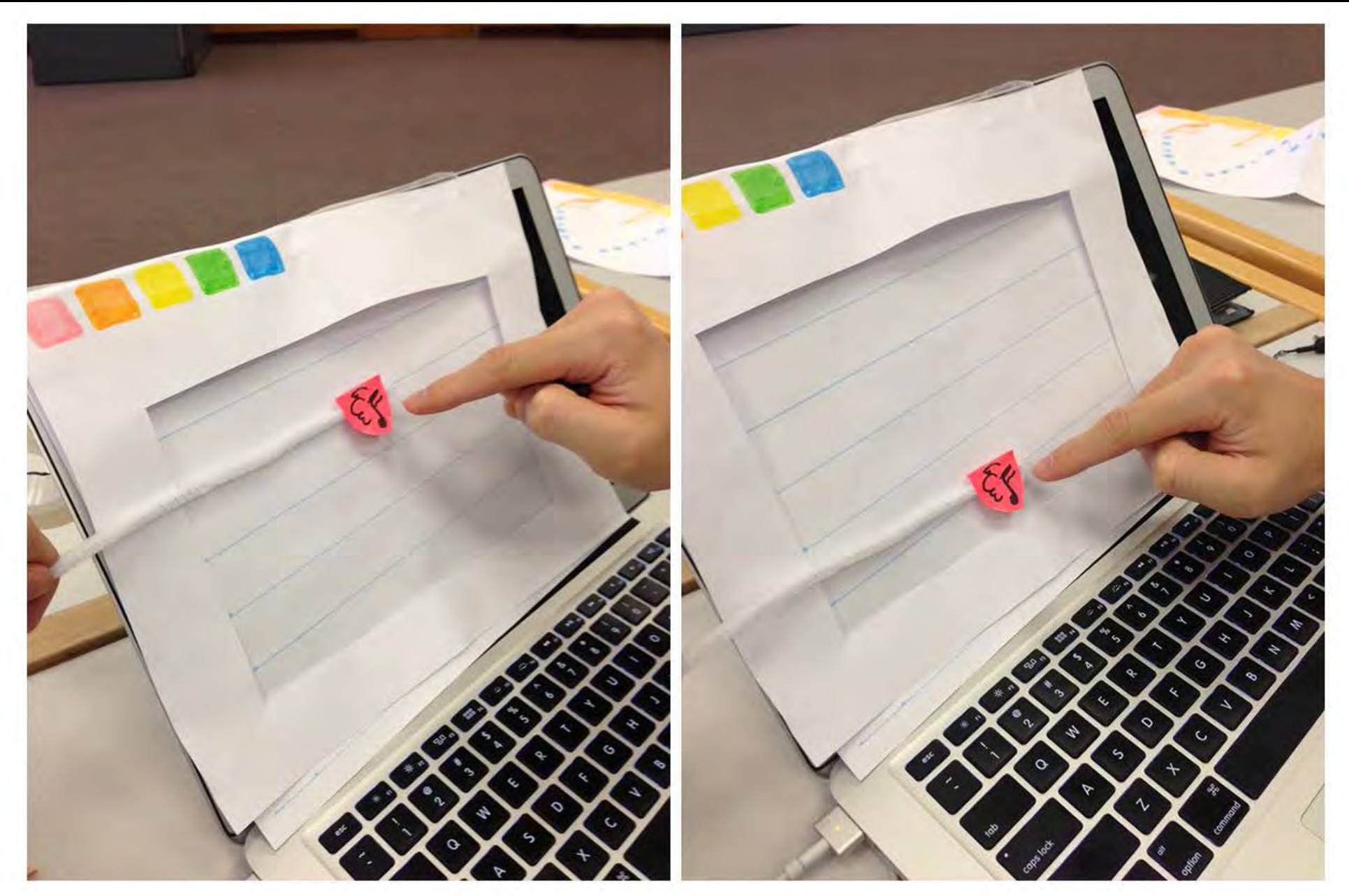
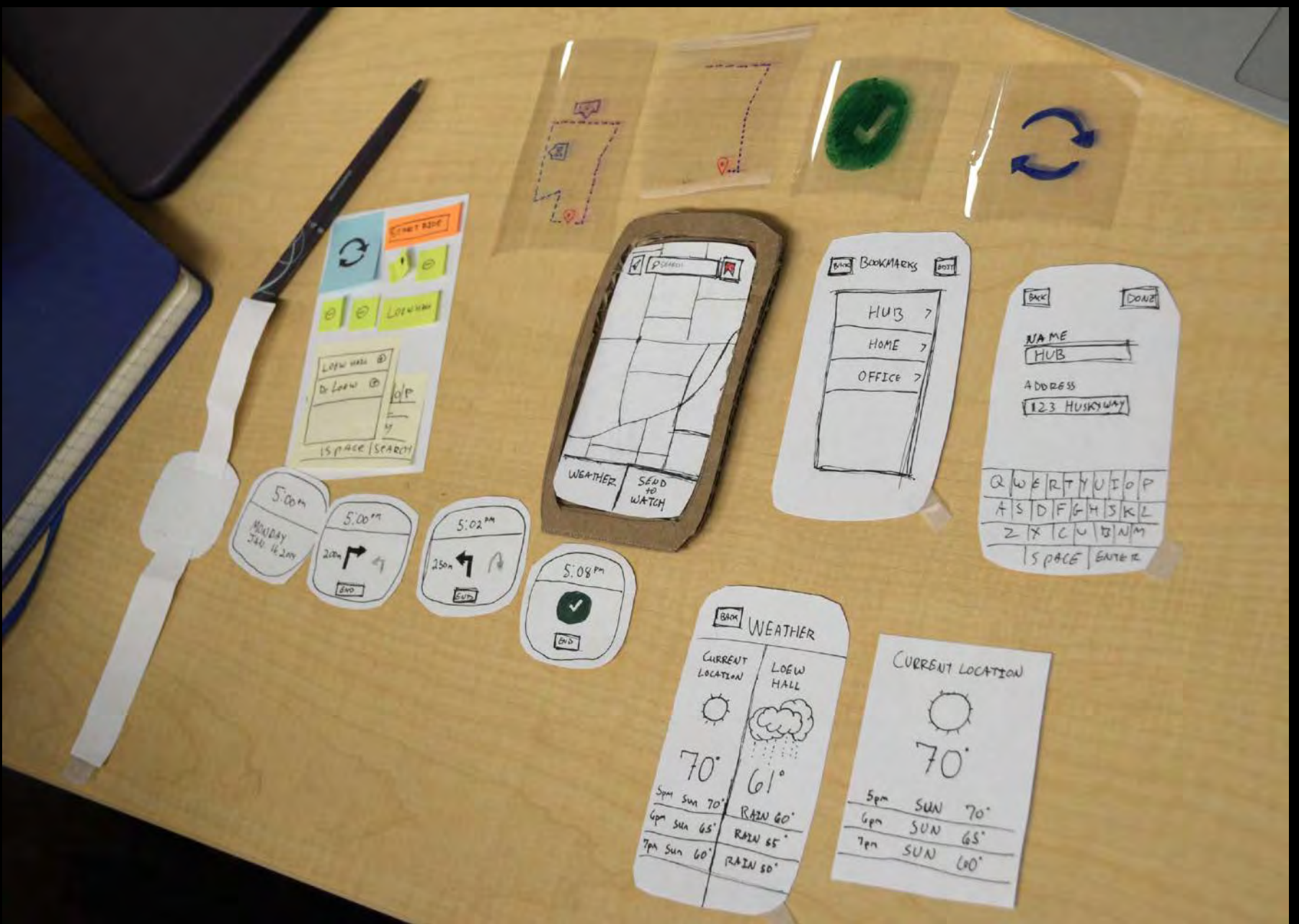
Ready response for any user action

e.g., Have those pull-down menus already made

Use photocopier to make many versions











User A

Test: Blood Analysis / Payment: Credit Card



CONDUCTING A TEST

Three or Four testers (preferable)

Greeter - Puts users at ease & gets data

Facilitator - only team member who speaks

Gives instructions & encourages thoughts, opinions

Computer - knows application logic & controls it

Always simulates the response, w/o explanation

Observer(s) - Take notes & recommendations

Typical session should be approximately 1 hour

Preparation, the test, debriefing

CONDUCTING A TEST (CONT.)

Greet

Get forms filled, assure confidentiality, etc.

Test

Facilitator explains how test will work

Performs a simple task

Facilitator hands written tasks to the user

Must be clear & detailed

Facilitator keeps getting “output” from participant

“What are you thinking right now?”, “Think aloud”

Observers record what happens

Avoid strong reactions:, frowning, laughing, impatience – biases the test

Designers should not lead participants

Let users figure things out themselves as much as possible

Only answer questions if user remains stuck for a long time

CONDUCTING A TEST (CONT.)

Debrief

Fill out post-evaluation questionnaire

Ask questions about parts you saw problems on

Gather impressions

Thank participants

PREPARING FOR A TEST

Select your participants

Understand background of intended users

Use a questionnaire to get the people you need

Don't use friends or family

Prepare scenarios that are

Typical of the product during actual use

Make prototype support these (small, yet broad)

Practice running the computer to avoid "bugs"

You need every menu and dialog for the tasks

All widgets the user might press

Remember "help" and "cancel" buttons

WOZ is different from pre-built/canned functionality

WIZARD OF OZ TIPS

Rehearse your actions

Make a flowchart which is hidden from the user

Make list of legal words for a speech interface

Stay "in role"

You are a computer, and have no common sense, or ability to understand spoken English.

Facilitator can remind user of the rules/think-aloud approach if the user gets stuck

RECORD CRITICAL INCIDENTS

Critical incidents are any unusual/interesting events

Most of them are usability problems.

They may also be moments when the user

- Got stuck

- Suddenly understood something

- Said "that's cool" etc.

USING THE RESULTS

Update task analysis and rethink design

Rate severity & ease of fixing problems

Fix both severe problems & make the easy fixes

Will thinking aloud give the right answers?

Not always

If you ask a question, people will always give an answer, even if it has nothing to do with the facts

Try to avoid leading questions



INPUT DEVICES

QUESTIONS:

What (low-level) tasks are the users trying to accomplish with an input device?

How can we think about the space of possible input devices?

What interaction techniques are encouraged/discouraged by a particular device?

IMPORTANT TASKS

Text Entry

Pointing/Marking

- Target acquisition
- Steering / positioning
- Freehand drawing
- Drawing lines
- Tracing and digitizing
- ...

KEYBOARDS





KEY LAYOUTS

QWERTY



DVORAK



DIFFICULTY: TEXT ENTRY

Still somewhat difficult on mobile devices

Keyboards (on-screen and thumb)

Full hand-writing recognition

Graffiti

EdgeWrite

ShapeWriter



MOBILE TEXT ENTRY: KEYPADS

Multi-tap mappings

Multiple presses per letter

Ambiguity resolution

One press per letter, dictionary lookup





MOBILE TEXT ENTRY: KEYPADS

Chording

Multiple keys pressed simultaneously
 2^n combinations for n keys



Twiddler2, HandyKey







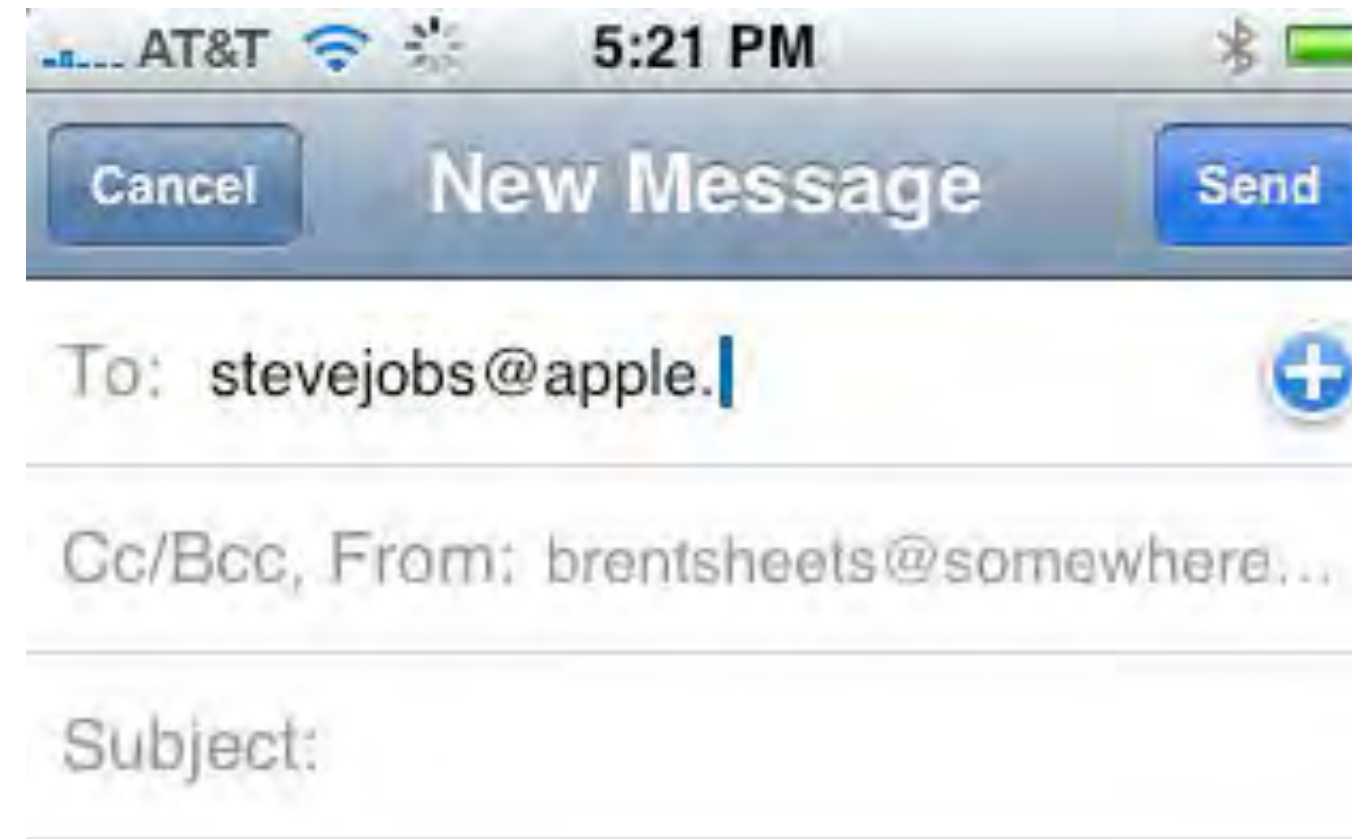




MOBILE TEXT ENTRY: SOFT KEYS

Soft Keyboards

Benefits? Drawbacks?



MOBILE TEXT ENTRY: HANDWRITING RECOGNITION



GRAFFITI - UNISTROKE TEXT ENTRY



A B C D E F G h i¹ j² k¹ l m n o

p q r s¹ t u v w¹ x² y z

0 1 2 3¹ 4² 5 6 7 8 9

. , ' ? _ ! / \ () ; : " & @ \$ % £ € ¥

. _ 7 ? _ ! / \ () ;¹ :¹ 7 7 & @ \$ % £ € ¥

+ - * . = o B μ f ø § / \ ~ .. ^ o

+² -¹ X² . = O B M F Ø i G¹ / \ N .. ^ O

‘ ’ “ ” § • ¢ i i l # ^ ÷ TM ® ©

L J - LL JJ § · || Ç i¹ c¹ l # ^ ÷ TM ® ©

< > [] { } space back space tab return

< > [] { } - - - /

EDGEWRITE

Corner-based text input technique

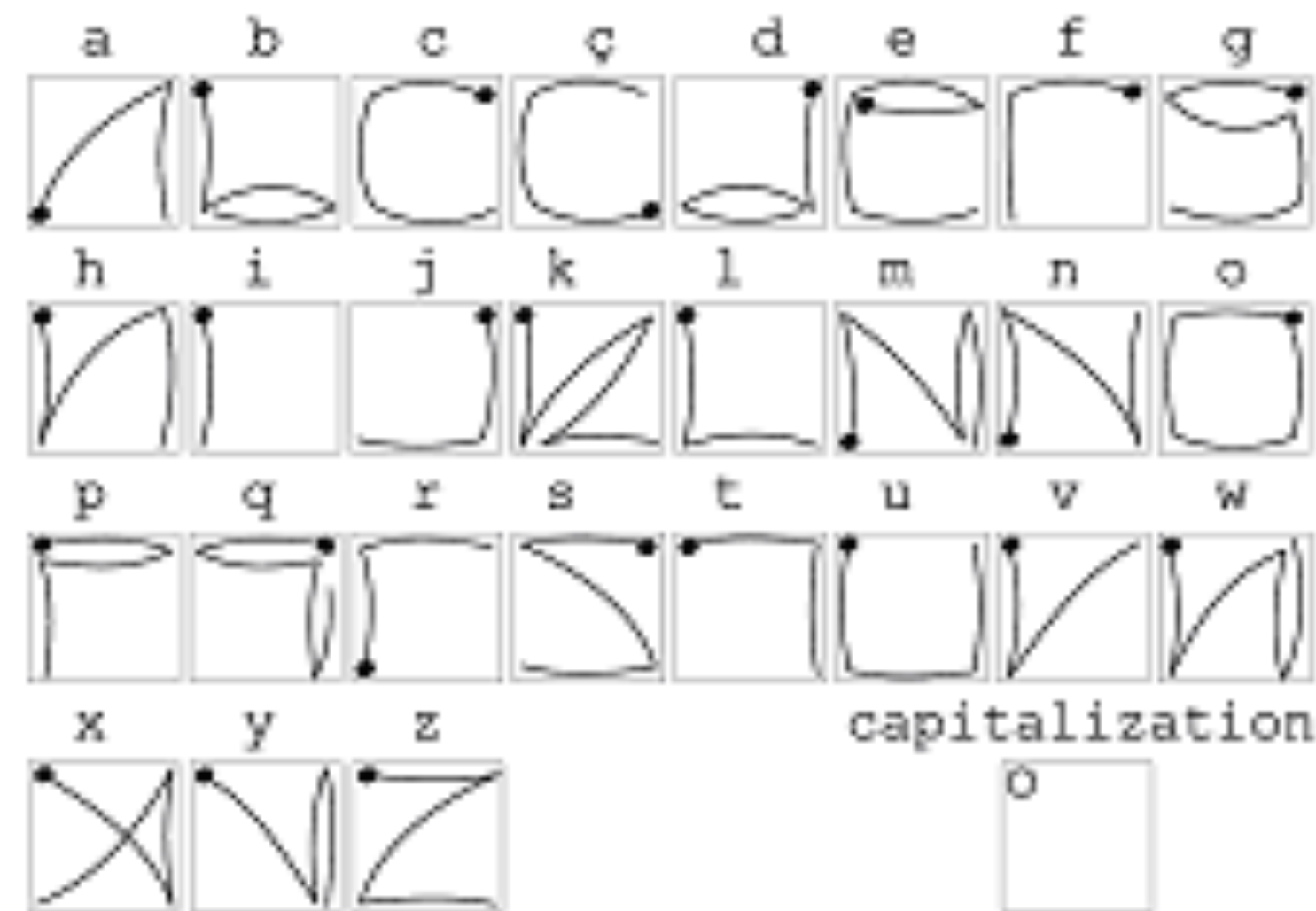
Makes use of physical edges and corners to improve input time

Particularly effective for users with motor impairments

Edges provide stability

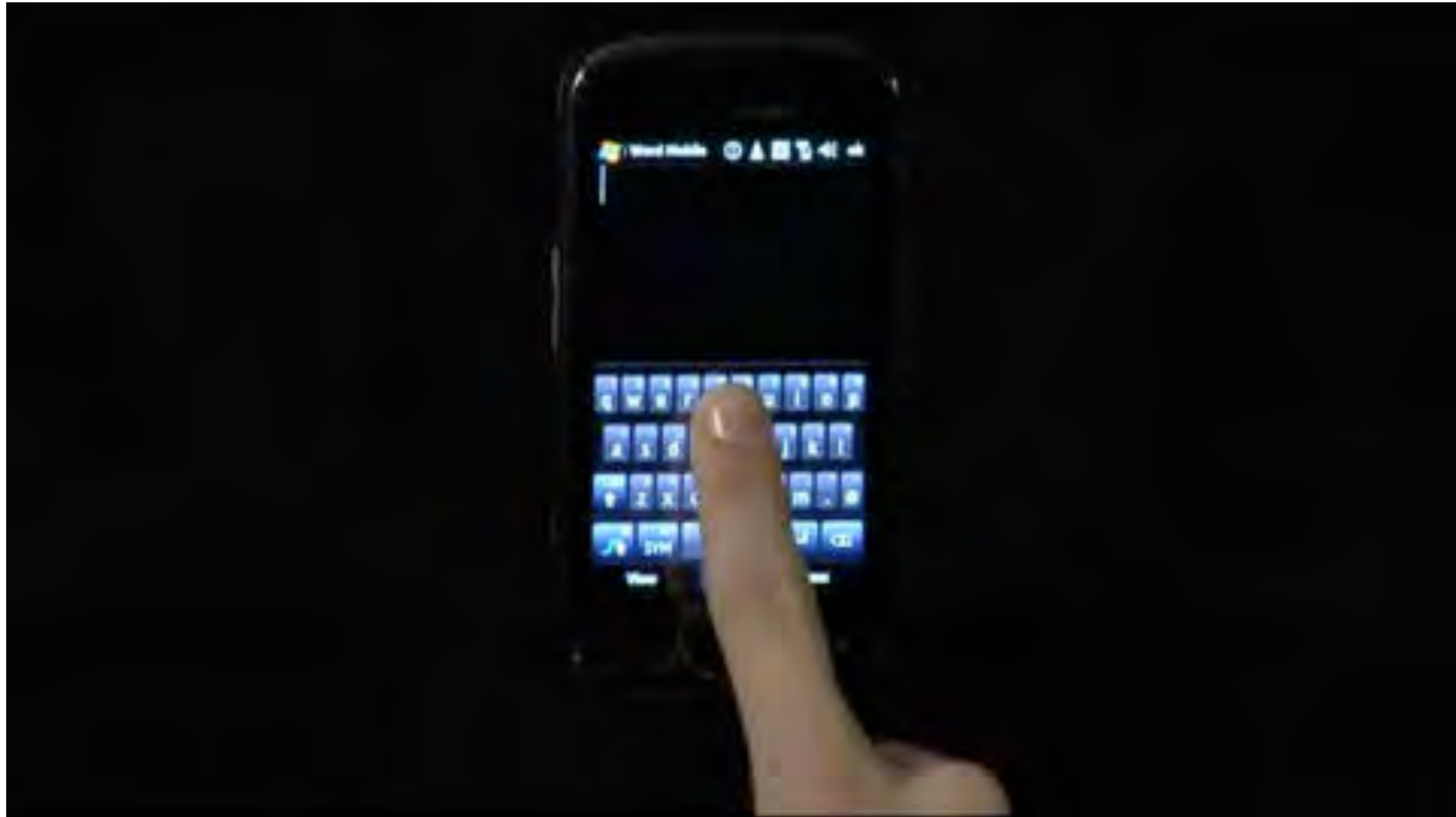
Implementable in many different input modalities

stylus, joysticks, trackball

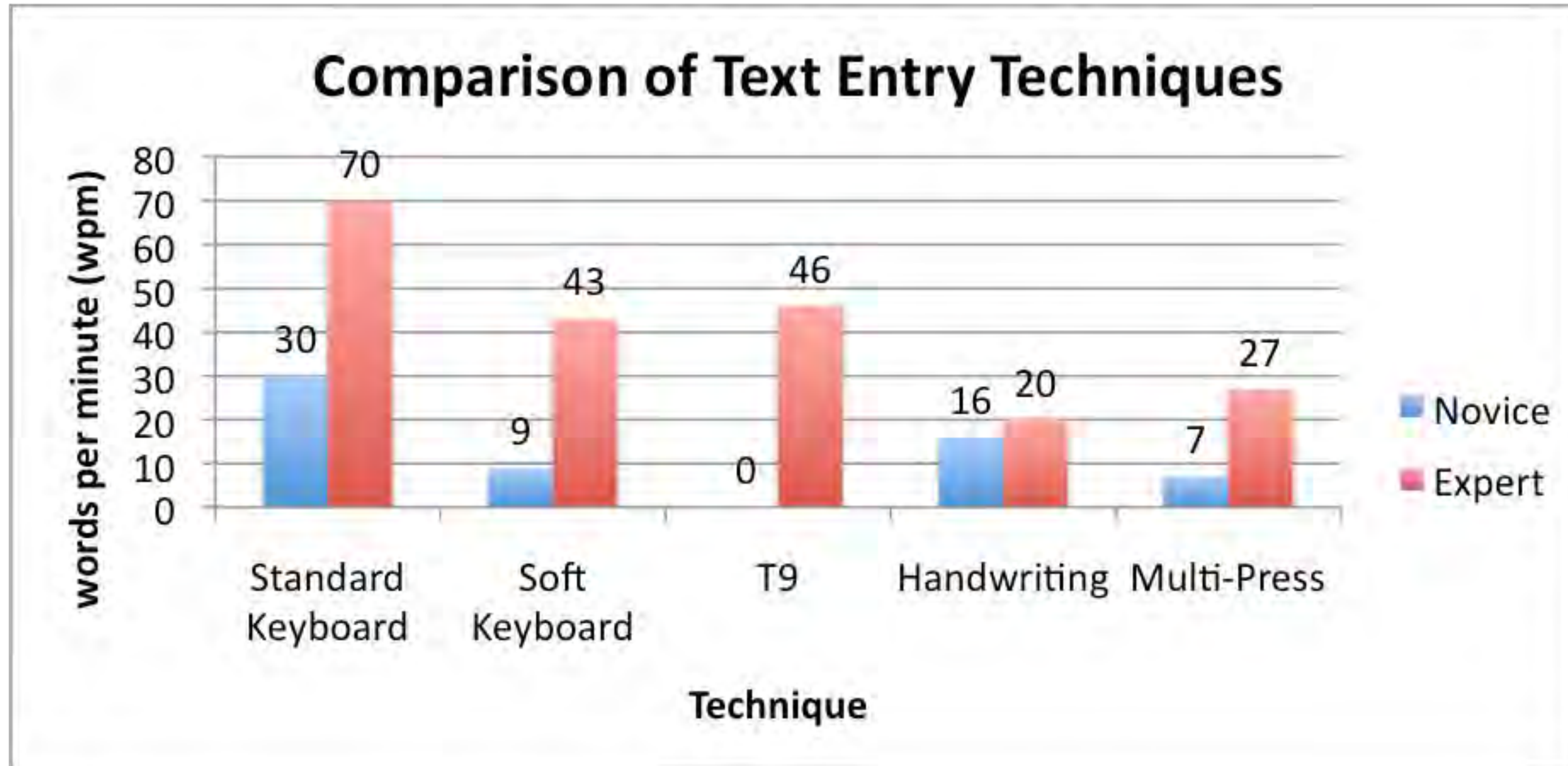


MOBILE TEXT ENTRY: TOUCH / STYLUS

Stroke Entry Methods (e.g., Swype, ShapeWriter)



WHICH IS FASTEST?



WHAT ABOUT SPEECH RECOGNITION?

Dictation is faster than typing (~100 wpm)

WHAT ABOUT SPEECH RECOGNITION?

Dictation is faster than typing (~100 wpm), BUT:

Speech is different from written language:

Speaking in well-formed, complete, print-ready sentences is cognitively challenging

High cost of correcting errors through speech channel alone

Social awkwardness?

POINTING DEVICES

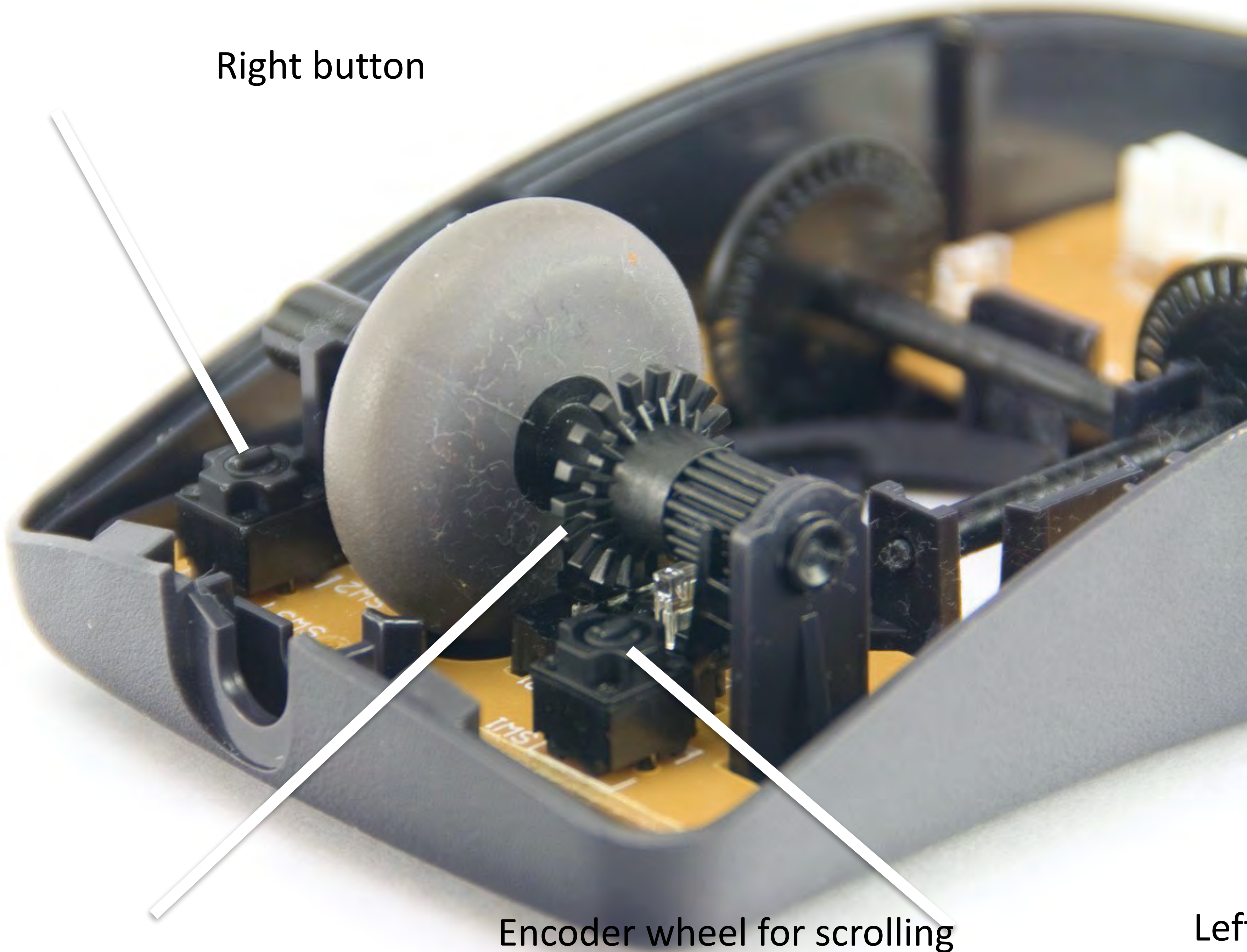




Mouse. Engelbart and English ~1964







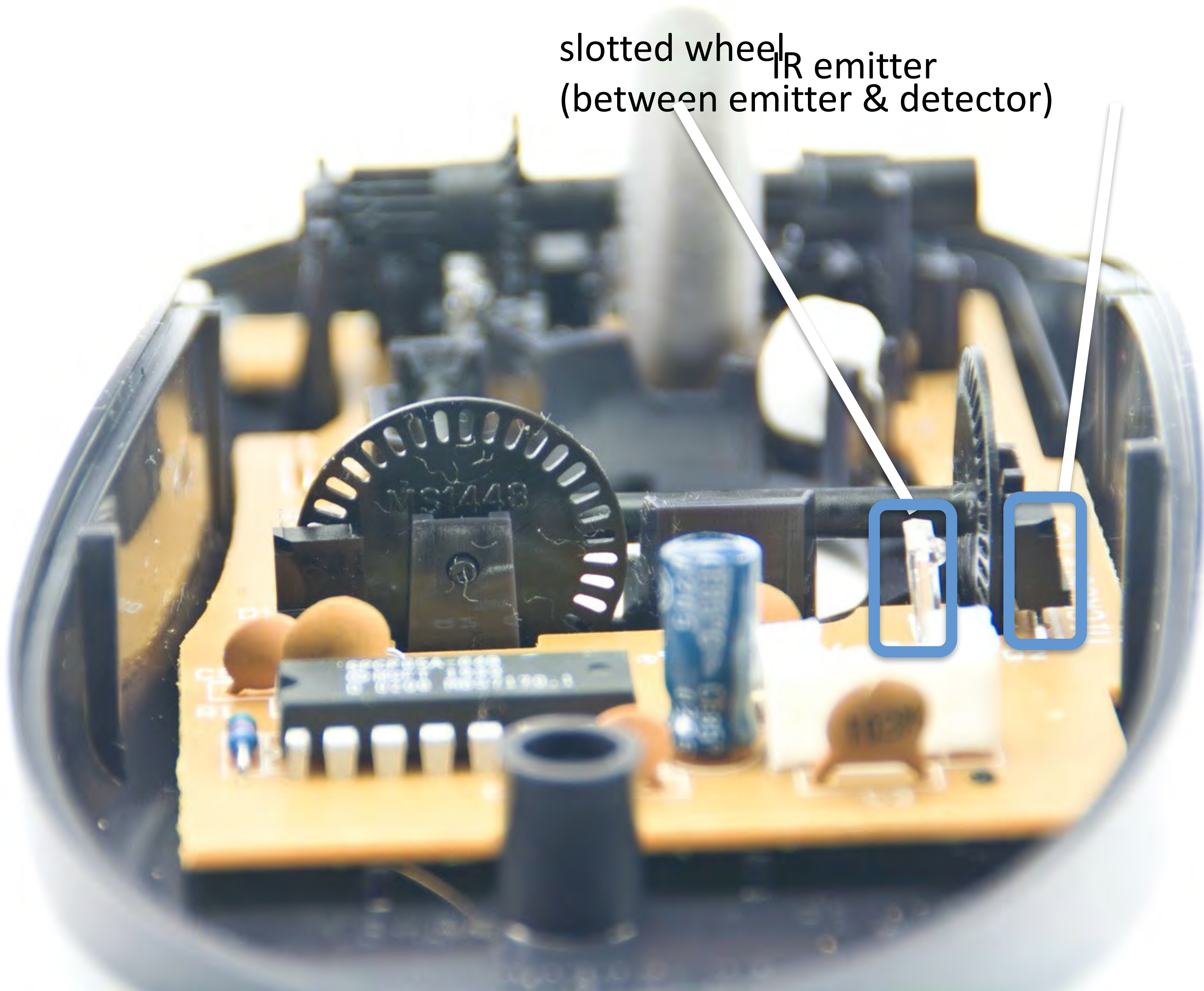
Right button

Encoder wheel for scrolling

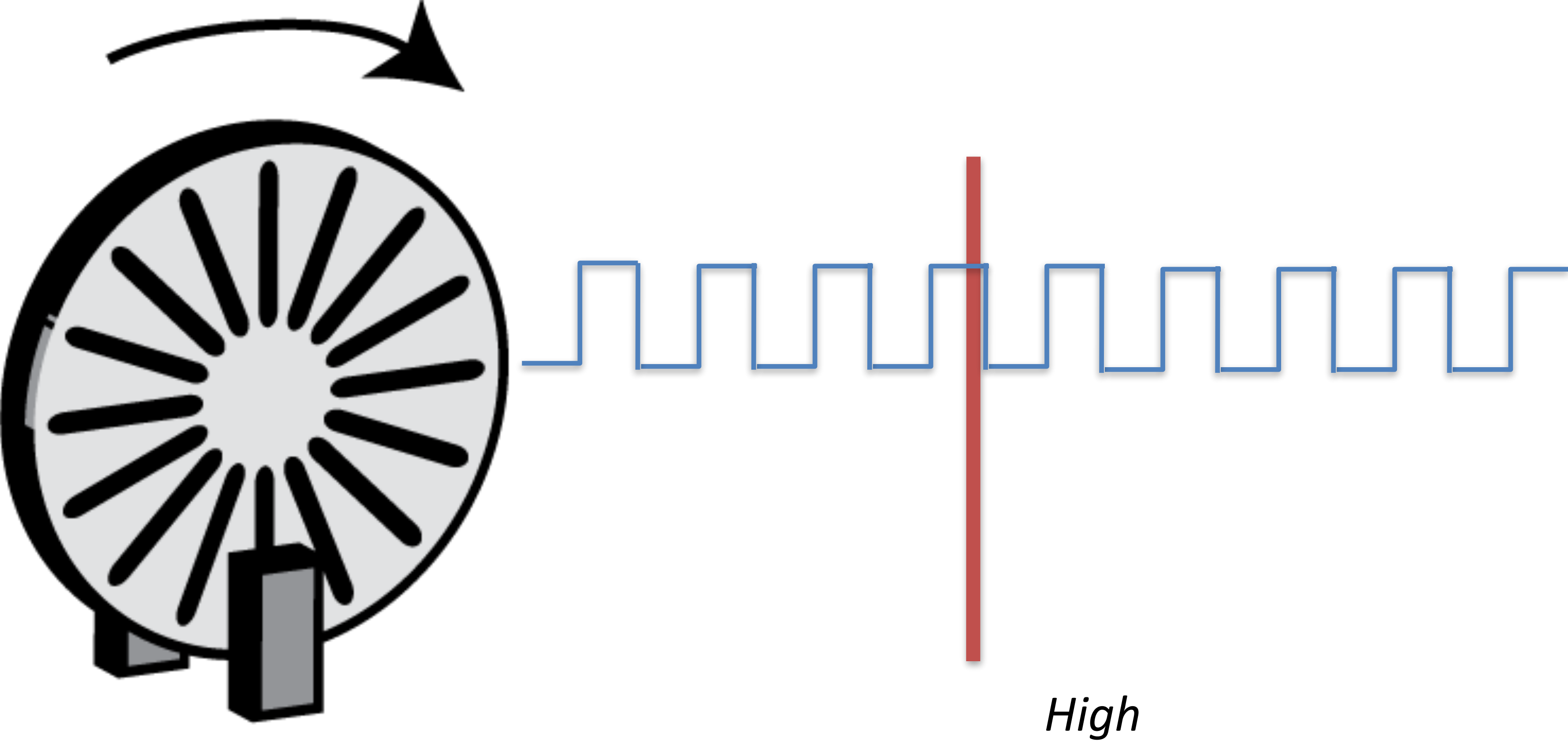
Left button

slotted wheel
IR emitter
(between emitter & detector)

IR detector



SENSING: ROTARY ENCODER



ABSOLUTE VS RELATIVE



Track Ball (relative, indirect locator)



Mice (relative, indirect locator)



Light Pen (absolute, direct locator)



Touch Screen (absolute, direct locator)

Absolute locators: have an origin location and locate in this frame of reference

Relative locators: report location relative to their previous location, rather than relative to a fixed origin

Direct locator: user points directly at the screen

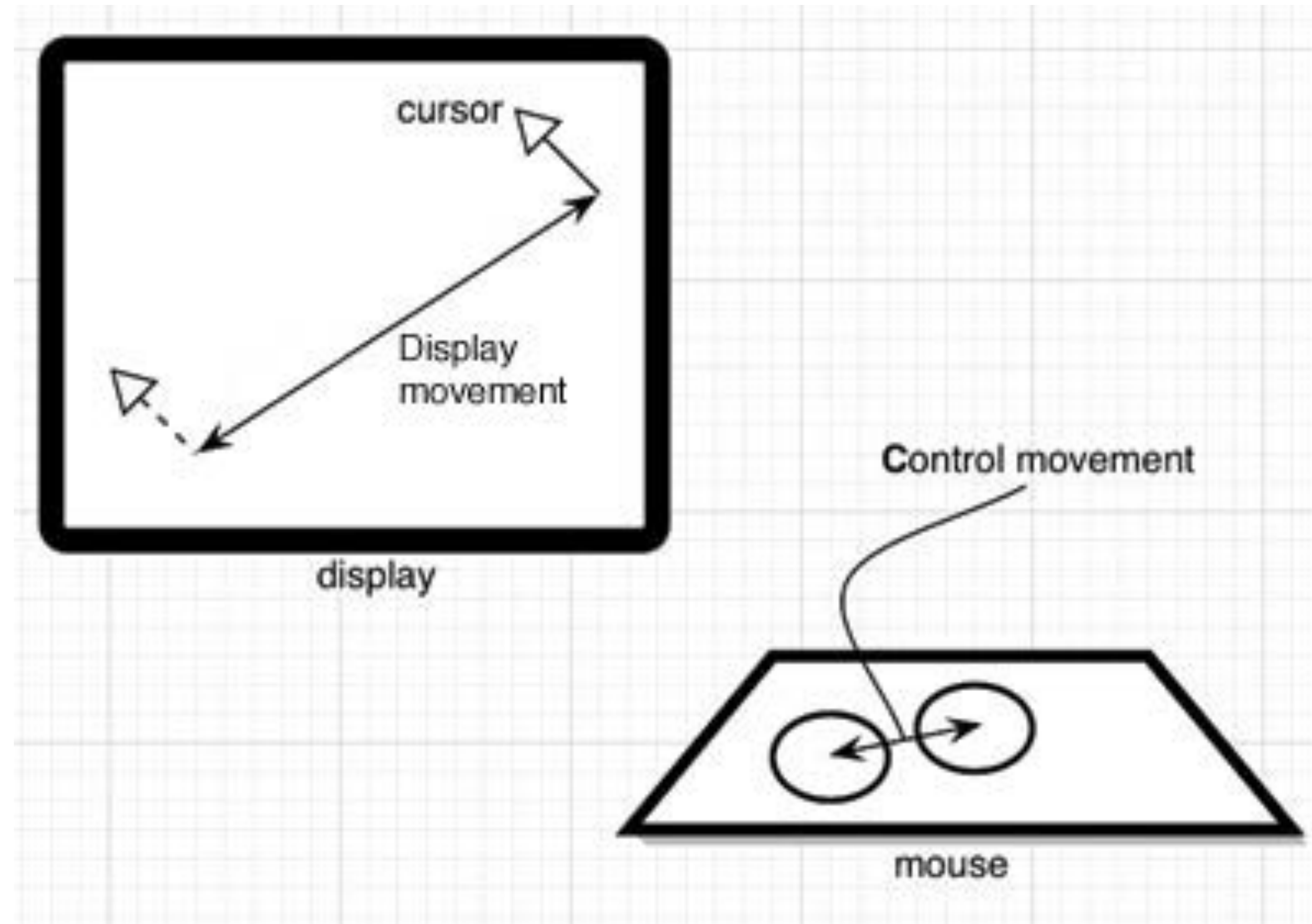
Indirect locator device user moves a cursor on the screen using a device separate from the screen

CONTROL TO DISPLAY RATIO (C:D RATIO)

Ratio of the speed of hand movement (**C**ontrol) to the speed/distance of cursor movement (**D**isplay) for a continuous locator device

Large ratio - large hand movement / small cursor movement (Good for accurate positioning, poor for long movements)

Small ratio - small hand movement / large cursor movement (Good for rapid movements across long distances, poor for accurate positioning)



DEVICE PROPERTIES

Indirect vs. Direct

Direct: Input and output space are unified

C:D Ratio

For one unit of movement in physical space, how far does the cursor travel in display space?

Q: What is the C:D ratio for direct touch screen input?

Device Acquisition Time

MOBILE POINTING

D-Pad
(see: arrow keys)



Trackball



Direct touch
(see: Trackpad)



Stylus

*Everything is best for
something and worst
for something else.*

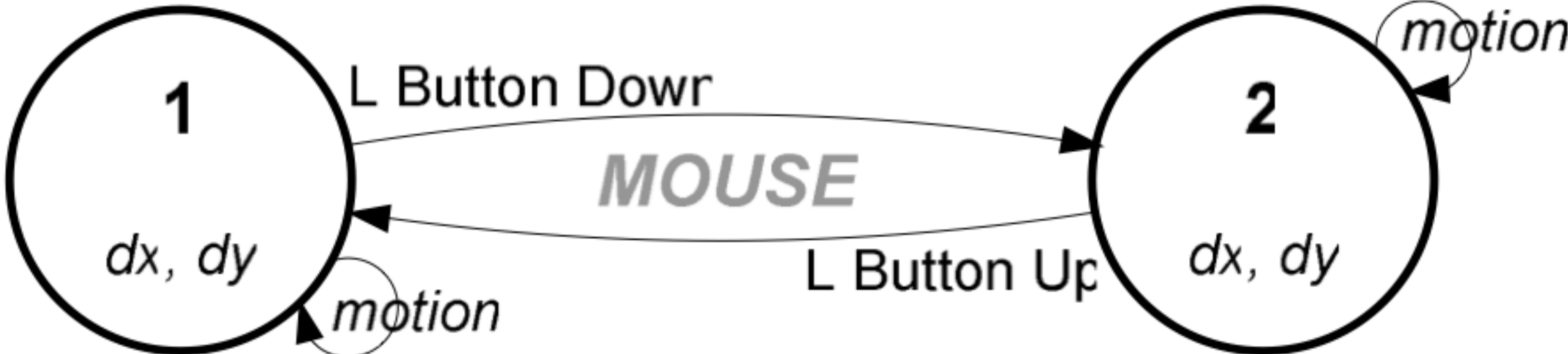
- Bill Buxton

3-STATE MODEL OF INPUT (BUXTON)

State	Description
0	<i>Out Of Range:</i> The device is not in its physical tracking range.
1	<i>Tracking:</i> Device motion moves only the cursor.
2	<i>Dragging:</i> Device motion moves objects on the screen.

(Table from Hinckley Reading)

MOUSE



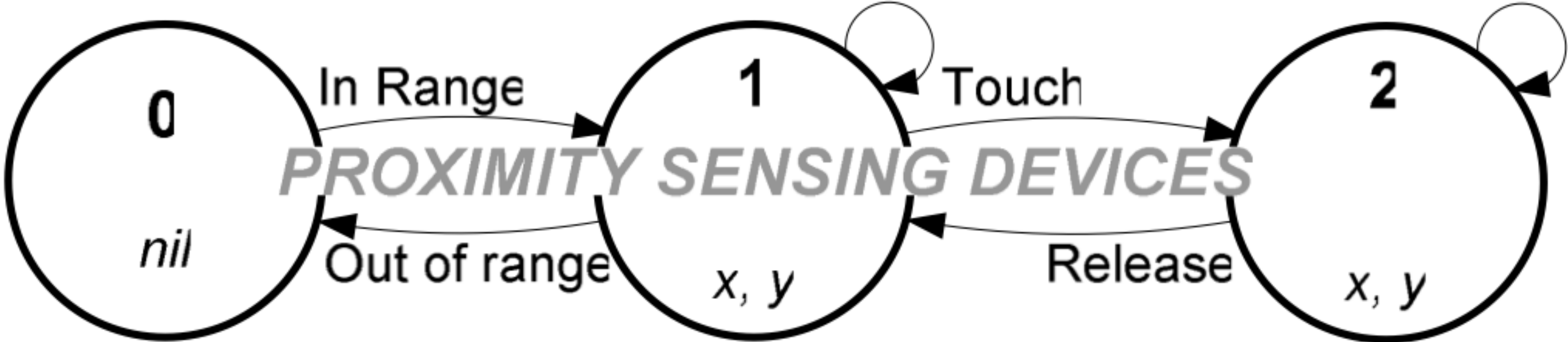
State	Description
0	<i>Out Of Range:</i> The device is not in its physical tracking range.
1	<i>Tracking:</i> Device motion moves only the cursor.
2	<i>Dragging:</i> Device motion moves objects on the screen.

TOUCH SCREEN



State	Description
0	<i>Out Of Range:</i> The device is not in its physical tracking range.
1	<i>Tracking:</i> Device motion moves only the cursor.
2	<i>Dragging:</i> Device motion moves objects on the screen.

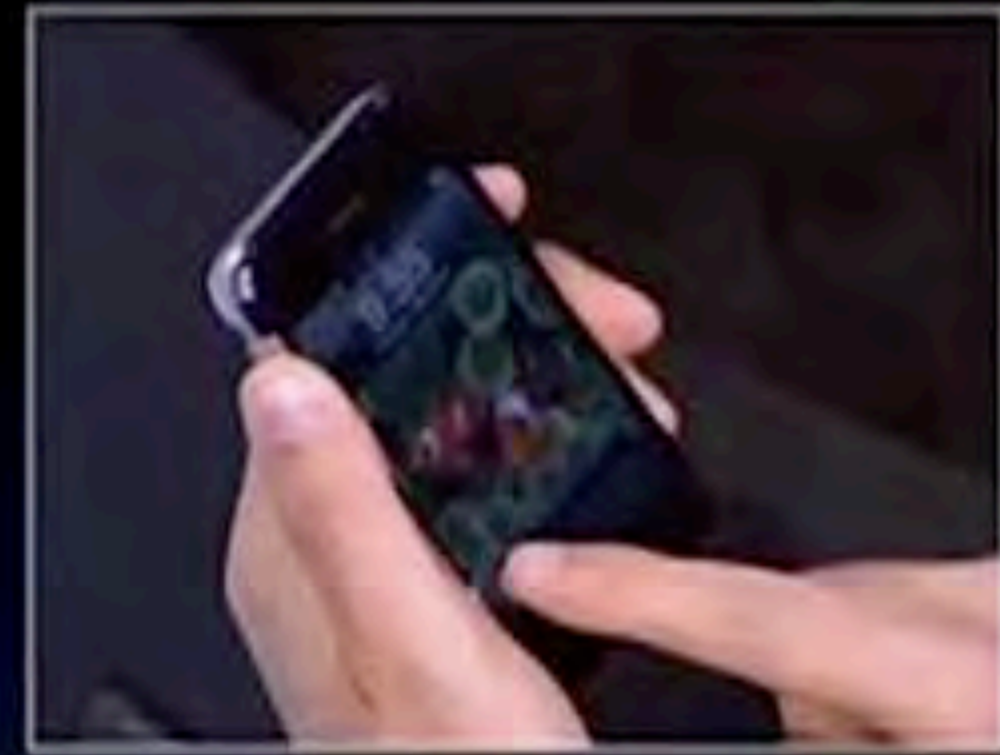
STYLUS ON TABLET



State	Description
0	<i>Out Of Range:</i> The device is not in its physical tracking range.
1	<i>Tracking:</i> Device motion moves only the cursor.
2	<i>Dragging:</i> Device motion moves objects on the screen.

(MULTI-) TOUCH





STRENGTHS

Direct input allows maximal screen space for mobile devices (ocular centrism).

More degrees of freedom.

“Virtual input devices” are adaptable.

No extra pieces to lose or break (styli!)

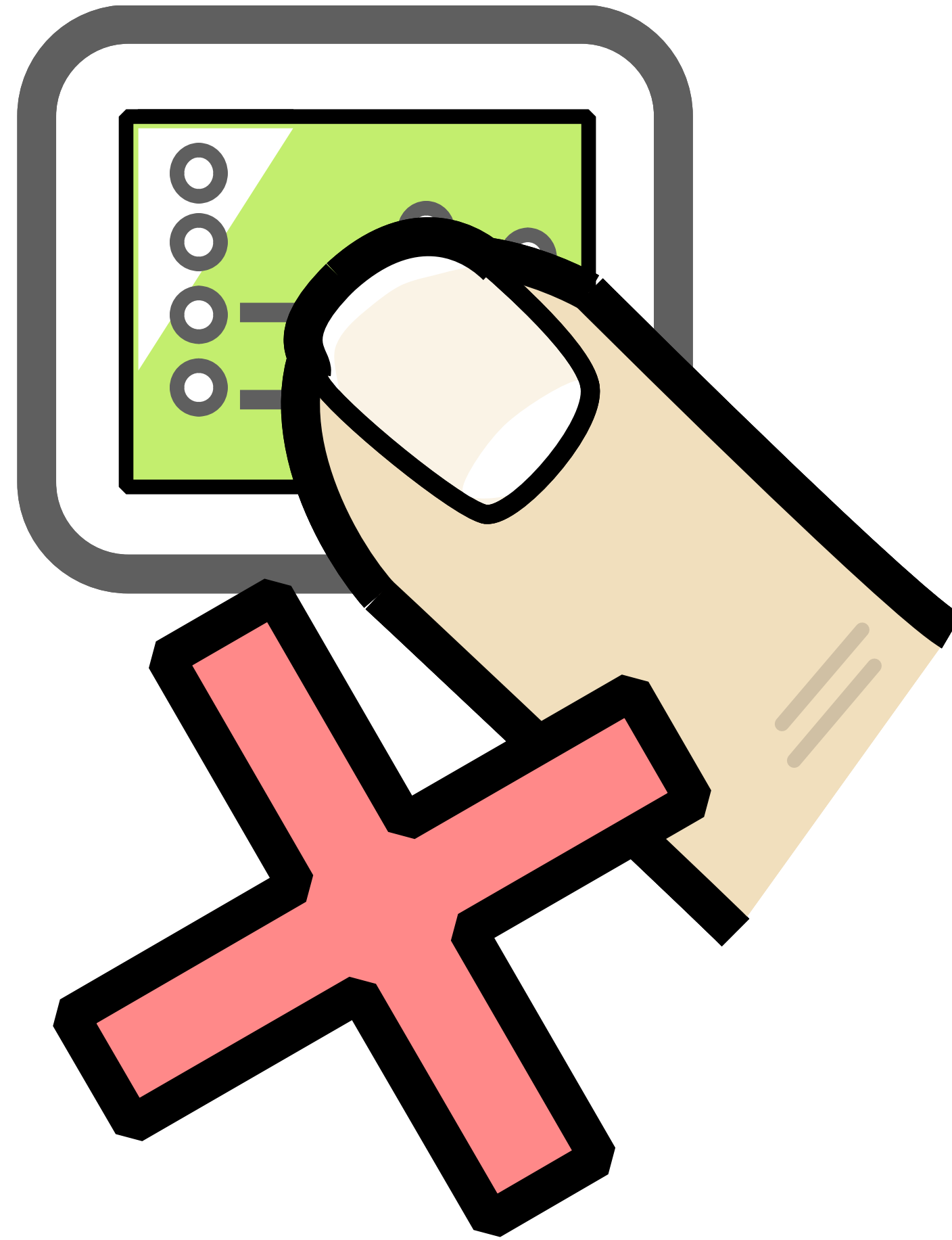
CHALLENGES

No tactile feedback.

Requires free use of (both) hands and eyes.

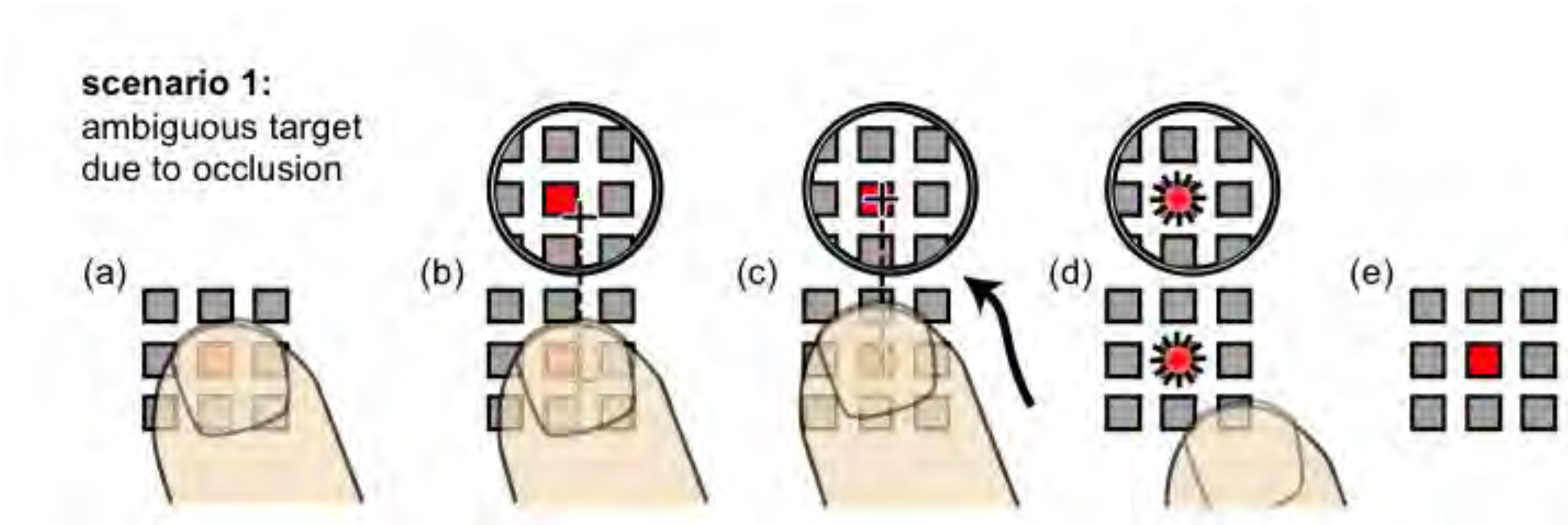
“Fat Finger” problems – precision & occlusion

THE “FAT FINGER” PROBLEM



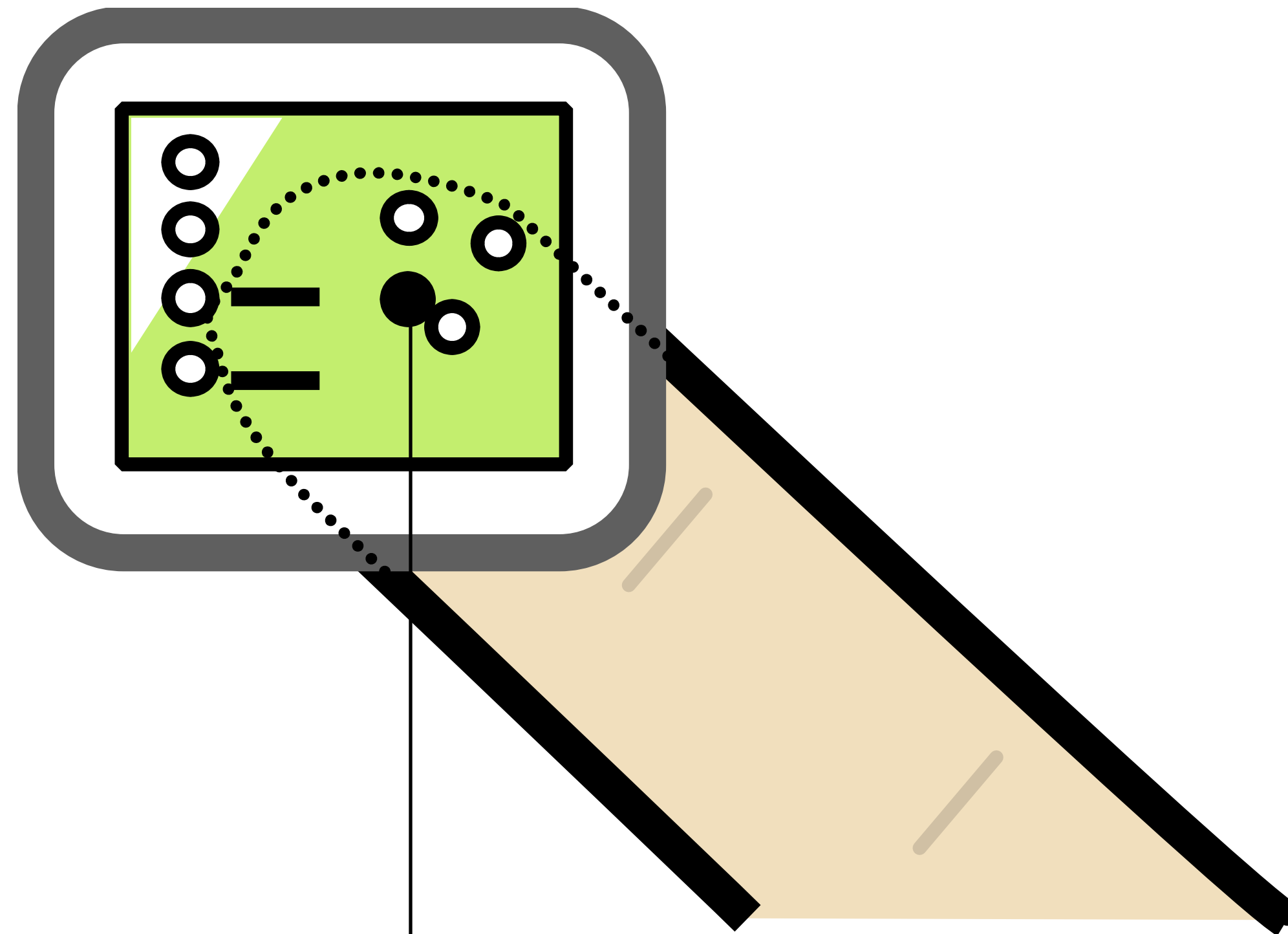
Graphics: Patrick Baudisch, nanoTouch

A SOFTWARE SOLUTION



Graphics: D. Vogel, P. Baudisch - Shift

A HARDWARE SOLUTION: USE THE BACKSIDE



pointer

Graphics: Patrick Baudisch, nanoTouch







GENK
GENK.VN

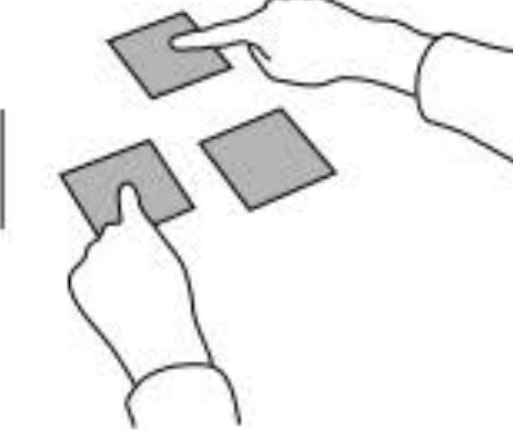
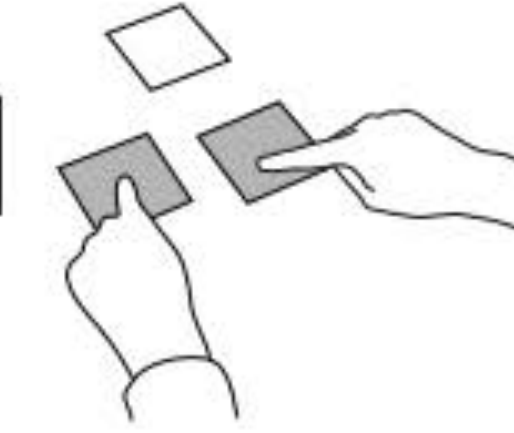
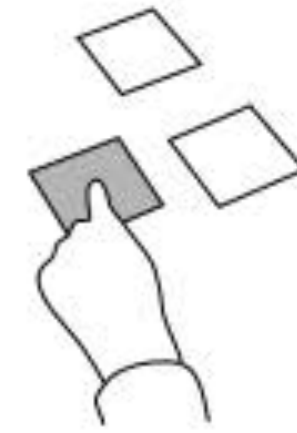
Select Single₁: tap



Select Single₂: lasso



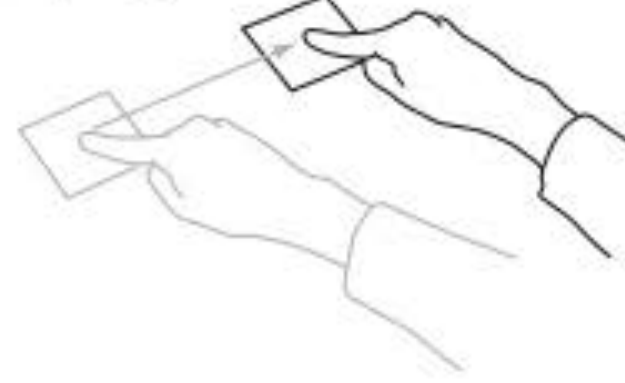
Select Group₁: hold and tap



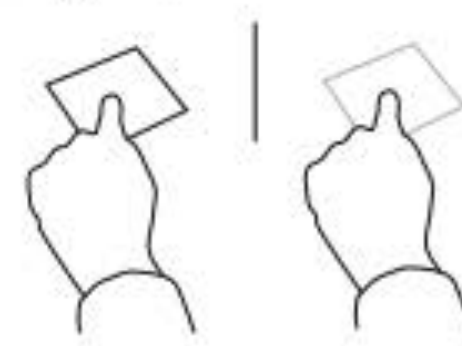
Select Group₂ and Select Group₃: Use Select Single₁ or Select Single₂ on all items in the group.

Multi-point Gestures

Move₁: drag



Move₂: jump

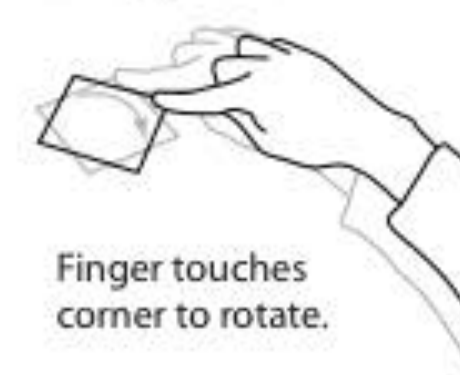


Object jumps to index finger location.

Pan: drag hand

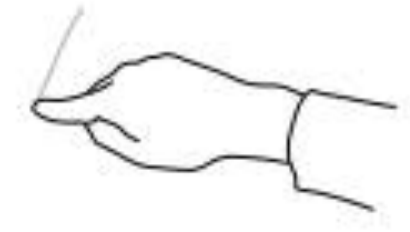


Rotate: drag corner



Finger touches corner to rotate.

Cut: slash

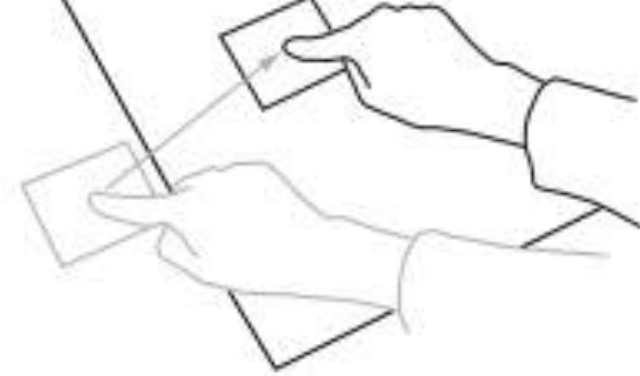


Cuts current selection (made via Select Single or Select Group).

Paste₁: tap



Paste₂: drag from offscreen



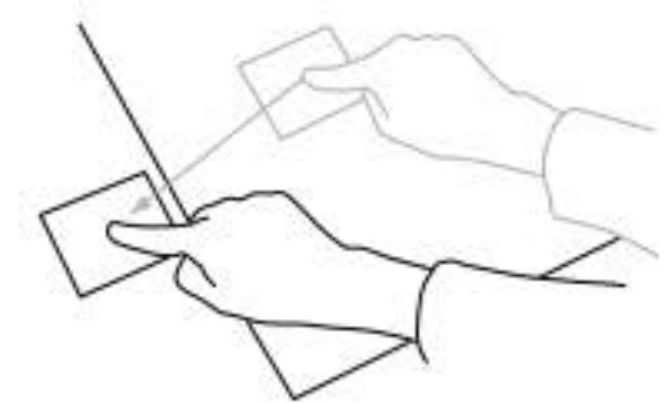
Paste₃: Use Move₂ with off-screen source and on-screen destination.

Duplicate: tap source and destination



After duplicating, source object is no longer selected.

Delete₁: drag offscreen



Delete₂: Use Move₂ with on-screen source and off-screen destination.

Accept: draw check



Reject: draw 'X'



Reject₂ Reject₃: If rejecting an object/dialog with an on-screen representation, use Delete₁ or Delete₂.

Help: draw '?'



Menu: pull out



Undo: scratch out

