AFFORDANCE, CONTEXTUAL INQUIRY, AND CONCEPTUAL MODELS

10 SEP 2015

ERIC PAULOS
www.paulos.net

UNIVERSITY OF CALIFORNIA Berkeley

CONTEXTUAL INQUIRY

GOALS

Method:

"Go where the customer works, observe the customer as she works, and talk to the customer about their work" [Holtzblatt]

Goals:

Get inside the user's head

See their tasks the way they do

A middle ground between pure observation and pure interview

GUIDELINE: MASTER-APPRENTICE MODEL

Allows user to teach us what they do

- Skill knowledge is usually tacit (can't put it in books)
- Sometimes literal apprenticeship is best

Matsushita Home Bakery – First automatic bread maker to have twist/stretch motion [Nonaka 95]

PRINCIPLES OF CONTEXTUAL INQUIRY

Context

Partnership

Interpretation

Focus

PRINCIPLES: CONTEXT

Go where the work is:

Conduct inquiry in a normal work environment

People summarize, but we want details

Keep it concrete when people start to abstract

"We usually get reports by email", ask "Can I see one?"

Look for skipped steps, ask user to fill them in.

PRINCIPLES: PARTNERSHIP

Master / Apprentice + intermittent probing

Alternative models (what's wrong with them?)

Interviewer / Interviewee

Expert / Novice

Guest / Host

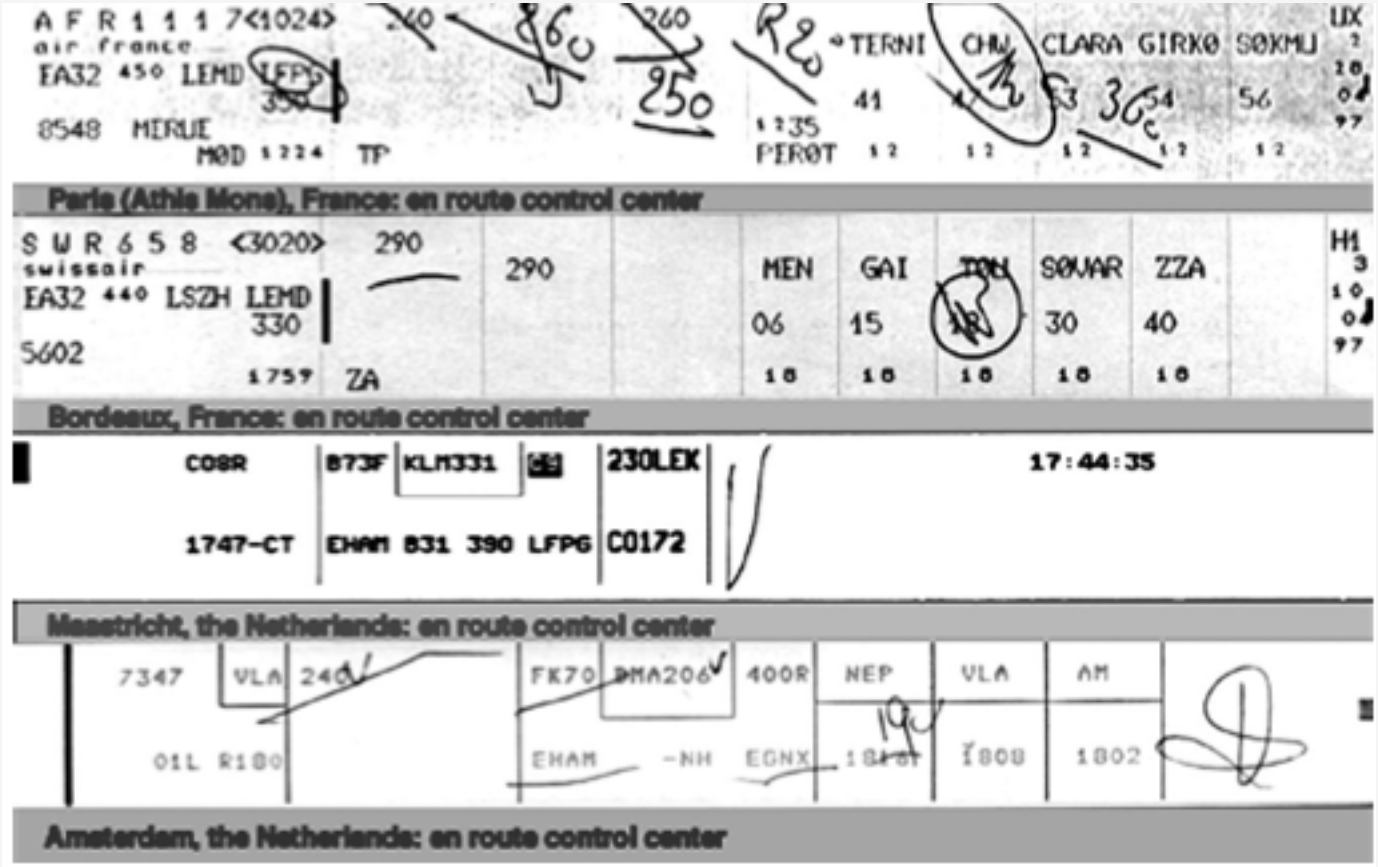
WHY NOT JUST INTERVIEW FOLKS?


OXO

EXAMPLE: PAPER FLIGHT STRIPS

W. Mackay. Is Paper Safer? The Role of Paper Flight Strips in Air Traffic Control

EXAMPLE: PAPER FLIGHT STRIPS



$12 Billion

Daily U.S. transactions

PRINCIPLES: PARTNERSHIP

Stick with master-apprentice; avoid other models, i.e.

Avoid interviewer/interviewee

Above all, don't "teach"!

Partnership allows more apprentice interaction

OK to be a designer and interrupt!

... but go back "in role" afterwards.

Alternate watching & probing (withdrawal & return)

PRINCIPLES: INTERPRETATION

Good facts only the starting point

Design based on interpretations

Validate & rephrase

Check interpretations with user

Be committed to hearing what user is really saying

PRINCIPLES: FOCUS

You need data about specific tasks

Steer conversation to stay on useful topics

Respect "intrapersonal triggers"
(flags to change focus/understanding)

"Why would they do that?"

Admit your ignorance

THOUGHTS ON INQUIRIES

Establish rapport before diving in

Use recording technologies

Notebooks, tape recorders, still & video cameras

Master/apprentice can be hard

Staying in role – it's a lot like acting

Don't correct! Its not a lesson!

It's hard not designing on the fly

SUMMARY

Contextual inquiry

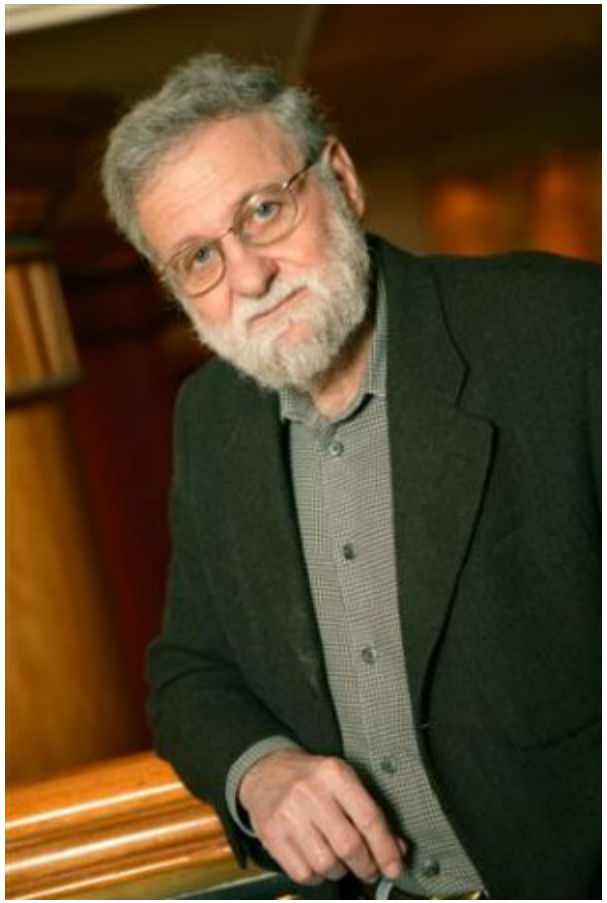
Helps answer the task analysis questions

Hybrid between interview and observation

Use master-apprentice model to get them to teach you

AFFORDANCE

"... the term **affordance** refers to the *perceived* and *actual* properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used."



The Design of Everyday Things.
Don Norman

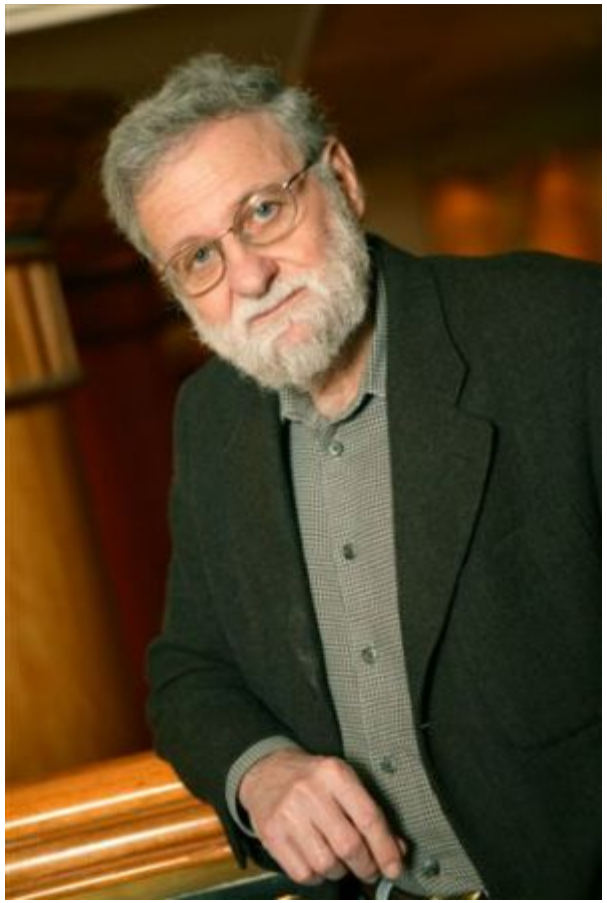
"... the term **affordance** refers to the *perceived* and *actual* properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used."

Some affordances obvious

Knobs afford turning

Buttons afford pushing

Glass can be seen through



The Design of Everyday Things.
Don Norman

"... the term **affordance** refers to the *perceived* and *actual* properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used.

Some affordances obvious

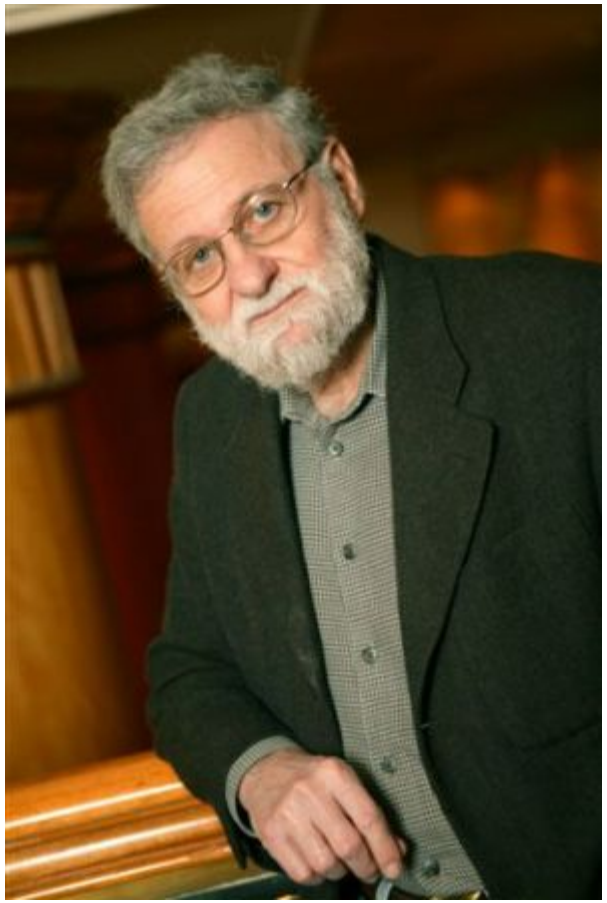
Knobs afford turning

Buttons afford pushing

Glass can be seen through

Some affordances learned

Glass breaks easily



The Design of Everyday Things.
Don Norman

AFFORDANCES

Clues about how object/interface works

AFFORDANCES

Clues about how object/interface works

Affordances

holes for insertion of fingers

blades for cutting

Implications clear for how operating parts work

DOOR HANDLES

Affordances suggest how to use the object

DOOR HANDLES

Affordances suggest how to use the object

DOOR HANDLES

Affordances suggest how to use the object

CULTURAL DEPENDENCIES

Affordances suggest how to use the object

Can be dependent on the

Experience

Knowledge

Culture

Switches (US down=off, UK down=on)

red = danger, green = go

Can make an action easy/difficult

PERCEIVED AFFORDANCES

Affordances suggest how to use the object

Can be dependent on the

Experience

Knowledge

Culture of the actor

Can make an action easy/ difficult

Affordances may be *perceived* without actually existing

HELLO, COMPUTER

SCREEN-BASED INTERFACES

Physical affordances

Screen, pointing device, physical buttons, keyboard

These afford touching, pointing, clicking on every pixel

SCREEN-BASED INTERFACES

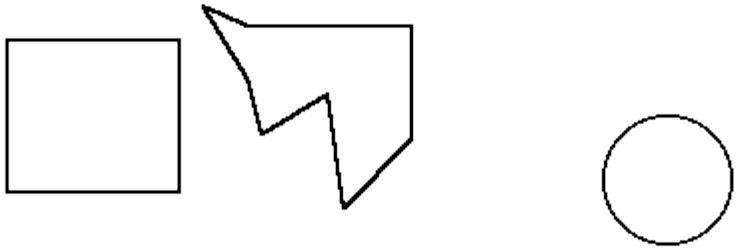
Physical affordances of screens are often unused

Screen affords touching, but many screens are *not* touch sensitive

“A MAGAZINE IS AN IPAD THAT DOESN’T WORK…”

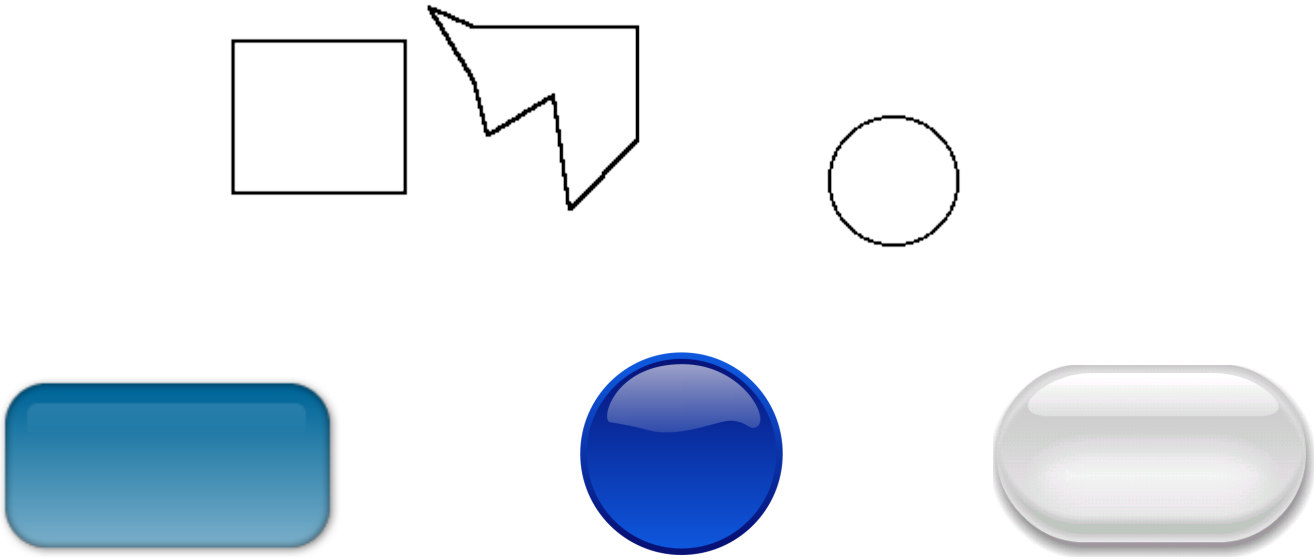
YouTube user UserExperienceWorks

DESIGNER CONTROLS PERCEIVED AFFORDANCES



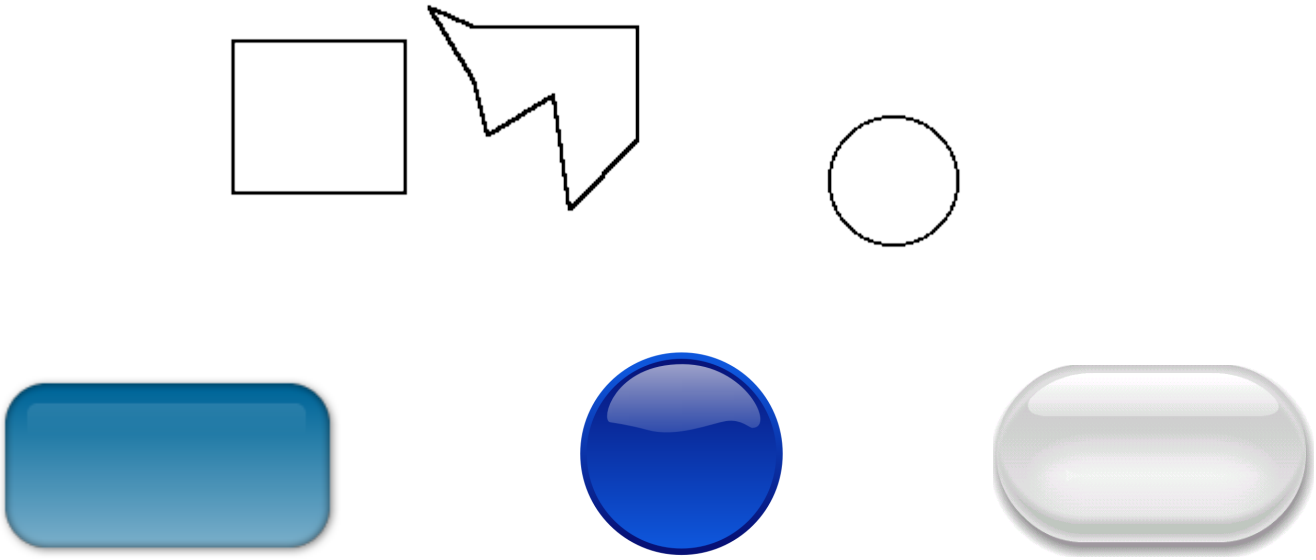
What are the affordances of these graphical objects?

DESIGNER CONTROLS PERCEIVED AFFORDANCES



What are the affordances of these graphical objects?

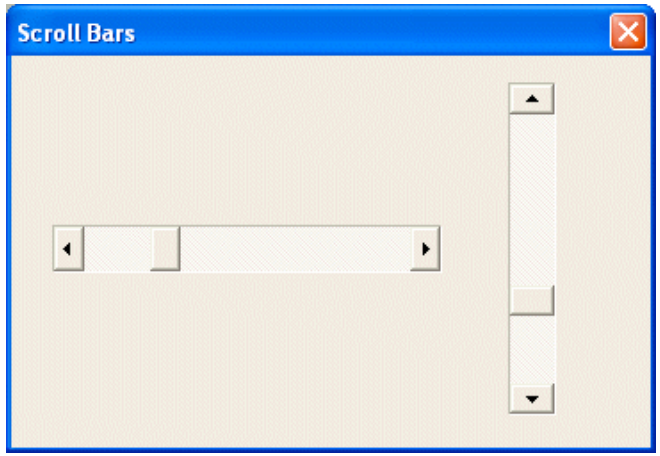
DO GRAPHICAL OBJECTS AFFORD CLICKING?

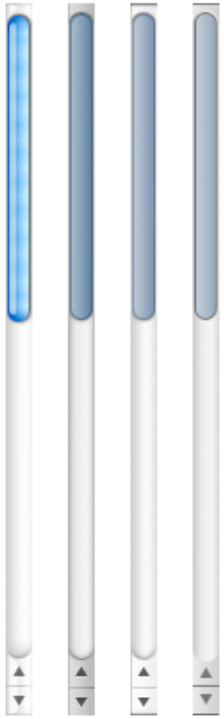


Graphic design emphasizes affordances

Helps user recognize objects as buttons

SCROLLBAR AFFORDANCES?

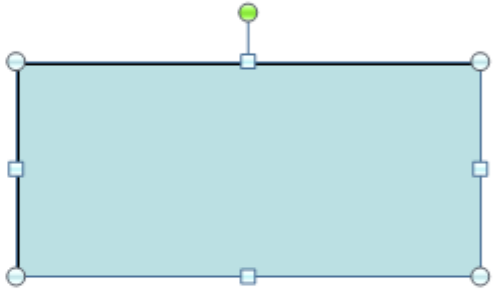




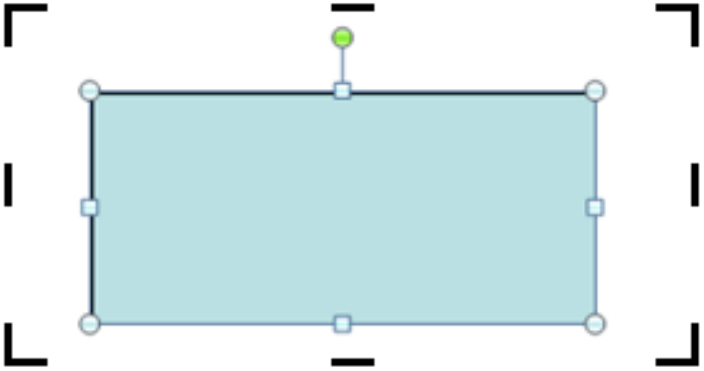
WIDGET AFFORDANCES

Well-designed widgets have clear affordances

e.g. resize handles:



crop handles:



motion arrows


No Service
7:56
Monday, June 10
slide to unlock
No Service
12:46
100% Charged
slide to unlock

NeoNode 2004

Affordance:…

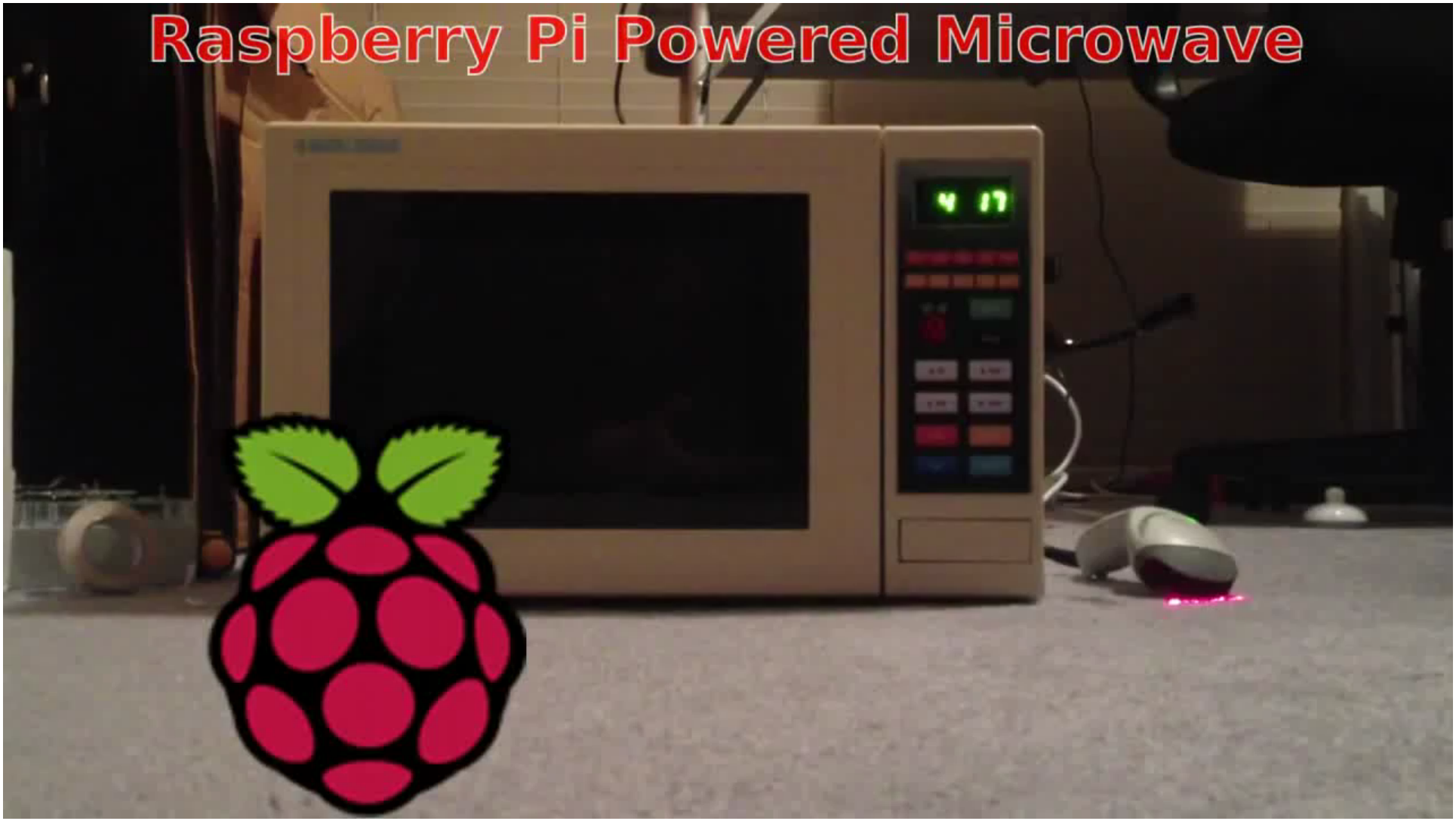
Visibility:…

Mapping:…

Mental Model:…

Feedback:…


CUSTOM FUNCTIONS
POPCORN
BEVERAGE
REHEAT
SNACKS
BAKED POTATO
FRESH VEG.
FROZEN VEG.
TIME COOK
TIME DEFROST
AUTO DEFROST
GUIDE BEHIND DOOR
1 EXPRESS COOK
2 EXPRESS COOK
3 EXPRESS COOK
4 EXPRESS COOK
5 EXPRESS COOK
6 EXPRESS COOK
START
7
8
9
0
30 SEC.
CLEAR OFF
POWER LEVEL
TIMER
CLOCK

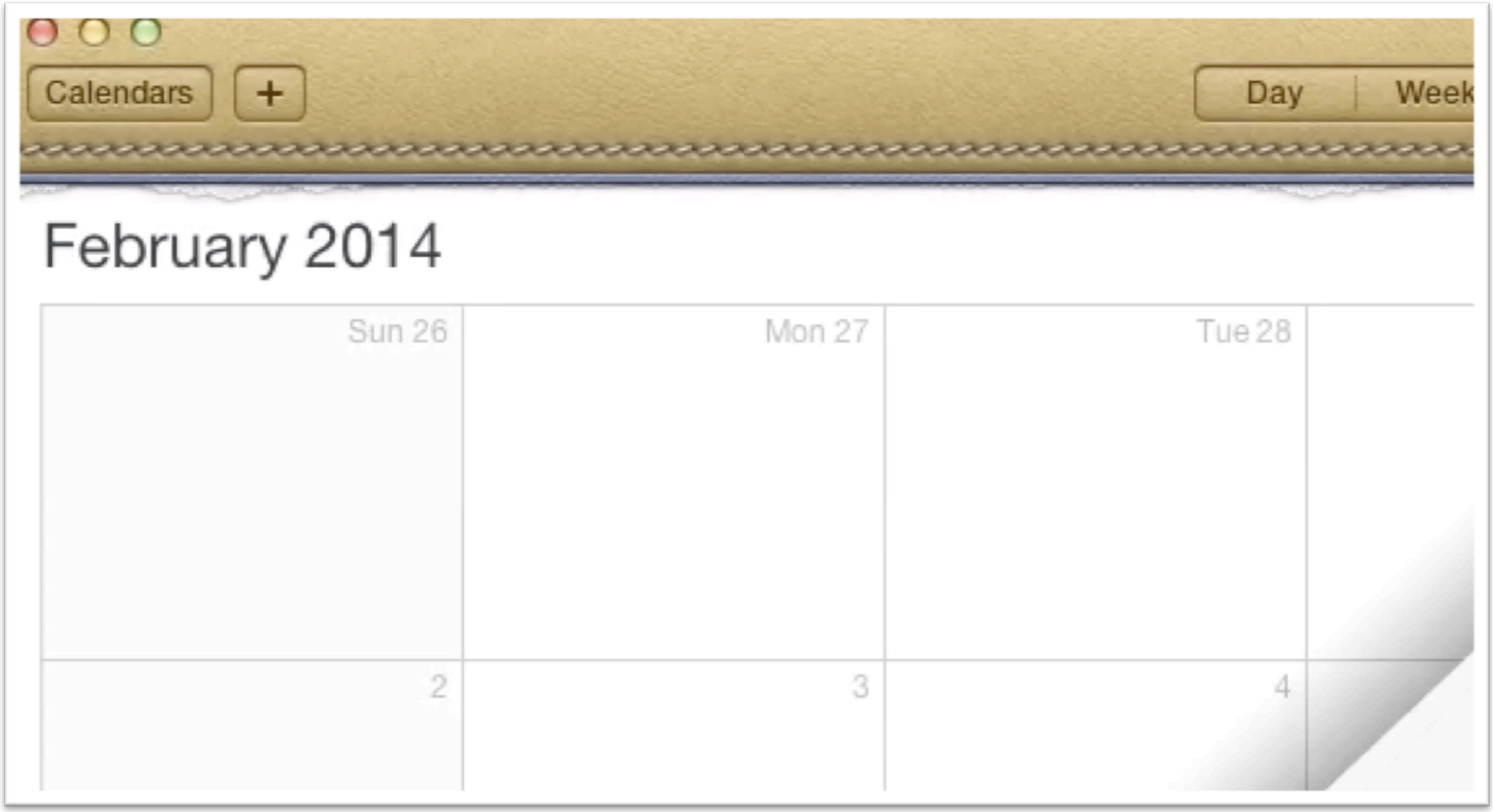

Raspberry Pi Powered Microwave


TV
CABLE
POWER
AUX
Setup
All On
ON DEMAND
REC
My DVR
LIVE
Lock
Day
Page
Page
OK
Select
Guide
Menu
Info
Exit
Last
Help
VOL
CH
Mute
FAV
1
2
3
4
5
6
7
8
9
Input
Enter
TV/VCR
0
HD ZOOM
Picture-in-Picture
On-Off
Swap
Move
PIP CH
comcast


MENU
►II


TV
SAT
AUDIO
PC
VCR
DVD
DVR
AUX
1
2
3
4
5
6
7
8
9
-/--
0
AV
FAV.CH
MACRO
RECALL
MENU
GUIDE
INFO
EXIT
PIP
SWAP
R
G
Y
B
TEVION
VOL
OK
CH


iCal — Updating...
Calendars
Day
Week
Month
Year
February 2014
Today
Sun 26
Mon 27
Tue 28
Wed 29
Sat 1
Skeuomorphism

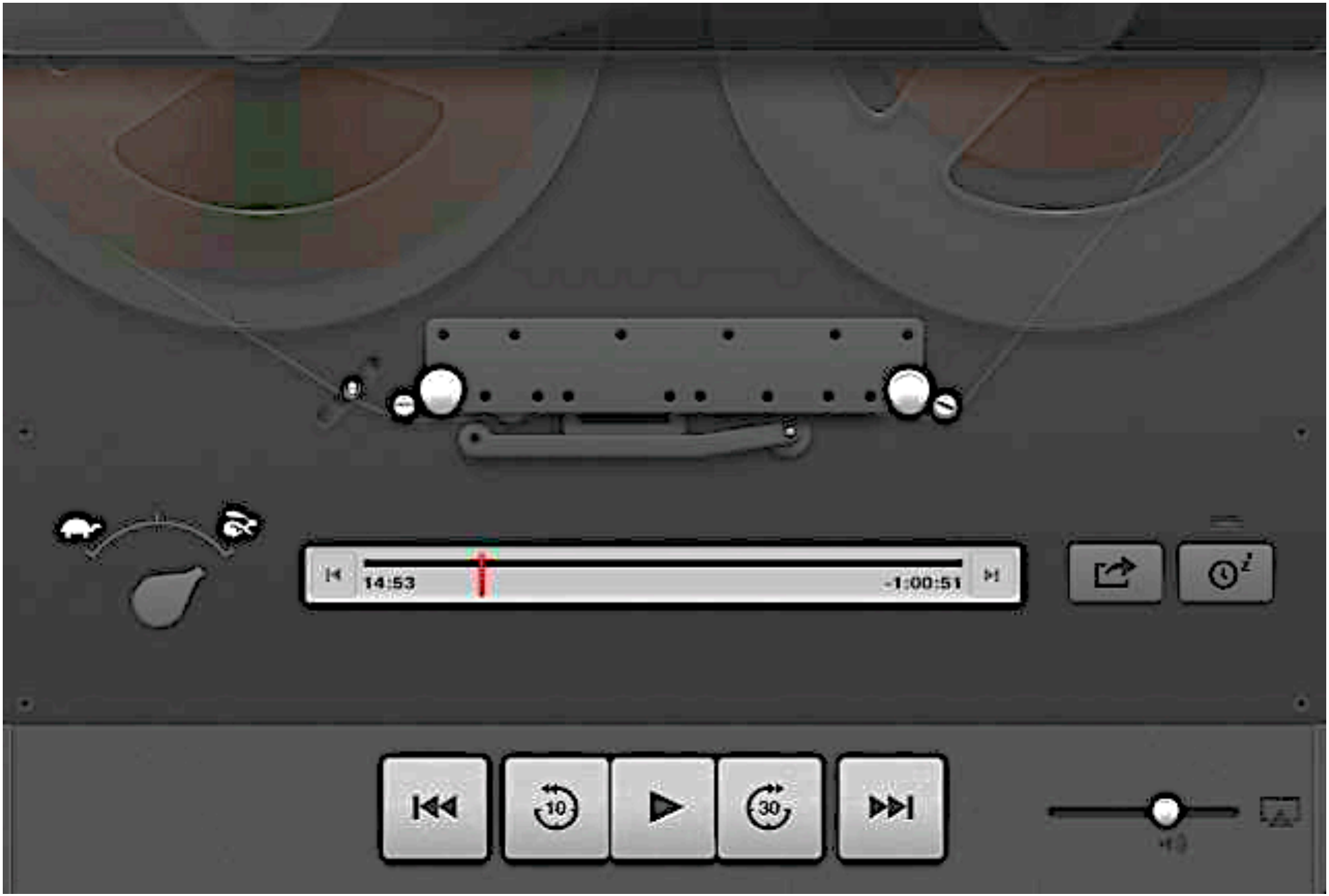

Calendars
+
Day
Week
February 2014
Sun 26
Mon 27
Tue 28
2
3
4

SKEUOMORPHS

Example:skeu.it

Example:skeu.it

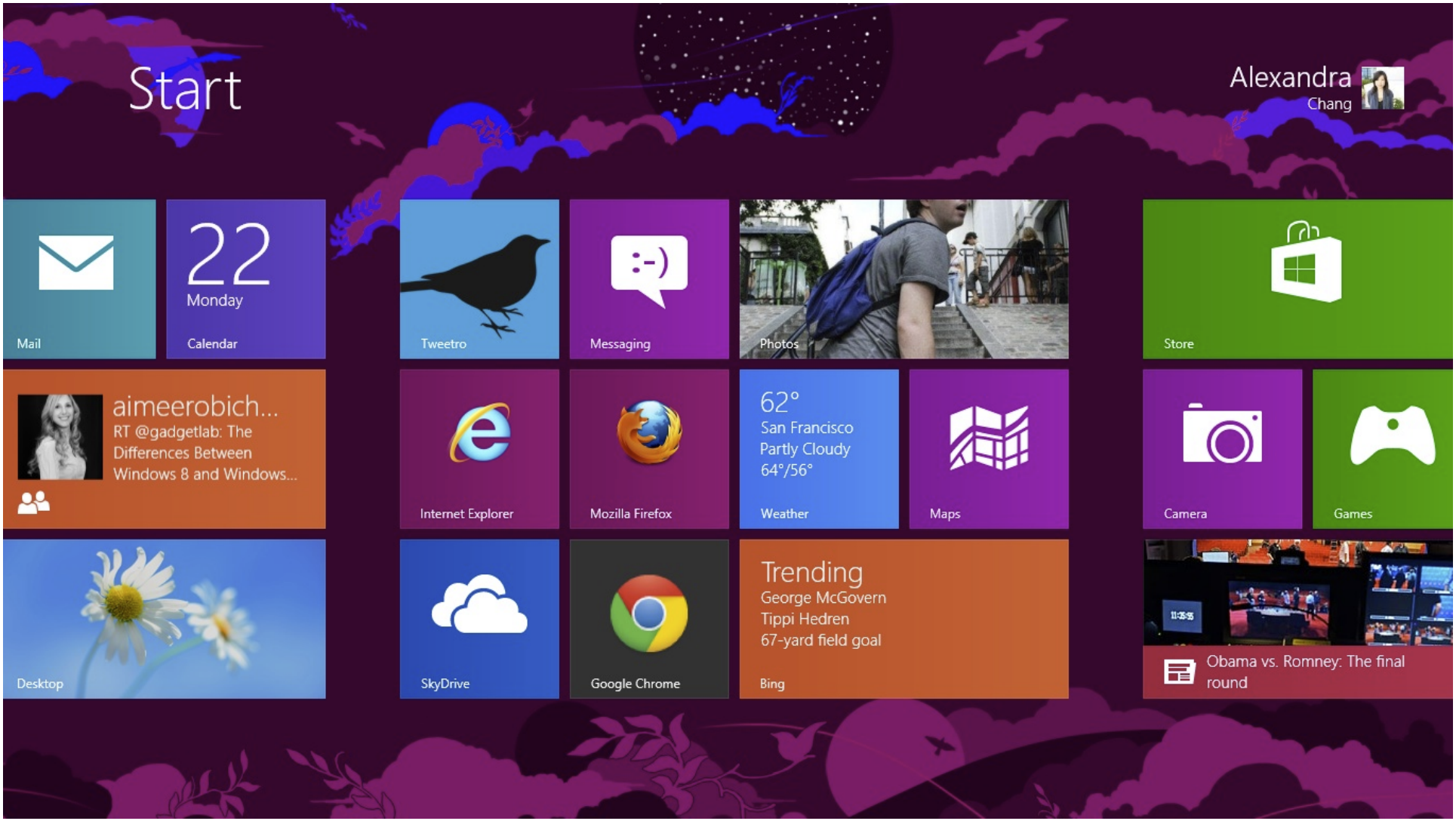
Hanx Writer (2014)



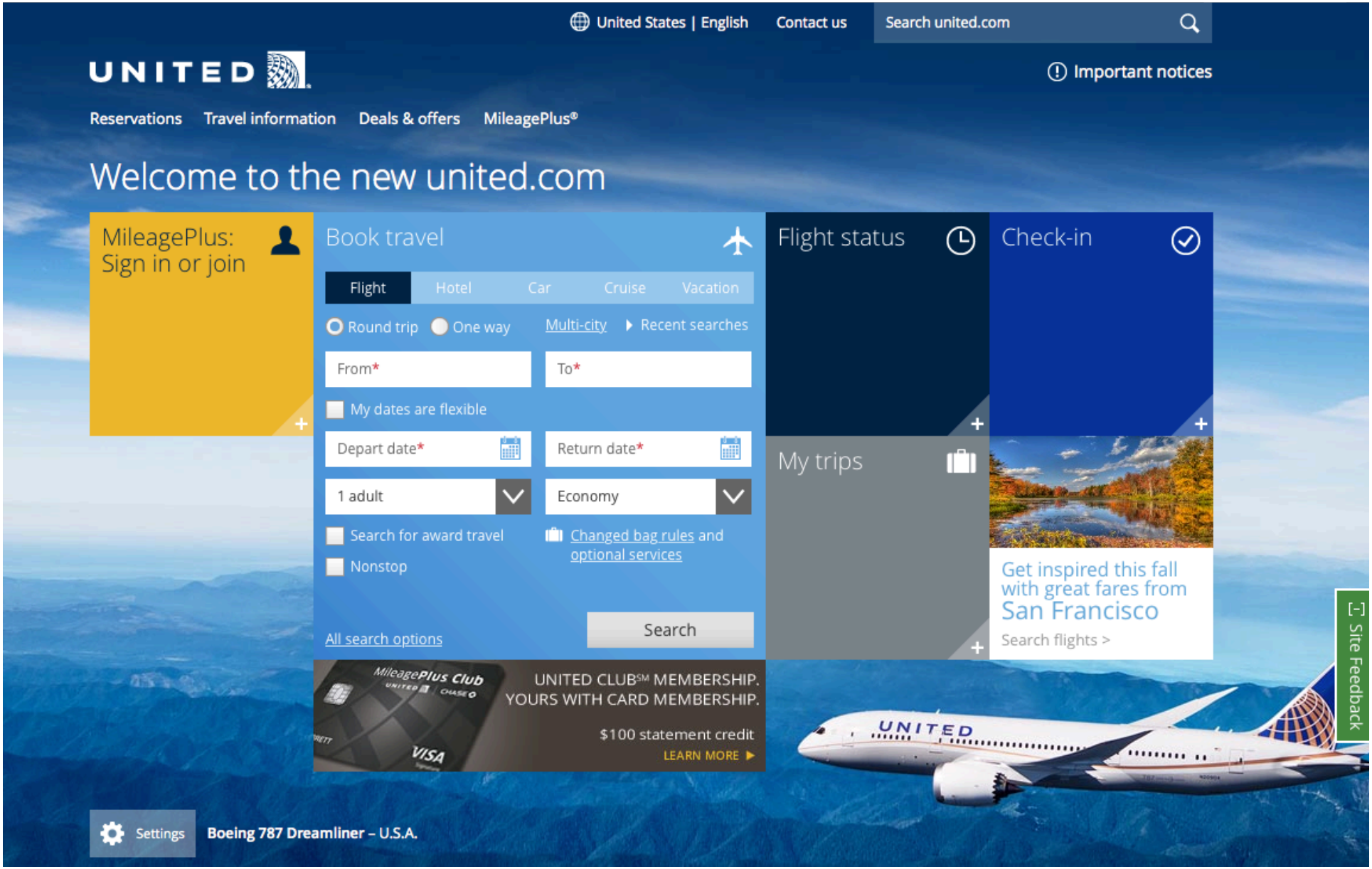
Apple Podcast application

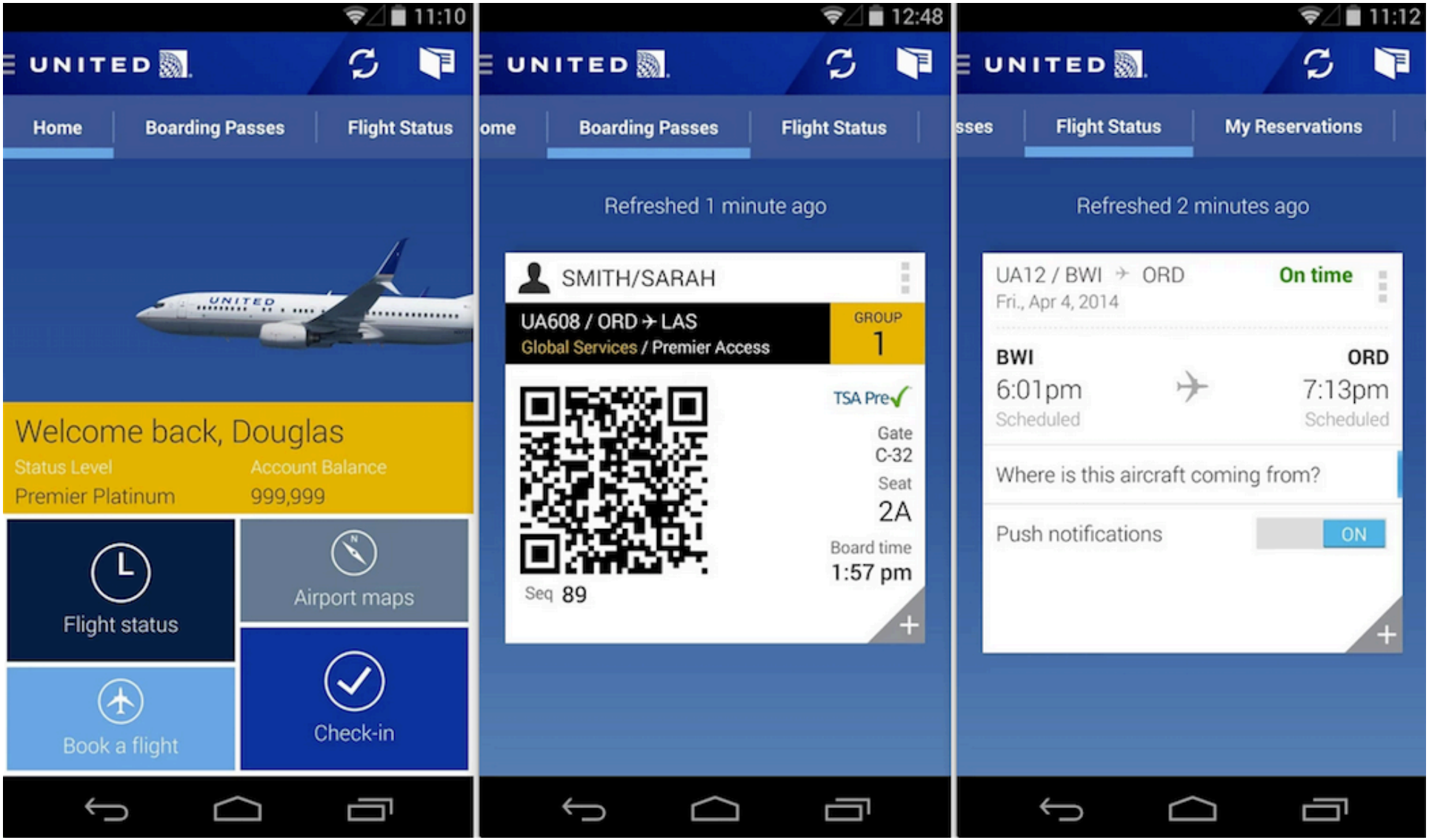
Braun reel-to-reel tape recorder (ca 1965)

http://www.cultofmac.com/176008/heres-the-braun-tape-recorder-that-inspired-apples-podcasts-app-gallery/



Windows 8
Source: wired.com


United States | English
Contact us
Search united.com
UNITED
Important notices
Reservations
Travel information
Deals & offers
MileagePlus®
Welcome to the new united.com
MileagePlus: Sign in or join
Book travel
Flight
Hotel
Car
Cruise
Vacation
Round trip
One way
Multi-city
Recent searches
From*
To*
My dates are flexible
Depart date*
Return date*
1 adult
Economy
Search for award travel
Nonstop
Changed bag rules and optional services
All search options
Search
Flight status
Check-in
My trips
Get inspired this fall with great fares from San Francisco
Search flights >
MileagePlus Club
UNITED CLUBSM MEMBERSHIP. YOURS WITH CARD MEMBERSHIP.
$100 statement credit
LEARN MORE
Site Feedback
Settings
Boeing 787 Dreamliner – U.S.A.


11:10
UNITED
Home
Boarding Passes
Flight Status
Welcome back, Douglas
Status Level
Premier Platinum
Account Balance
999,999
Flight status
Airport maps
Book a flight
Check-in
12:48
UNITED
ome
Boarding Passes
Flight Status
Refreshed 1 minute ago
SMITH/SARAH
UA608 / ORD → LAS
Global Services / Premier Access
GROUP
1
TSA Pre
Gate
C-32
Seat
2A
Board time
1:57 pm
Seq 89
11:12
UNITED
sses
Flight Status
My Reservations
Refreshed 2 minutes ago
UA12 / BWI → ORD
Fri., Apr 4, 2014
On time
BWI
6:01pm
Scheduled
ORD
7:13pm
Scheduled
Where is this aircraft coming from?
Push notifications
ON


Examples
of Skeuomorphic
UIs
Definition
History
Types
in
Web
Design
Anti-
innovation
Cons
UI Aberration
Pros
Familiarity
Misleading Behavior
Well-Selling
Monster TV
Lack of Universality


iPad
11:31 PM
Not Charging
Store
iBooks
Edit
INFINITE JEST
DAVID FOSTER WALLACE
CHRISTOS TSIOLKAS
THE SLAP
NEAL STEPHENSON
SNOW CRASH
TERRY PRATCHETT
THE TRUTH
ELMORE LEONARD
CATCH-22
JOSEPH HELLER
The GREAT GATSBY
F SCOTT FITZGERALD
LITTLE BROTHER
CORY DOCTOROW
iPad User Guide
CHRONIC CITY
JONATHAN LETHEM
Sense and Sensibility
Jane Austen
Winnie-the-Pooh

CONCEPTUAL MODELS

ERIC PAULOS
www.paulos.net

UNIVERSITY OF CALIFORNIA Berkeley

MENTAL REPRESENTATIONS

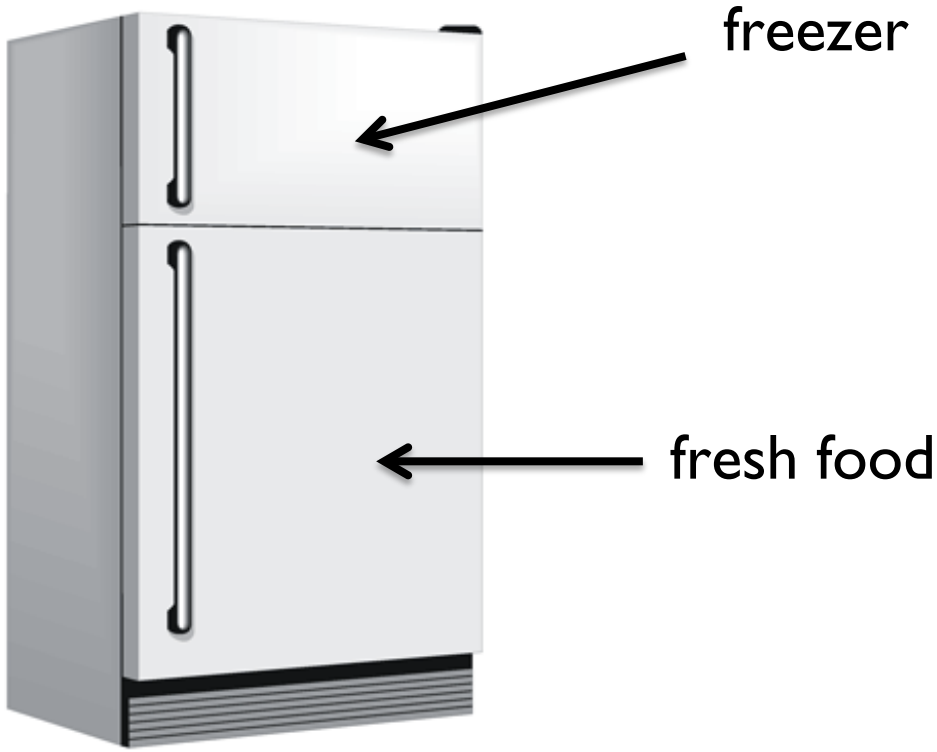
Users' understanding of how interface works

People have preconceived models

Online help / documentation useful (but shouldn't be necessary)

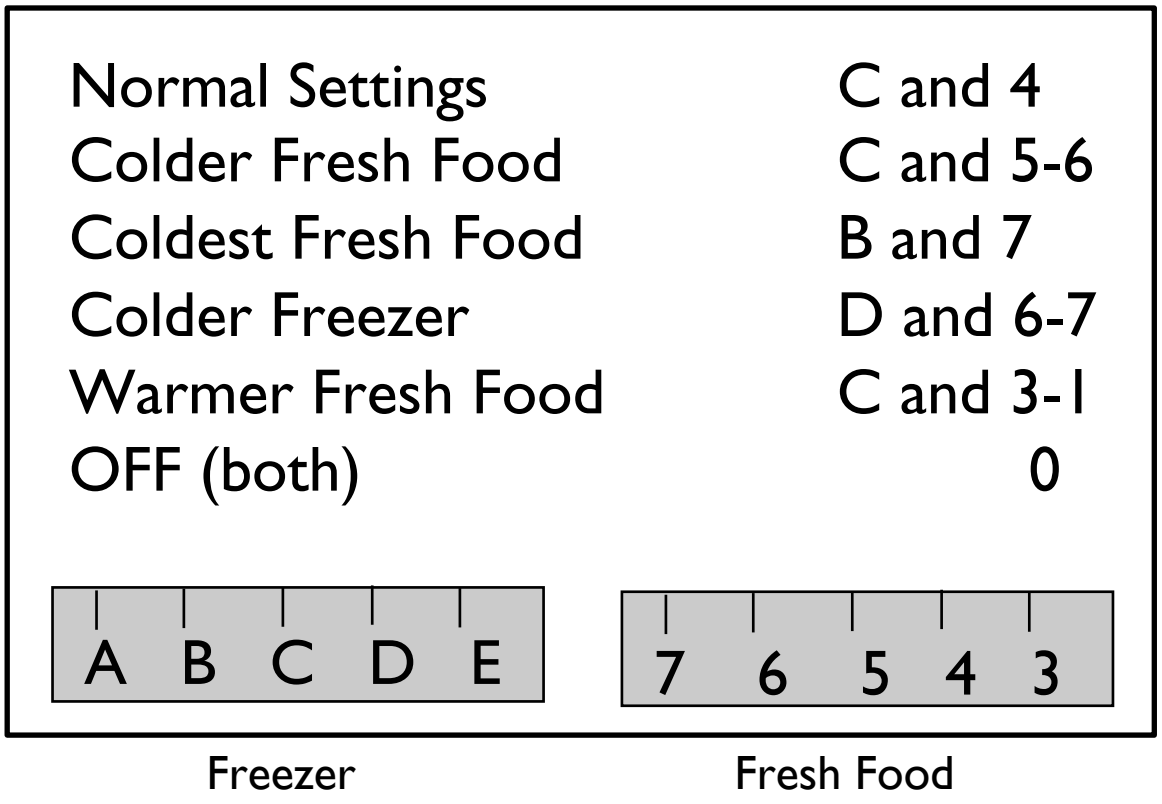
Interfaces Must Communicate Model

REFRIGERATOR



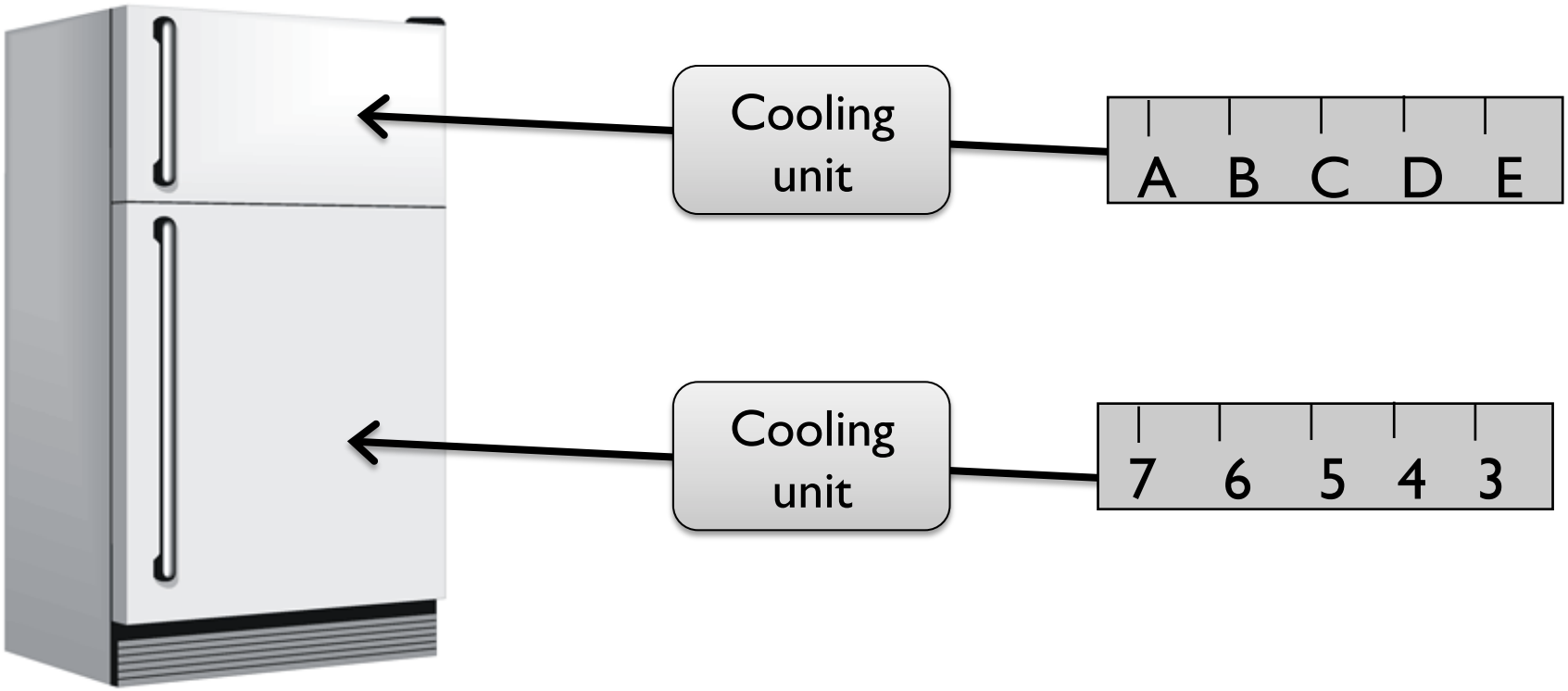
Problem: freezer too cold, but fresh food just right

REFRIGERATOR CONTROLS



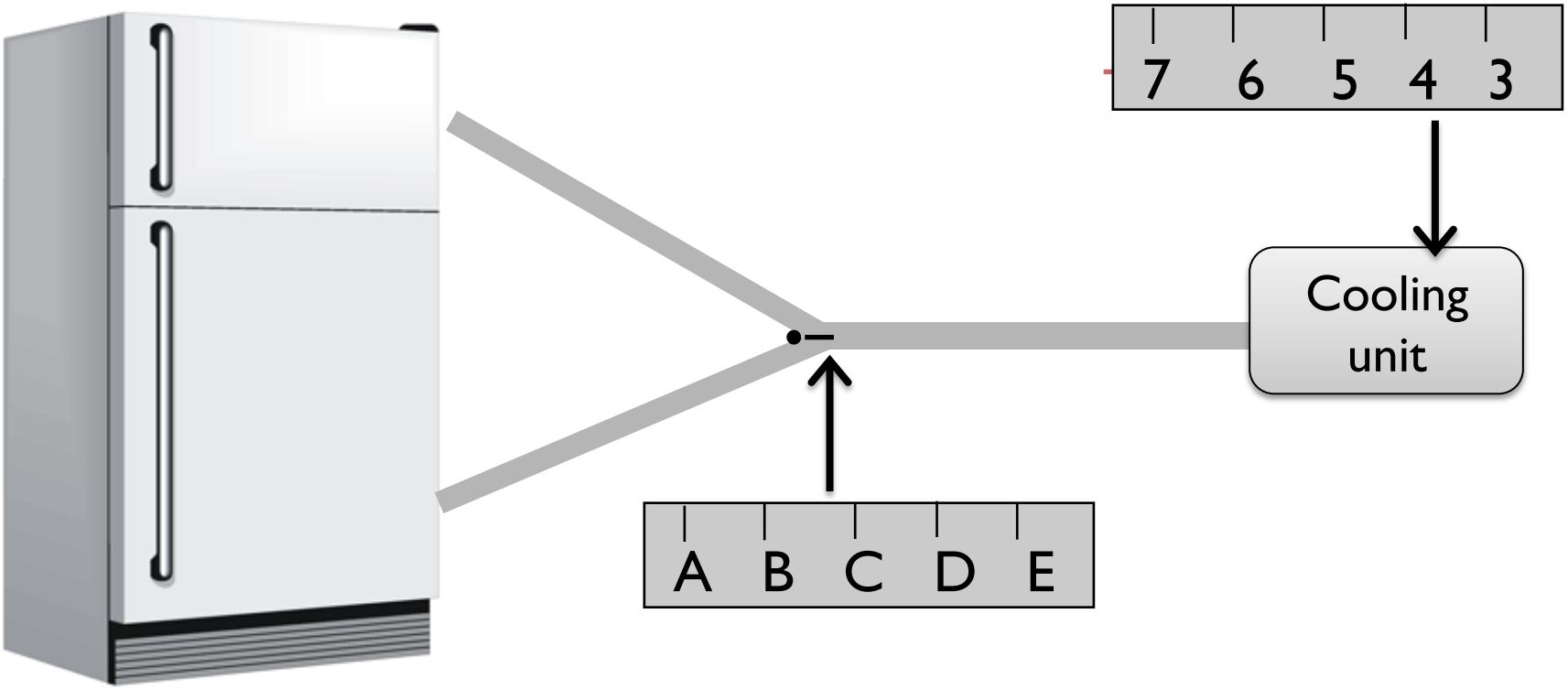
What is your conceptual model?

MOST LIKELY CONCEPTUAL MODEL



Independent Controls

CORRECT CONCEPTUAL MODEL

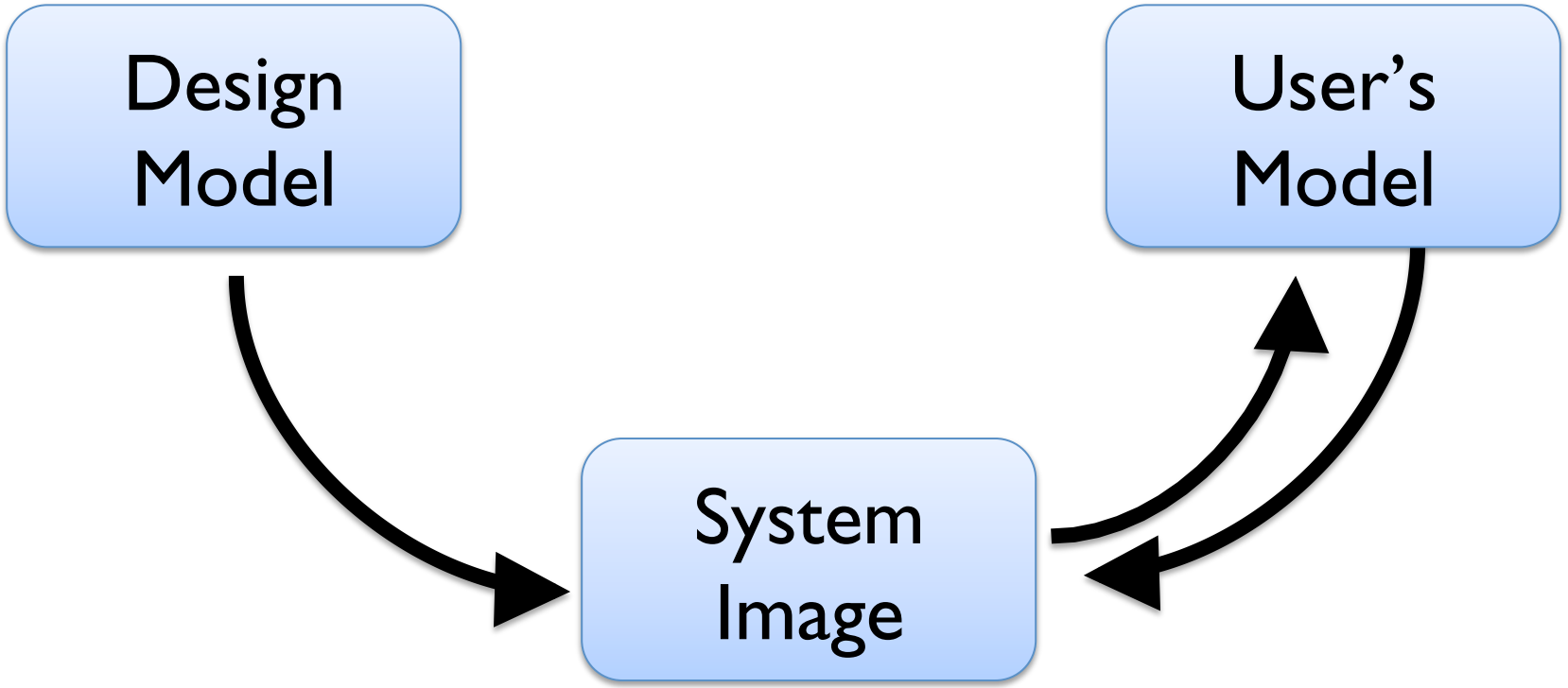


Possible solutions:

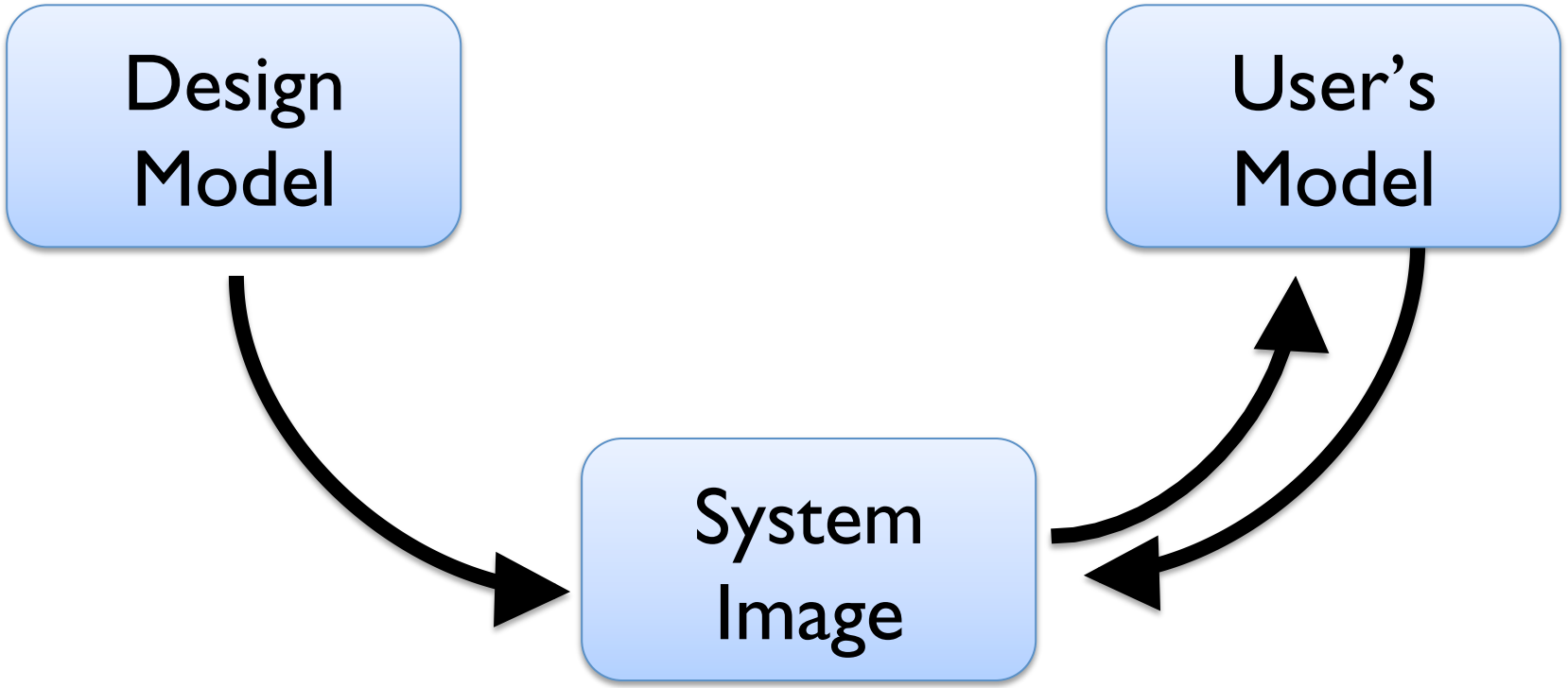
Make controls map to user's model

Make controls map to actual system

CONCEPTUAL MODELS



CONCEPTUAL MODELS



Designers model may not match user's model

Users get model from experience & usage

Users only work with system image, not with designer

PRECONCEIVED MODELS

People have preconceived models of how things work

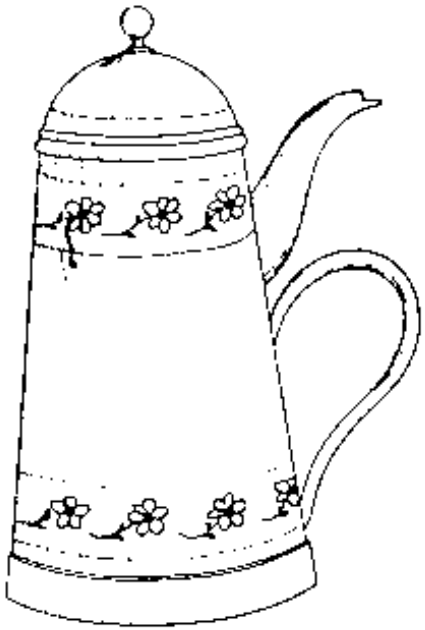
how does your car start?

how does an ATM machine work?

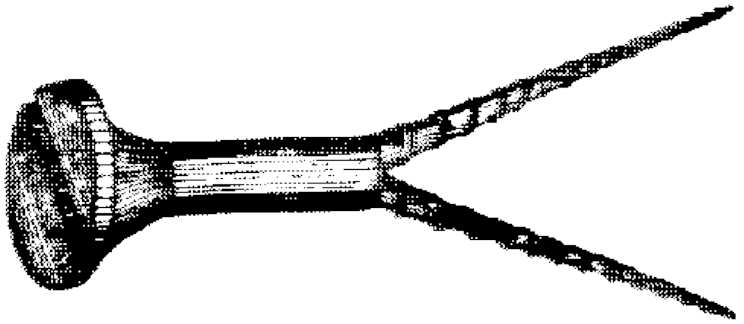
how does your computer boot?

Allow us to predict how things will work or not work

PRECONCEIVED MODELS



Teapot



Screw

PRECONCEIVED MODELS OFTEN WRONG!

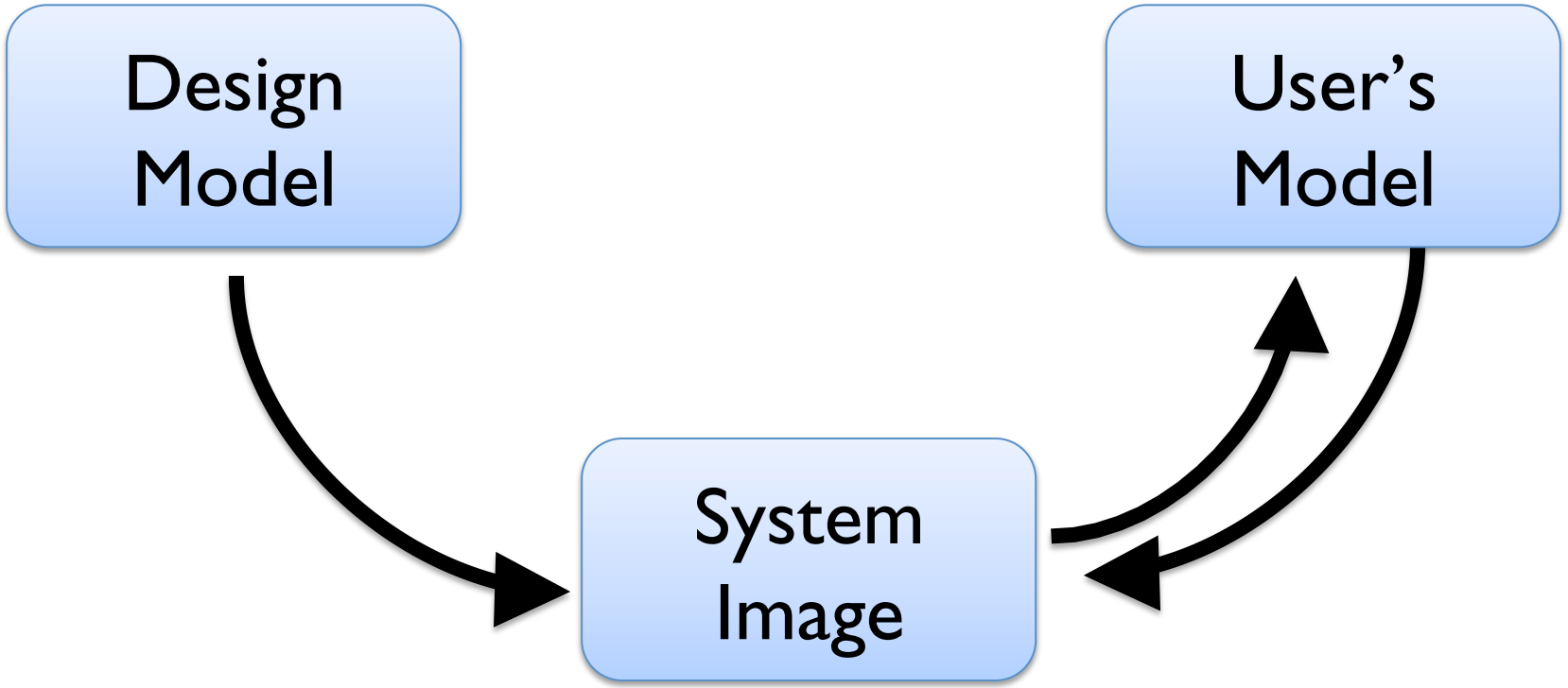
Extracted from fragmentary evidence

People find ways to explain things

Certain you're driving on the correct road

THE ACTION CYCLE

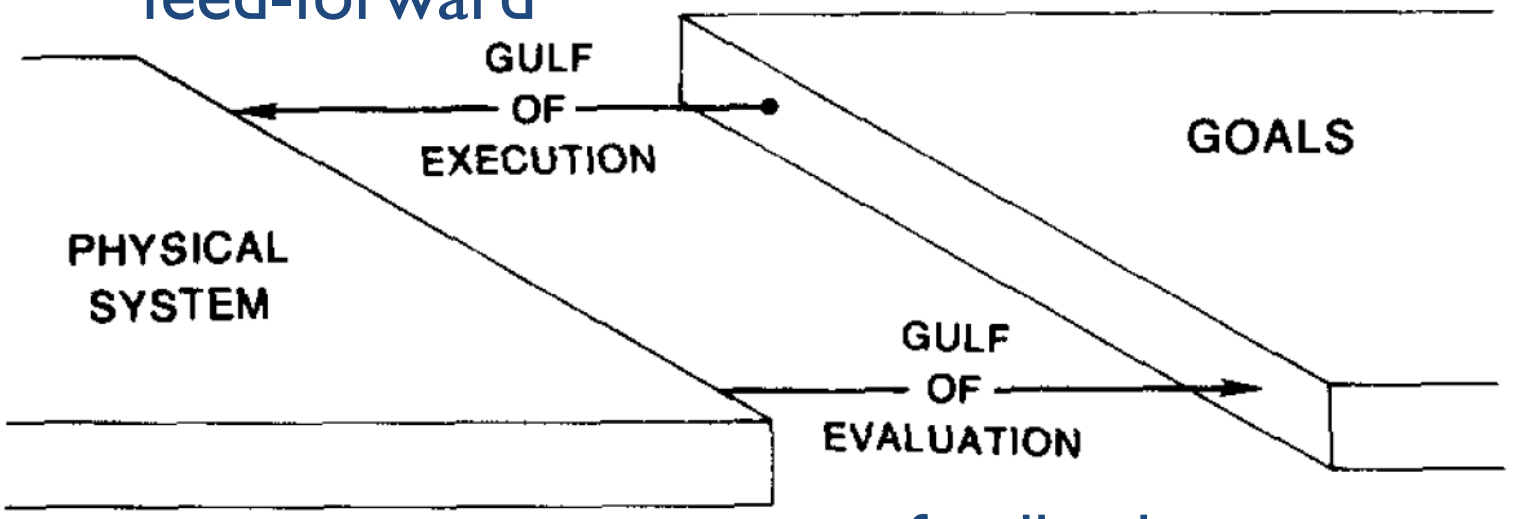
CONCEPTUAL MODELS



GULFS OF EXECUTION & EVALUATION

interface
affordances
feed-forward

Mental Model



feedback

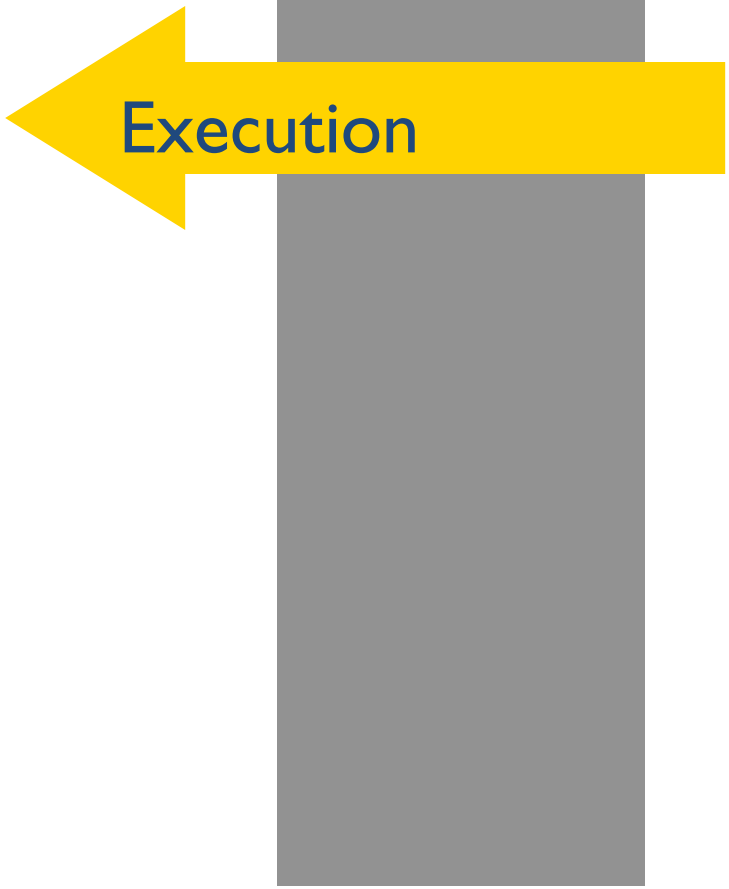
Real World

GULF OF EXECUTION

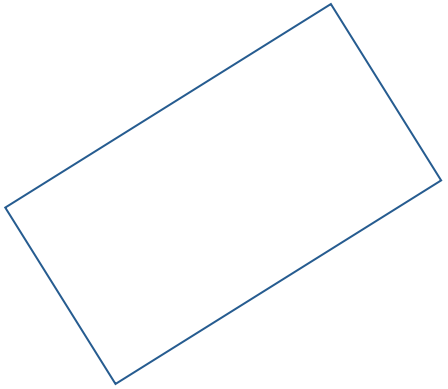
Real world

Gulf

Mental model:
Draw a rectangle



Move 90 30
Rotate 35
Pen down
…



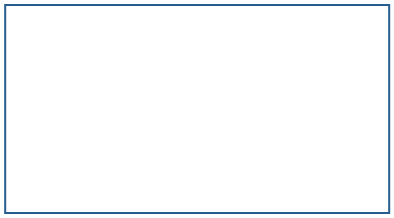
GULF OF EXECUTION

Real world

Gulf

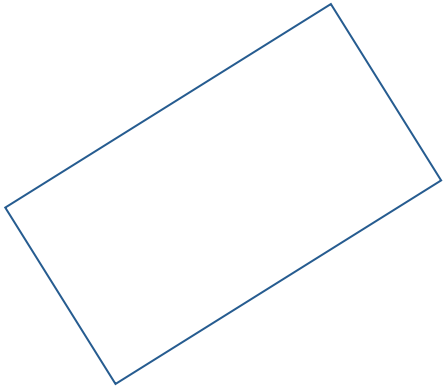
Mental model:
Draw a rectangle

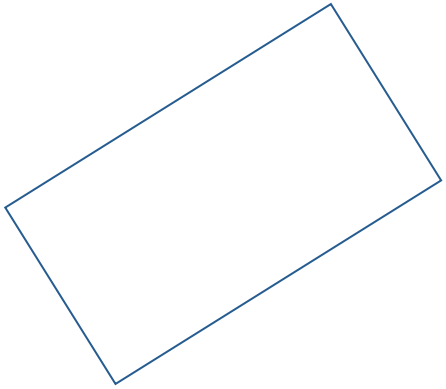
1. Draw a rectangle



Execution

2. Rotate the shape





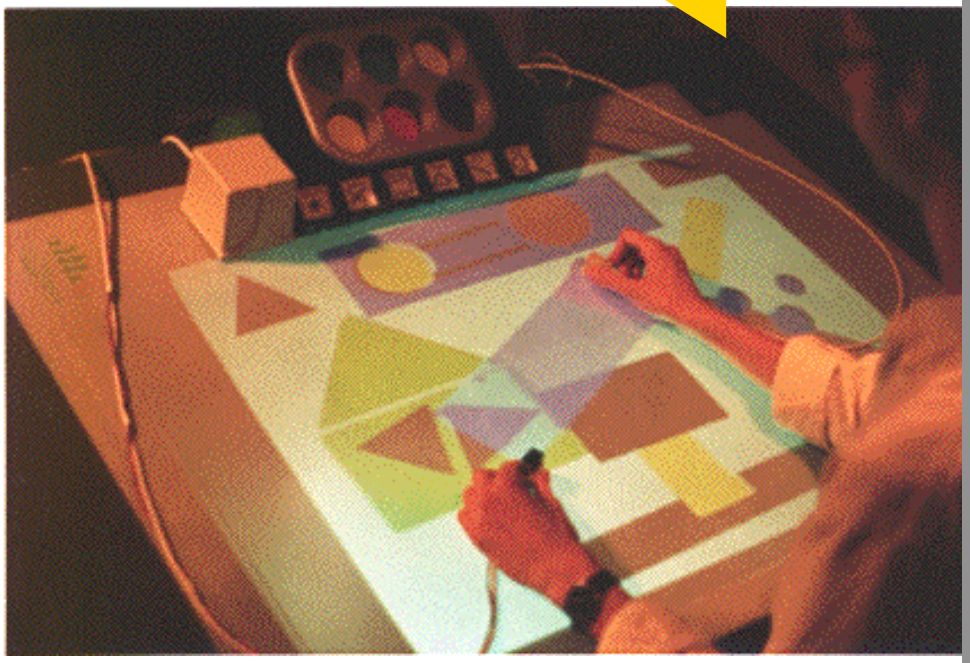
GULF OF EXECUTION

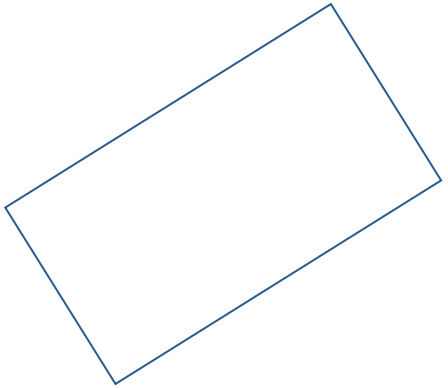
Real world

Gulf

Mental model:
Draw a rectangle

Execution



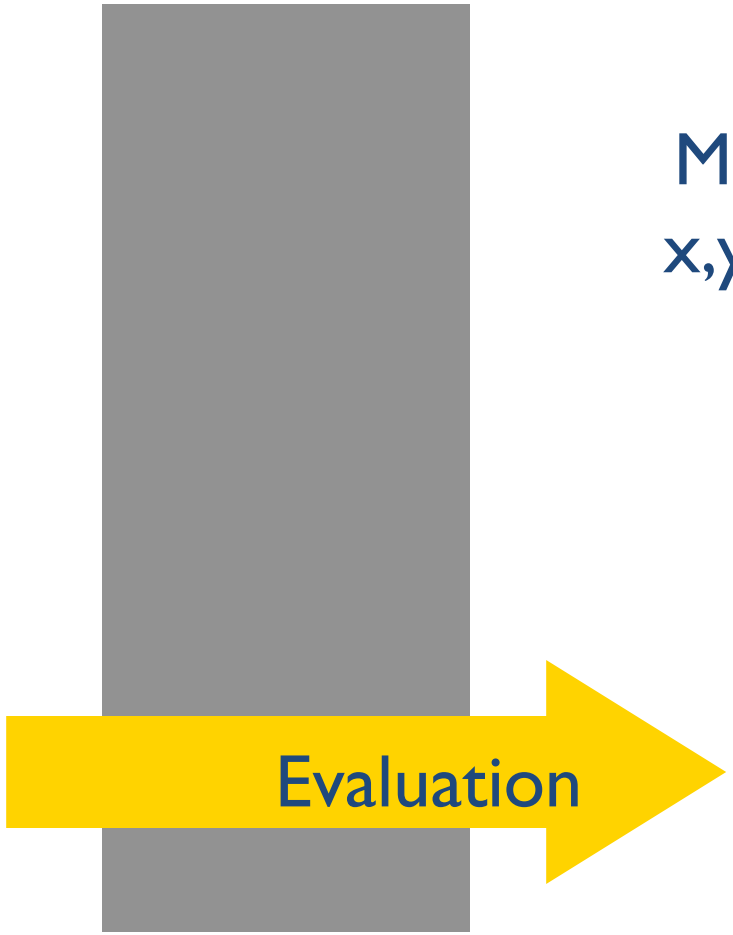


GULF OF EVALUATION

Gulf

Real world:

X	Y
0.67	0.79
0.32	0.63
0.39	0.72
0.27	0.85
0.71	0.43
0.63	0.09
0.03	0.03
0.20	0.54
0.51	0.38
0.11	0.33
0.46	0.46

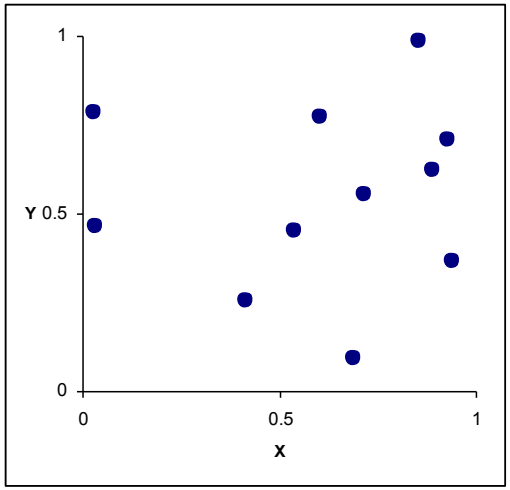


Mental model:
x,y correlated?

GULF OF EVALUATION

Gulf

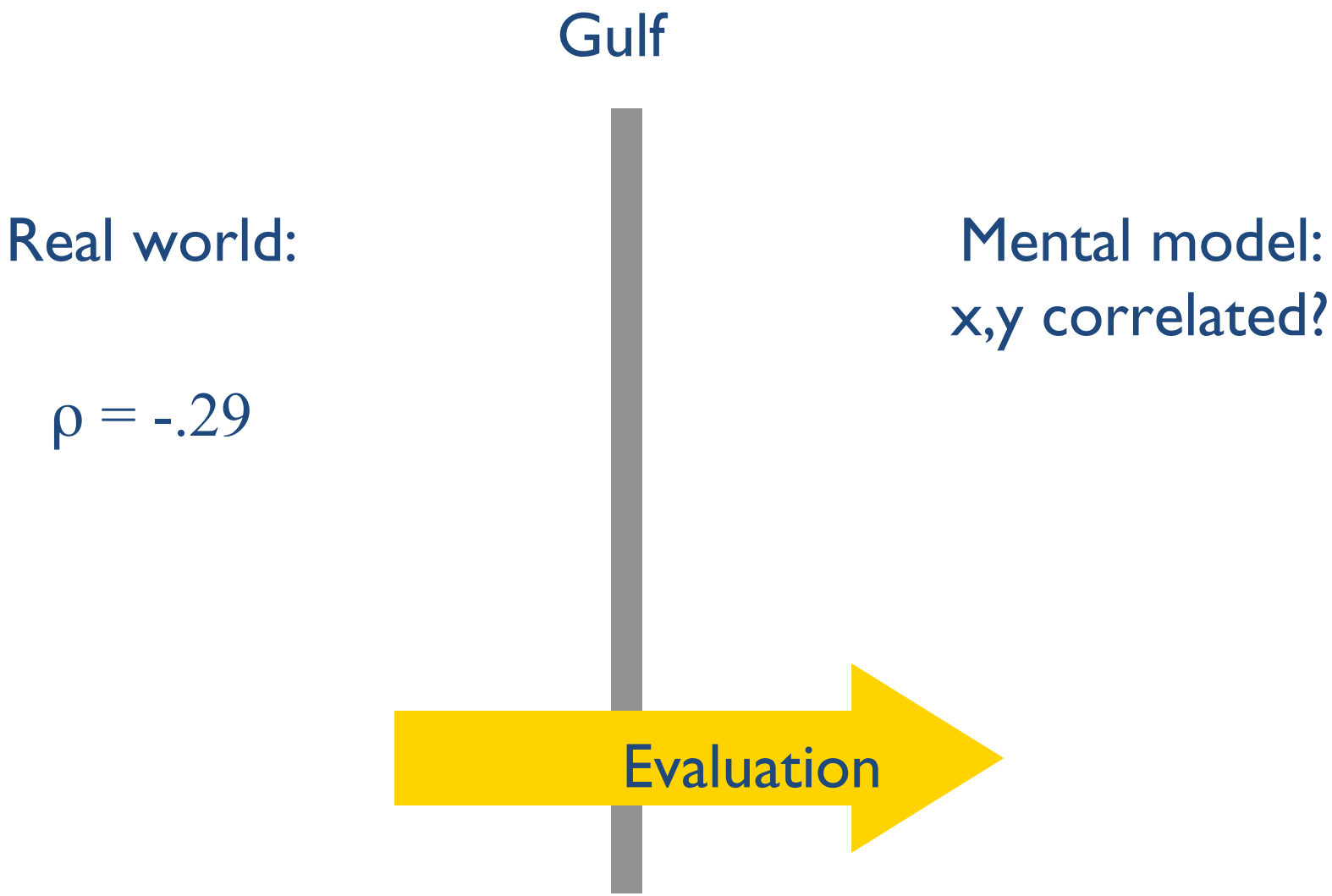
Real world:



Mental model:
x,y correlated?

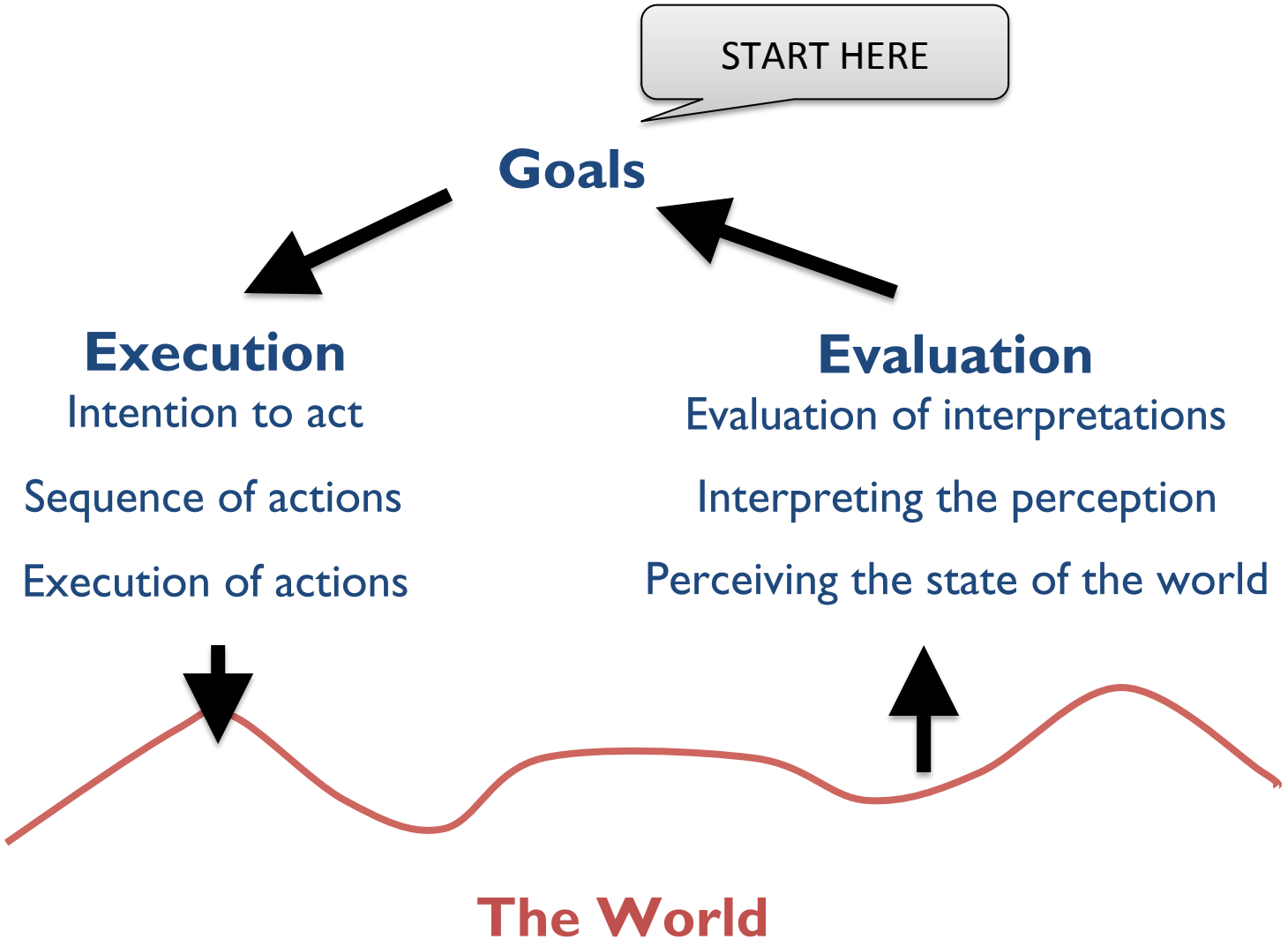
Evaluation

GULF OF EVALUATION



ACTION CYCLE

ACTION CYCLE



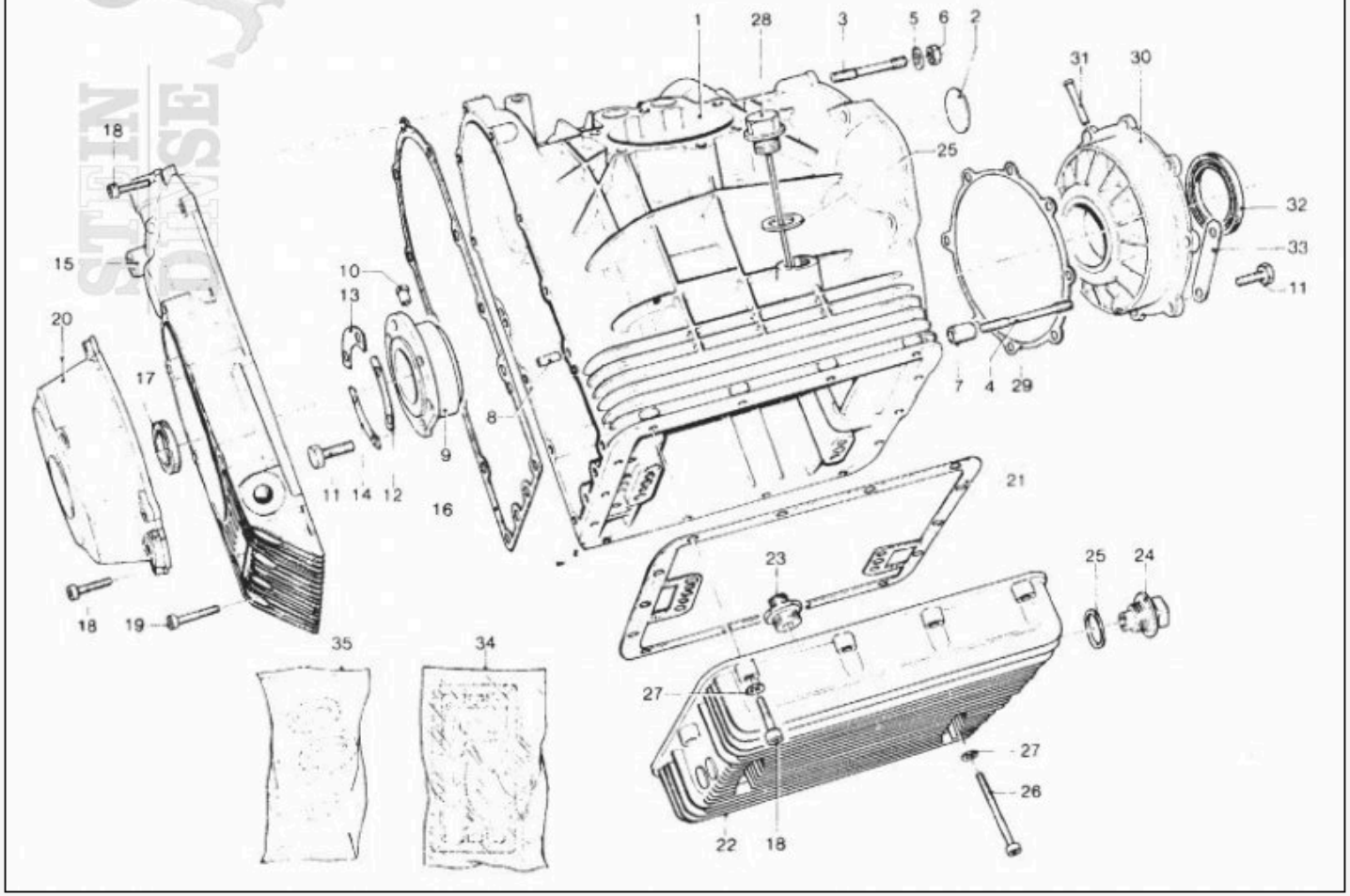
SEIMM
MOTO GUZZI

BASAMENTO E COPERCHI
CRANKCASE - COVERS
CARTER MOTEUR - COUVERCLES
KURBELGEHAUSEUNT. - DECKEL

9200-1400

850 LM (316.10)

Tavola - Drawing
Table - Bild
3



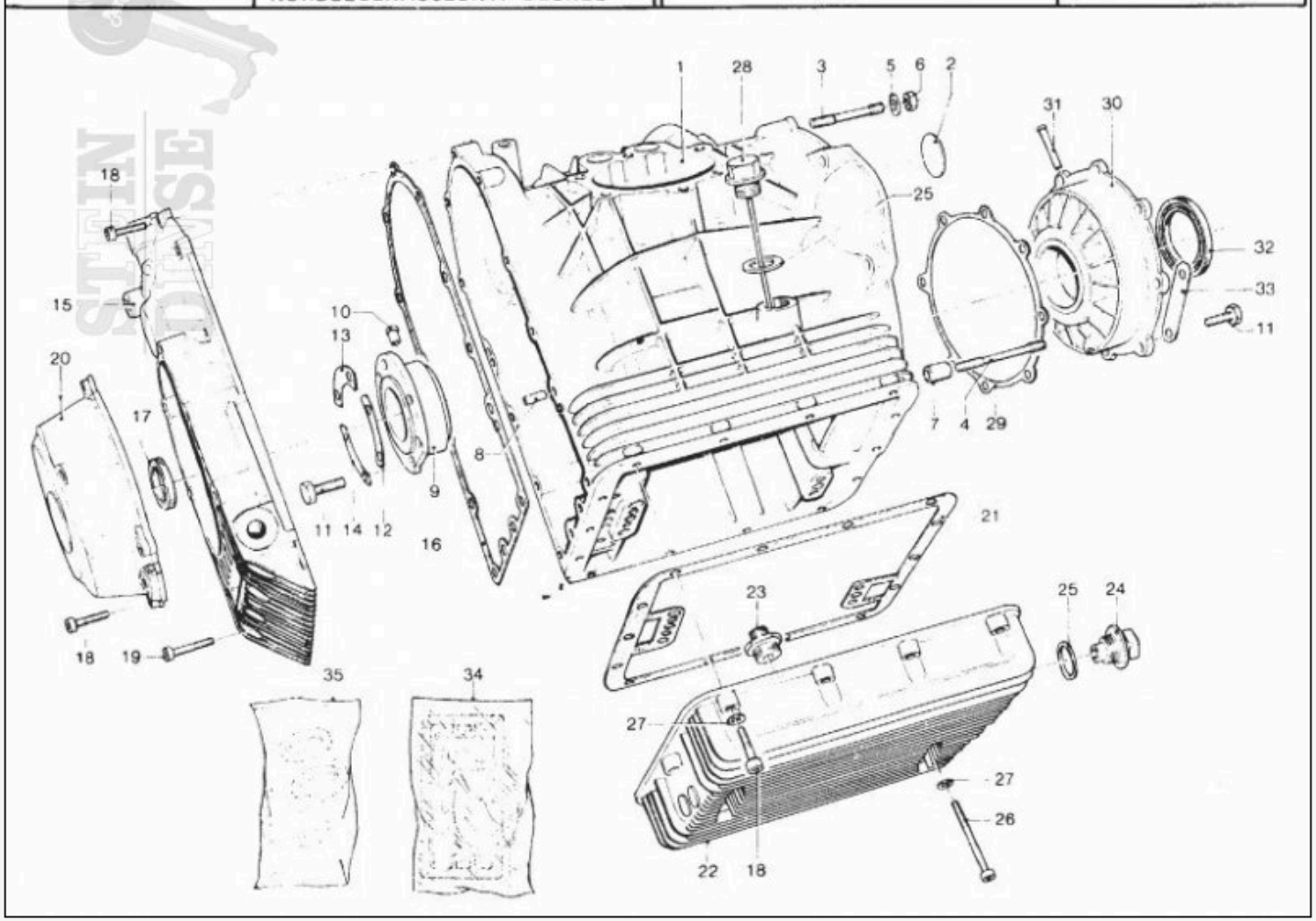
SEIMM MOTO GUZZI

BASAMENTO E COPERCHI
CRANKCASE - COVERS
CARTER MOTEUR - COUVERCLES
KURBELGEHAUSEUNT. - DECKEL

9200-1400

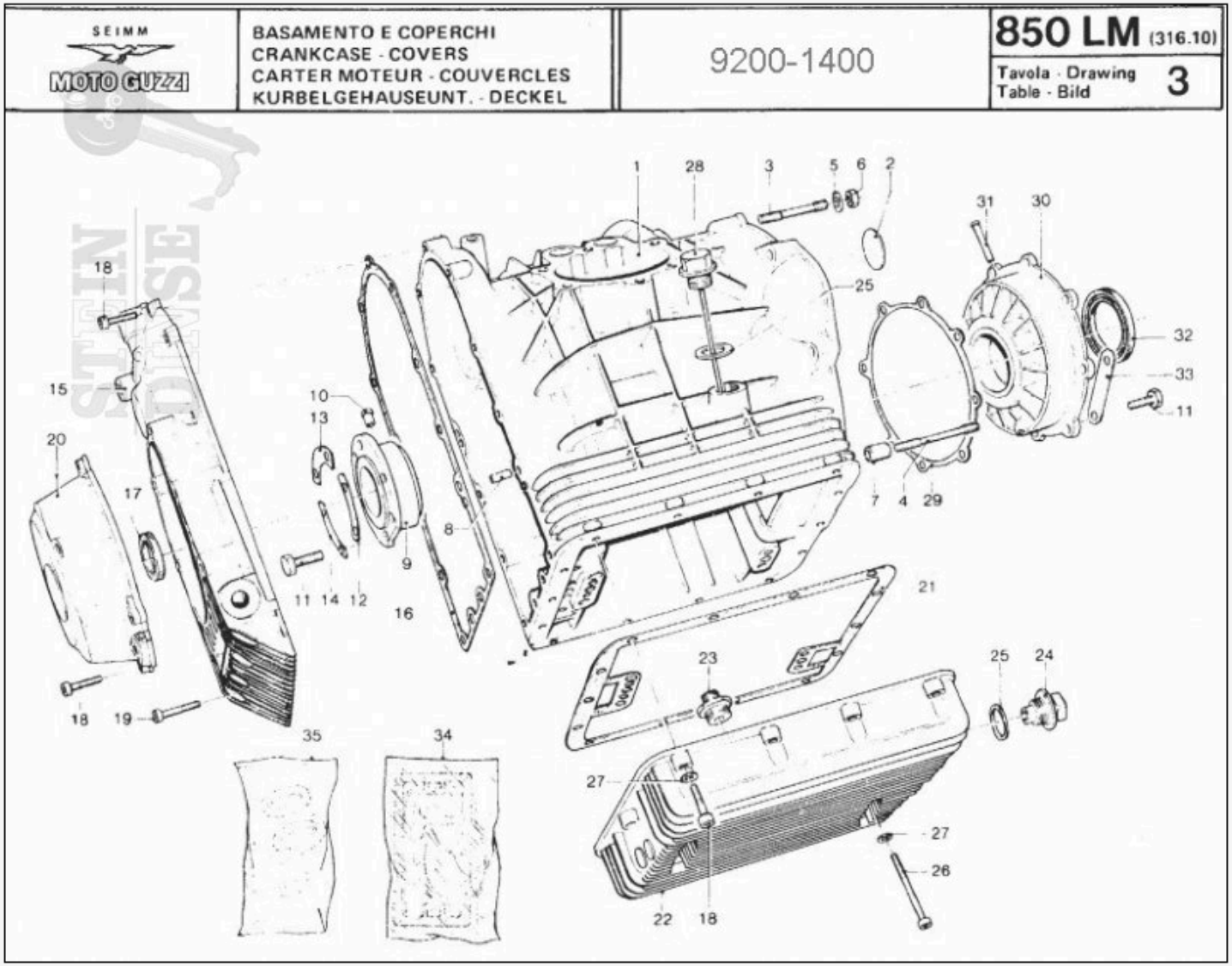
850 LM (316.10)

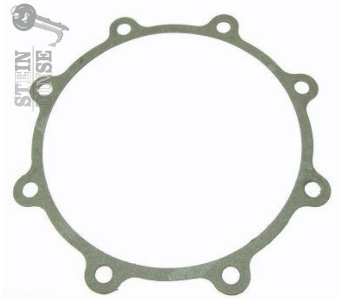
Tavola · Drawing
Table · Bild **3**



Articelno.	Description	Price	Stock	Picture	Shop
12011800	FLANGE GASKET Dichtung KW Hauptlager gr.Mod hinten	2,05 € *	Available	Show	Order
05011830	Gasket crankshaft main bearing 850/1100/1200 Dichtung KW Hauptlager gr.Mod hinten	2,59 € *	Short on stock, please ask	Show	Order

All informations comes from our Online-Shop and are up to date.
* The price includes VAT and plus porto costs





Articelno.	Description	Price	Stock	Picture	Shop
12011800	FLANGE GASKET Dichtung KW Hauptlager gr.Mod hinten	2,05 € *	Available	Show	Order
05011830	Gasket crankshaft main bearing 850/1100/1200 Dichtung KW Hauptlager gr.Mod hinten	2,59 € *	Short on stock, please ask	Show	Order

All informations comes from our Online-Shop and are up to date.
* The price includes VAT and plus porto costs

DIRECT MANIPULATION

ERIC PAULOS
www.paulos.net

UNIVERSITY OF CALIFORNIA Berkeley

DIRECT MANIPULATION

An interface that behaves as though the interaction was with a real-world object rather than with an abstract system

Central ideas

Visibility of the objects of interest

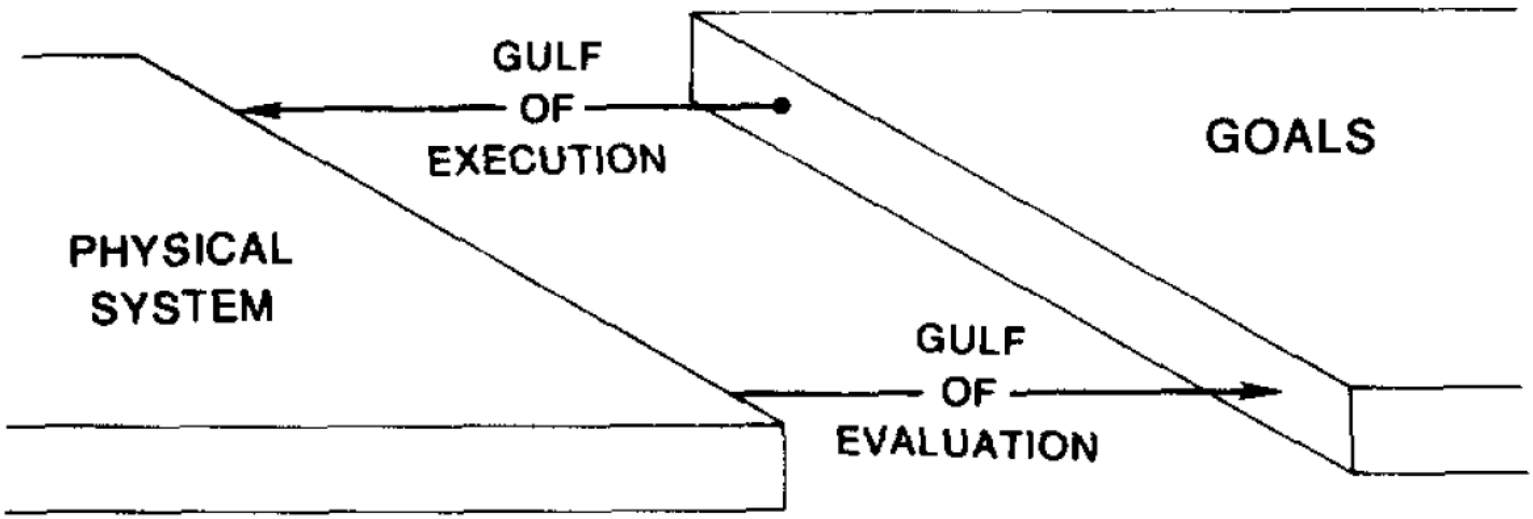
Rapid, reversible, incremental actions

Manipulation by pointing and moving

Immediate and continuous display of results

REDUCE DISTANCE

Decrease gulfs



DEFINITIONS

Direct Engagement

The feeling of working directly on the task

Direct Manipulation

An interface that behaves as though the interaction was with a real-world object rather than with an abstract system

Central ideas

Visibility of the objects of interest

Rapid, reversible, incremental actions

Manipulation by pointing and moving

Immediate and continuous display of results

Almost always based on a metaphor

Mapped onto some facet of the real world task semantics

THE METAPHOR

Computer objects as visible, moveable objects

Consequences

Items represented as icons

Items can be “picked up” and “moved” on a surface

Items can be “thrown out”

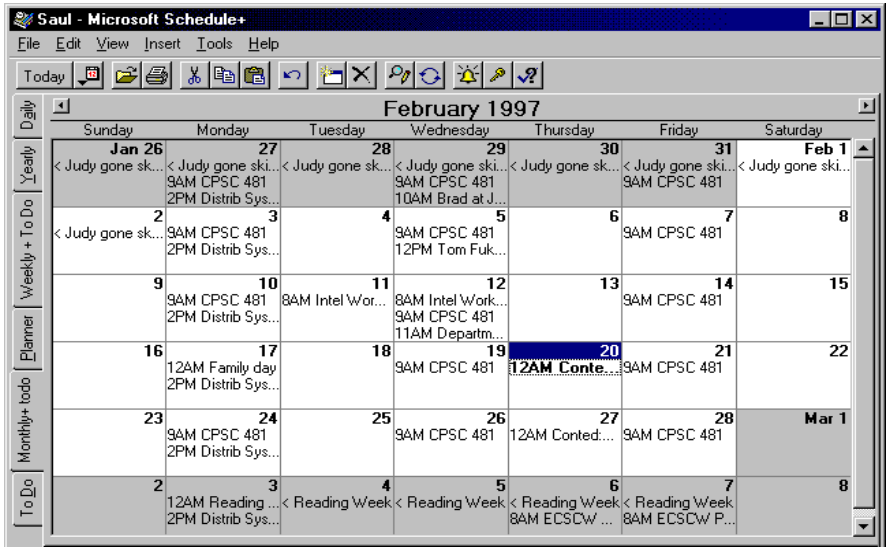
Items can be “copied”

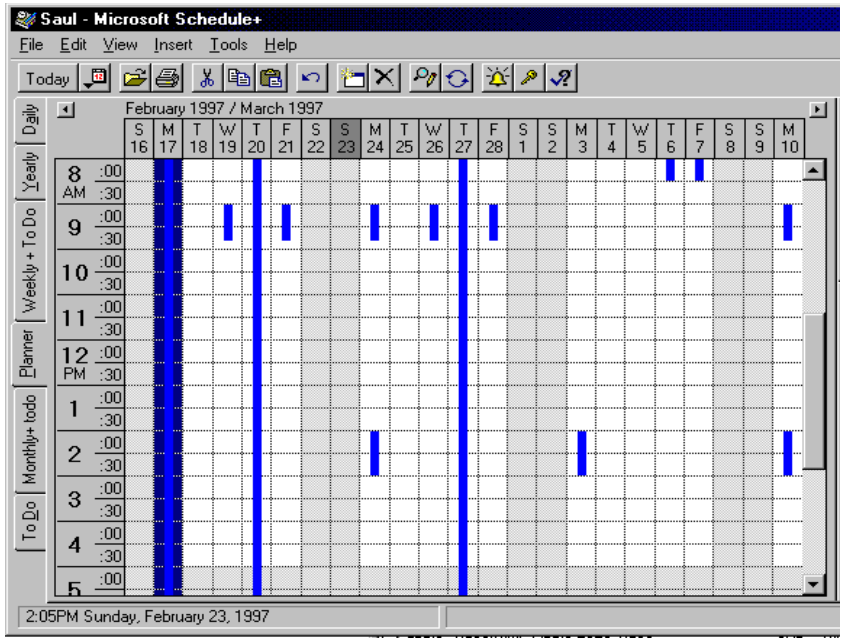
Do we really want to have to drag them to a photocopier?

How much is too much?

VISUAL REPRESENTATION

To manipulate an object it must be visible





ISSUES

Some Disadvantages

Repetitive operations (may still be best via script)

Tasks that require high accuracy (positioning)

Ill-suited for abstract operations

- Spell-checker?
- Search database by scrolling or by query?
  May desire to trade off directness for generality

Solution: Combine direct manipulation & abstractions

Word processor:

- WYSIWYG document (direct manipulation)
- Buttons, menus, dialog boxes (abstractions, but direct manipulation "in the small")

If we only restrict ourselves to direct manipulation we miss the most exciting potential of new technology – to enable new ways to think and interact

SUMMARY

Conceptual model is the user's mental model of how the interface works

Perceived affordances help users form this model

Designers must provide clues in system to make conceptual model clear

Make controls visible

Make sure mapping is clear

Provide feedback

Gulfs of Execution and Evaluation

Action cycle involves bridging gulfs between user & system

If we only restrict ourselves to direct manipulation we miss the most exciting potential of new technology – to enable new ways to think and interact

DESIGN PRINCIPLES

1. MAKE CONTROLS VISIBLE

POOR VISIBILITY (BMW'S IDRIVE)

How do you put someone on hold?

How do you set the alarm?


SONY
FM II
ST
LCL
LOUD
102.7
3
FM/AM CASSETTE CAR STEREO
DIR
DSPL
ATA
1
2
3
4
5
6
LCL
A MEM
RELEASE
35W×4
XR-1890
–
SEL
+
–
SEEK
MANU
+
LOUD
TUNER
OFF

Primary controls are visible

But how to set a radio station preset?

TOO MUCH VISIBILITY?

6 remote controls for “modest” home theater

2. MAKE SURE MAPPING IS CLEAR

Mapping: Relationship between controls and their result

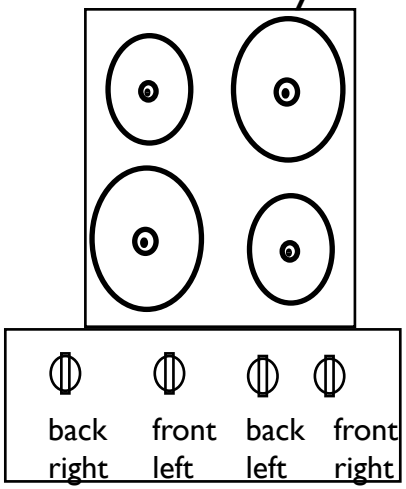
Mercedes S500 Car Seat Controller

(cc) Flickr user geekcraft

Which way will the sound be moved when you turn this knob?

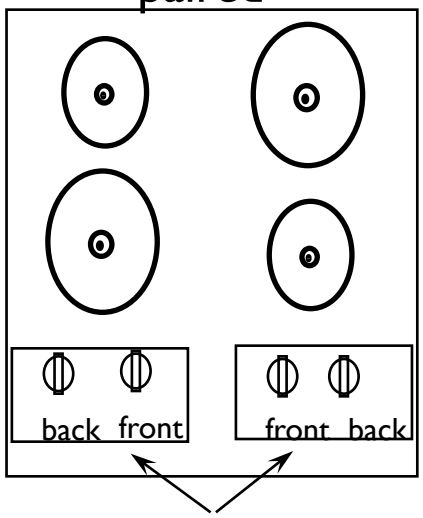
STOVETOP CONTROLS

arbitrary



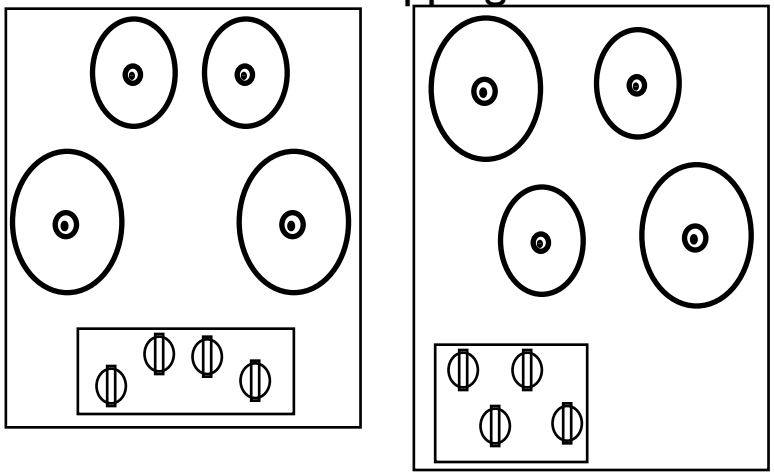
24 possibilities, requires:
visible labels
memory

paired



2 possibilities per side
=4 total possibilities

full mapping

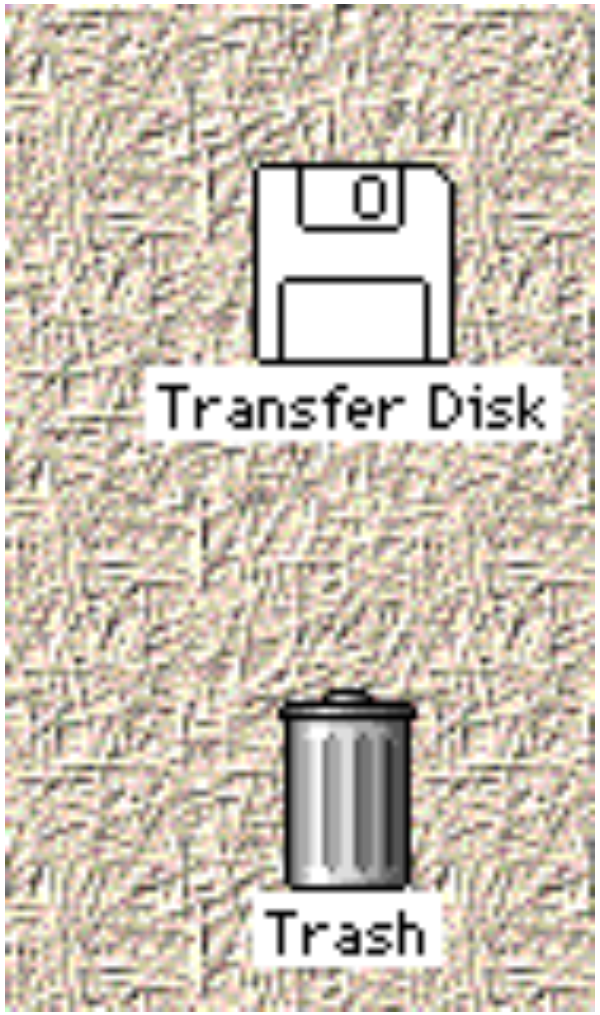


TRANSFER EXPECTATIONS

From known objects to similar new ones

Positive: previous experience applies to new situation

Negative: previous experience conflicts with new situation



What happens when disk is dragged onto trash can?

Crown in Apple Watch

3. PROVIDE FEEDBACK

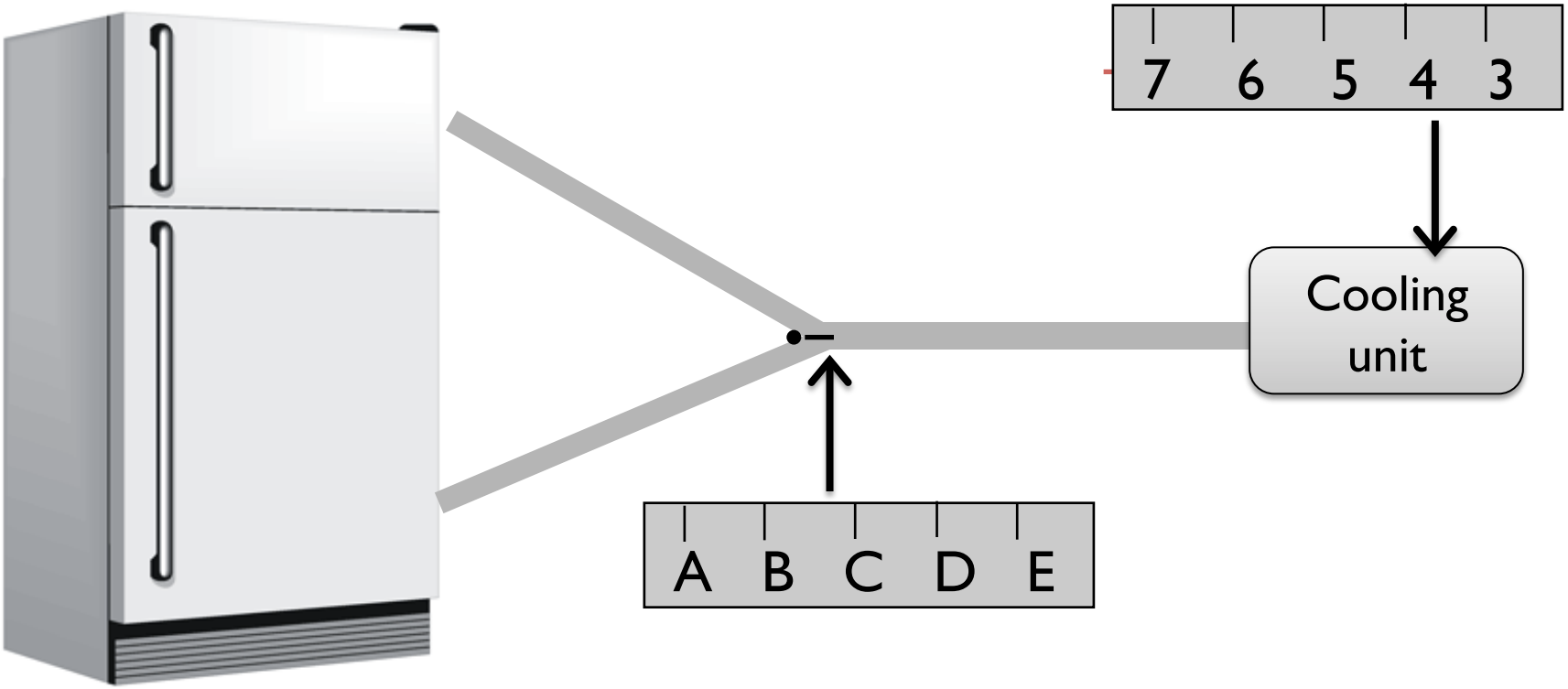
People press >> 1 time

Unclear if system has registered the button press

Elevator buttons light up → reduces multiple presses

(cc) Flickr user iseethelight

POOR FEEDBACK



Took a day for refrigerator to adjust to new settings