Human Machine Interface (HMI)

Agenda

- **Introduction**
- Usability Principles
- HMI Models
- Ergonomics
- Interactivity
- Components of User Experience (CUE) Model

Introduction

- The relationship between human users, computer and system devices should be intuitive in common sense and even fun.
- It should be intuitive, because most current users do not have engineering skills.
- Funny because gratification of the use of technology makes it very easy to introduce and use it continuously despite the innovation elements that could be
- A socially widespread experience of intuitive and fun relationship is between humans and their smart phones
- The development of graphical or sensory interfaces has undoubtedly led to a high level of intuition, and experience in the gaming industry has allowed to introduce gratification logic that is very powerful in loaning the user to use.

Human Machine Interface

- The study of how people interact with computer and to what extent computers are developed for successful interaction with human beings

- Consists of three parts
    - The user
    - The computer
    - The way they work togheter

- Concern with the *physical, psychological and theoretical aspects of this process*

Why HCI?

- *...to enable us to design interactive products to support people in their everyday and working lives*

- Develop usable products:
  - easy to learn
  - effective to use
  - provide an enjoyable experience

- **HCI is important because we have several examples of bad design of products and services….**

Some problematic designs (source www.baddesigns.com)

- How fast am I going?

For a long time I caught myself mistaking the tachometer for the speedometer.
One might think that I could break this habit pretty easily.
Why was this such a difficult habit to break?
At first I thought that the problem was that in one of our cars, the speedometer was on the **right (above)** and on the other car, it was on the **left (below)**.
But as several readers pointed out, the speedometer and tachometer on the car below have the **same numeric sc**ale.
So if a gauge shows **30**, does it indicate 30 miles per hour, or 3000 revolutions per minute?
The gauge above doesn't have that problem

Some problematic designs (source www.baddesigns.com)

- How fast am I going?

Design suggestion
When you have several similar displays close together and lined up, people will confuse them with each other.

This is especially true when displays with numeric scales **have the same increments**

These displays should be made more distinctive by making the **numberic scale increments different.**

Some problematic designs (2)

This sign is on a men's room door at the Houston Museum of Natural Science.
I was going to go in, but it seemed that maybe this restroom was for handicapped men **only**. Just to be sure I watched some guys walk up to the door, look at the sign and then walk away, presumably to go down stairs to the IMAX lobby, like the sign says. Other guys went on in, so I did too. It was a perfectly normal men's room. I don't really know what I was expecting!

Design suggestion
The words **Men** and **handicapped** need to be separated on the sign. By putting them next to each other and giving them about the same amount of salience, one is misled into thinking that the room is only for handicapped men.

Some problematic designs (3)

Doors without windows

Here is another example of doors without windows.
This picture shows a set of doors in the hallway of a university building. Imagine reaching to pull open these doors just when someone on the other side is pushing them open.
Here is a picture of a set of doors in the same hallway as the doors above. These doors have built-in windows so that you can see if there are people on the other side of the door.

Design suggestion
Make sure your design provides displays of everything a person needs to see.

Problematic designs

- Lead to daily challenges
- Cause frustration and low productivity
- Increase the cost of the product
  - For example, for a computer
    - Costs from a technical perspective
      - Hardware
      - Software
    - Cost from the users's perspective
      - Training costs
      - Daily usage

To avoid problematic design we need to...

- Take into account
  - who the users are
  - what activities are being carried out
  - where the interaction is taking place

- Optimise the interactions users have with a product
  - such that they match users' activities and needs

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What is usability?

- **Usability** is the measure of the quality of a user's experience when interacting with a product or system
  - The international standard, ISO 9241-11, defines it as: The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.
- **Usability is about:**
  - Effectiveness - can users achieve goals with the product?
  - Efficiency - how much effort (time) do users require to do this?
  - Satisfaction – what do users think about the products ease of use?
- ….**which are affected by:**
  - The users, their goals, the usage situation (or 'context of use')
- **Usability** should not be confused with 'functionality'
  - Increased functionality does not mean improved usability!

Usability goals

- Effectiveness
- Efficiency
- Safety
- Utility
- Learnability
- Memorability

- They all affect users' satisfaction

Design principles (not exhaustive list)

- Visibility – can I see it?
- Feedback – what is it doing now?
- Constraints – why can't I do that?
- Mapping – where am I and where can I go?
- Consistency – I think I have seen this before?
- Affordance – how do I use it?
- Mental/conceptual models – I think I know how this operates?

Visibility

- Can see the state of a device and possible actions

- Systems are more usable when they clearly indicate
  - their status
  - the possible actions that can be performed
  - and the consequences of those actions

Visibility (1)

- Car controls are positioned in a way that they can be easily found and used

Visibility (2)

- Problems arise when we cannot see how to use a device
  - Recall our first class and troubles with the laser pointer
  - Sensor technology like auto faucets – not sure how to use – guess where to put hands
  - Visible knobs, dials and buttons ambiguous "**active zones**"

Visibility (3)

- This is a control panel for an elevator.
- How does it work?
  - Push a button for the floor you want?
  - Nothing happens. Push any other button? Still nothing. What do you need to do?
- It is not visible as to what to do!

Visibility (3)

- You need to insert your room key – a card – into the slot by the buttons
  - FESB has a similar system

- How would you make this action more visible?
  - Make the card reader more obvious
  - Provide an auditory message, that says what to do (which language?)
  - Provide a big label next to the card reader that flashes when someone enters

  - Make relevant parts visible
  - Make what has to be done obvious

Visibility (4)

- Google makes it clear where to enter text

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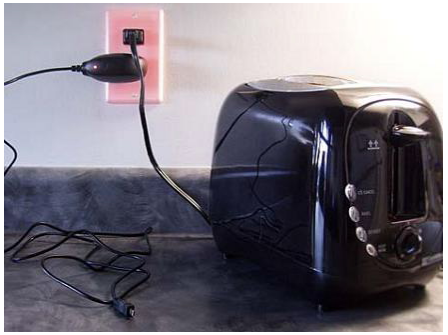
Feedback

- What is it doing now?
- Sending information back to the user about what has been done
- Needs to be immediate and synchronized with user action

- Includes sound, highlighting, animation and combinations of these
  - Listen to your mouse when you click it
  - Can’t it be designed more silent?
  - Look around you and find examples of feedback
  - Glowing switch and power socket



Feedback (1)

- Other examples of feedback in everyday design?

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Constraints

- Restricting the possible actions (the kind of interaction) that can be performed (can take the place)

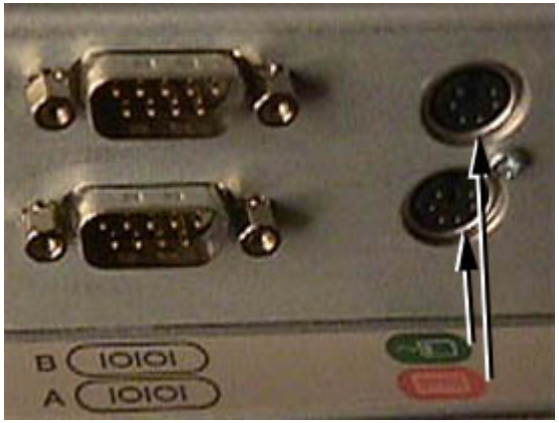
- Helps prevent user from selecting incorrect options

Constraints (1)

- Restricting the kind of interaction that can take the place

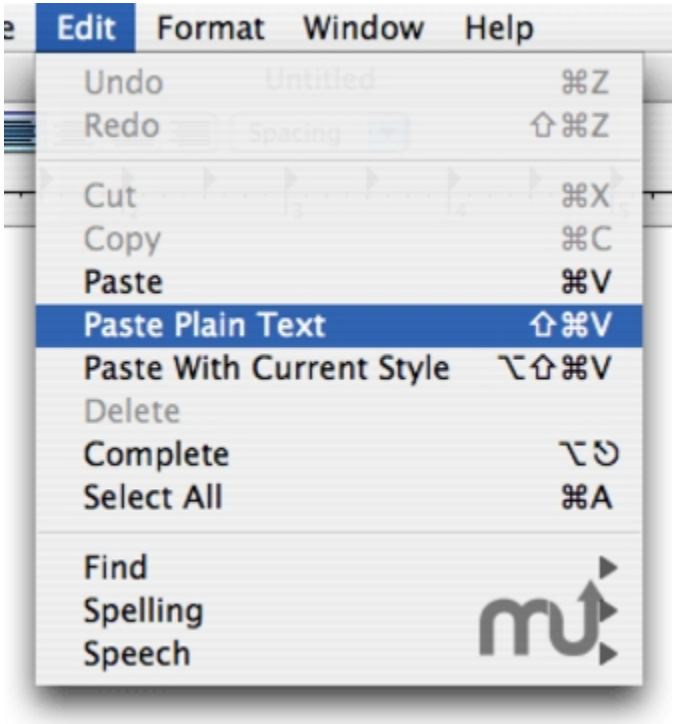
nowdays

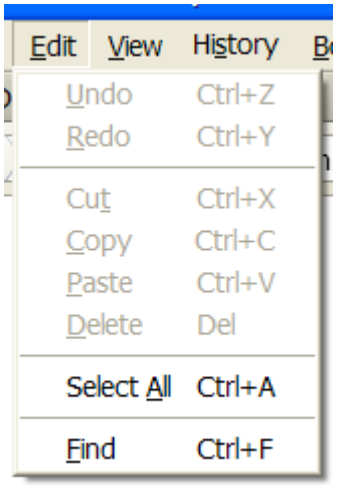
in the past



Constraints (2)

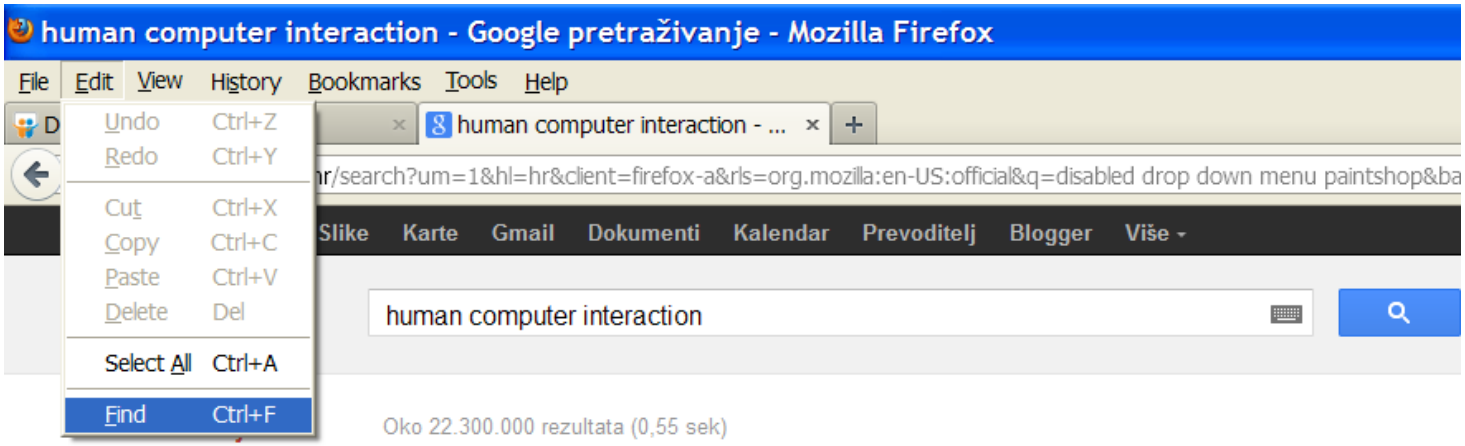
- Reduce the error

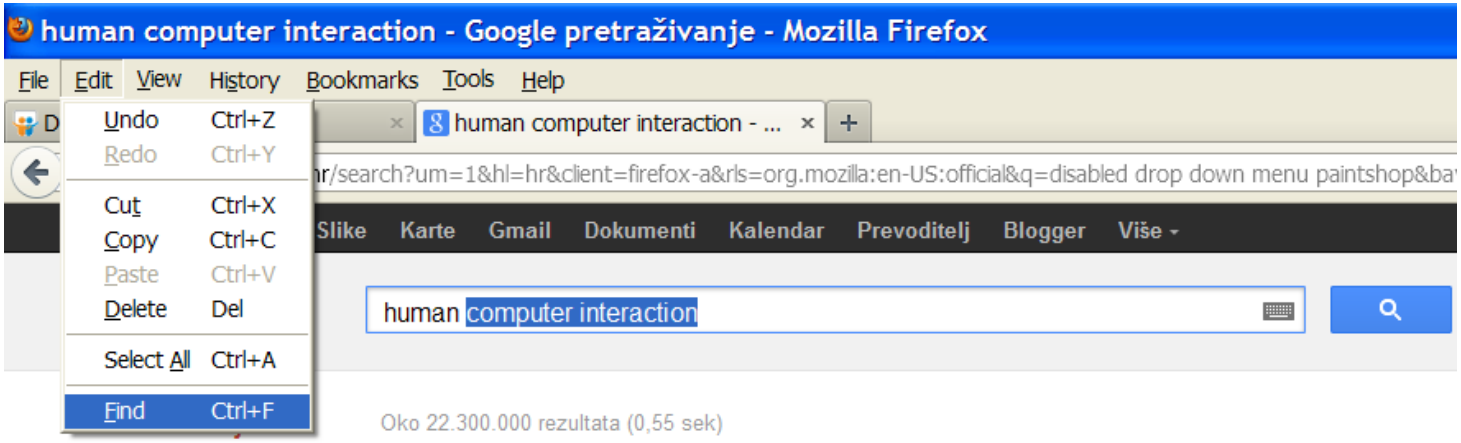




Constraints (3)

- Can work to focus the user's attention to needed task





Cultural constraints

- We learned arbitrary conventions which help us use technologies

- Can apply in a number of ways
  - Icons, menus
  - Number pads: calculators vs. phone which should comput keypads follow?
  - Keyboards (typing Qwerty slower, still we all got used to it)

QWERTY

DVORAK

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Mapping

- Turn a wheel, flip a switch, or push a button
  - What effect do you expect?

- Mapping is a relationship between controls and their movements and the results in the world (effects)

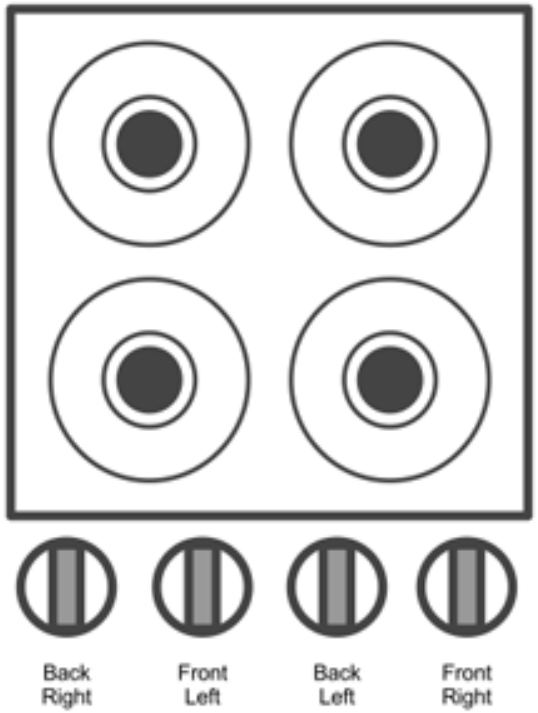
- Good (natural) mapping - the effect corresponds to the expectation

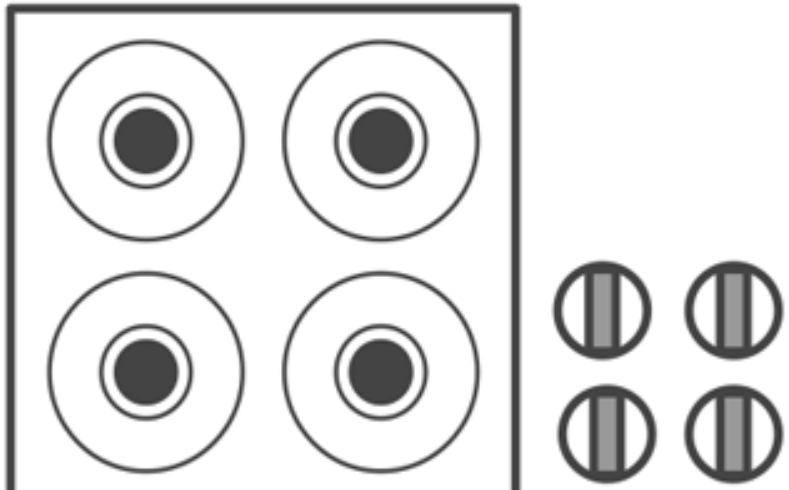
- Poor mapping - the effect does not correspond to the expectation

- Good mapping between controls and their effects results in greater easy of use

Mapping (1)

- Which stove control design provides better mapping? Why?





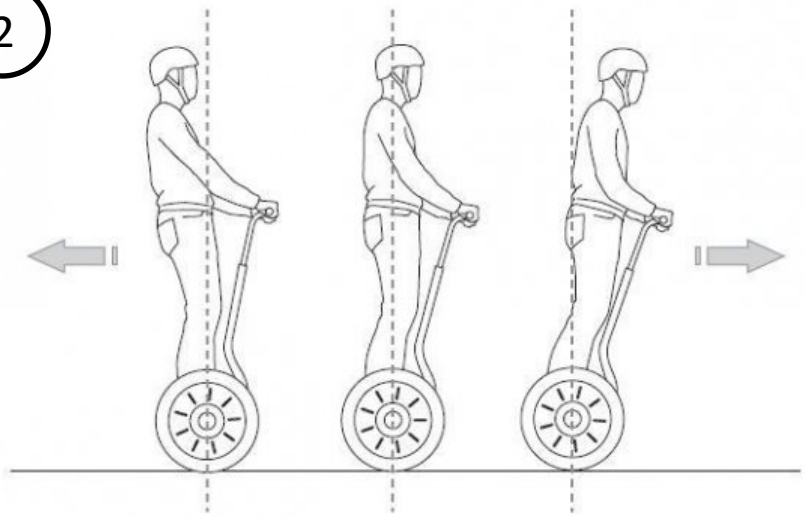
Mapping (2)

- Good or bad mapping?

1

3

2



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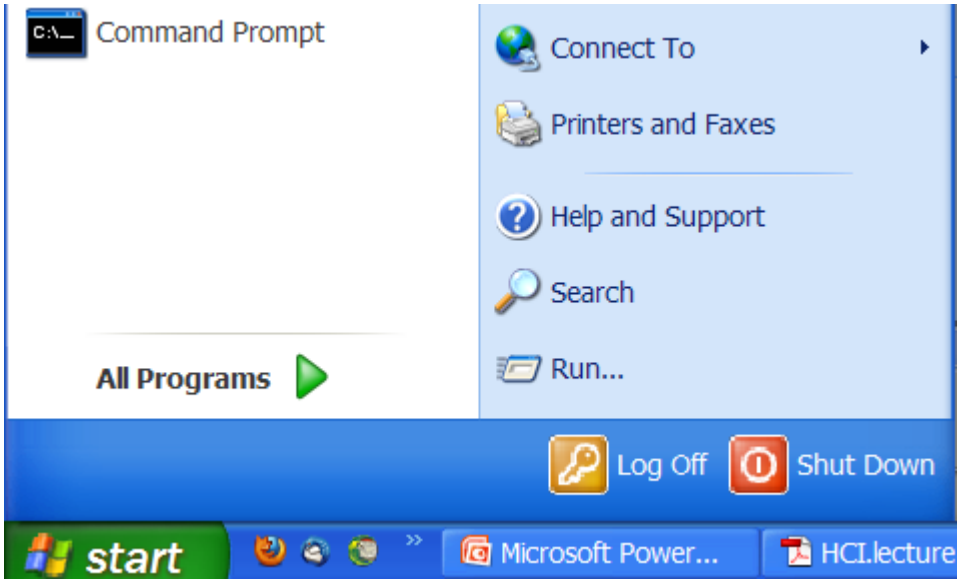
What about the switches in the classrom?

Mapping (3)

- Good mapping primarily a function of similarity of
  - Layout – e.g., stove controls from the last slide
  - Behavior – e.g., steering wheel, Segway
  - Meaning – e.g., shut-down button is colored red (people associate red with STOP)



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Consistency

- Design interfaces to have similar operations and use similar elements for similar tasks

- For example:
  - Always use ctrl key plus first initial of the command for an operation – Ctrl+C, Ctrl+S, Ctrl+V ...

- Main benefit is consistent interfaces are easier to learn and use

Consistency breakdowns

- What happens if there is more than one command starting with the same letter?
  - e.g. save, spelling, select, style
- Have to find other initials or combinations of keys, thereby breaking the consistency rule
  - E.g. Ctrl+S, Ctrl+Sp, Ctrl+shift+L
- Increases learning burden on user, making them more prone to errors

Internal and external consistency

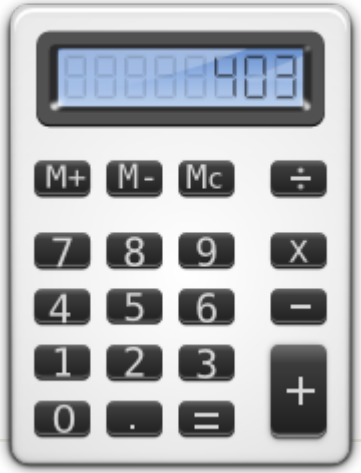
- Internal consistency refers to designing operations to behave the same within an application
  - Difficult to achieve with complex interfaces

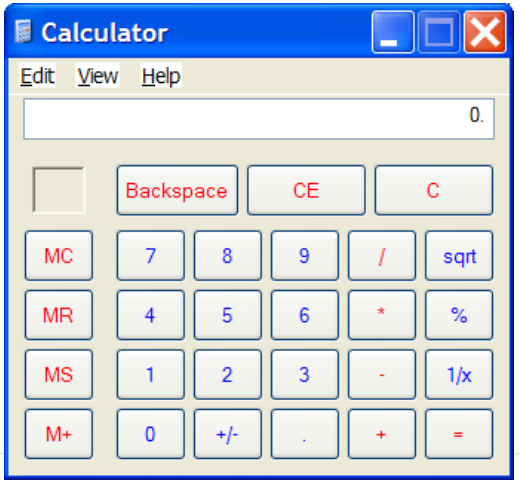
- External consistency refers to designing operations, interfaces, etc., to be the same across applications and devices
  - Very rarely the case, based on different designers' preference

External inconsistency

- Phone, remote controls

- Calculator





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Affordance

- Refers to an attribute of an object that allows people to know how to use it

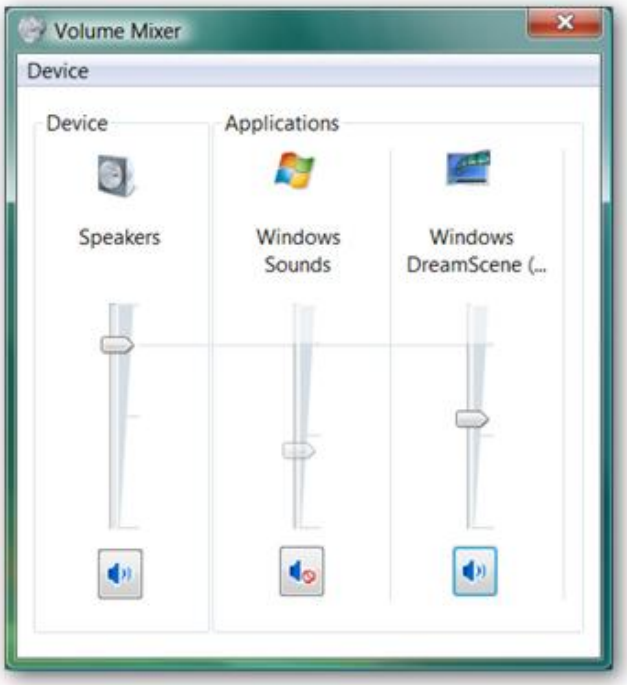
- How something looks indicates how it's can be used
  - Chair for sitting
  - Table for placing things on
  - Knobs for turning
  - Slots for inserting things into
  - Buttons for pushing

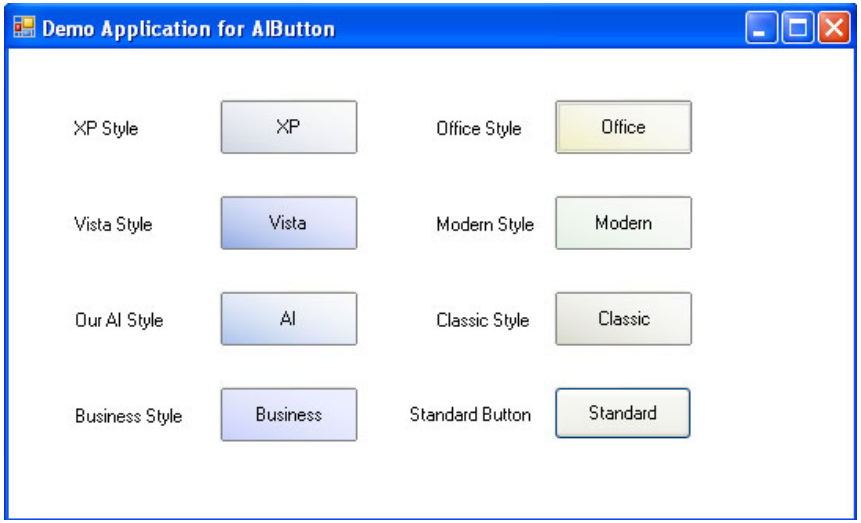
Affordance (1)

- Refers to an attribute of an object that allows people to know how to use it

Affordance (2)

- Refers to an attribute of an object that allows people to know how to use it





Affordance (3)

- Complex things may need explaining, but simple things should not
  - When simple things need pictures, labels, instructions, then design has failed
  - Their usage should be obvious based upon their appearance

Both sides don't have to look the same. The pull side can have a handle, the other side can have a big metal plate or a push bar. A handle sends out a signal: grab me and pull. A metal plate cannot be pulled, so you have only one option: push. Designing each side of the door appropriately eliminates confusion because the perceived affordances are now more focused on the intended action.

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Mental model

- Representations of systems derived from experience

- People understand and interact with systems based on **mental representations developed from experience**

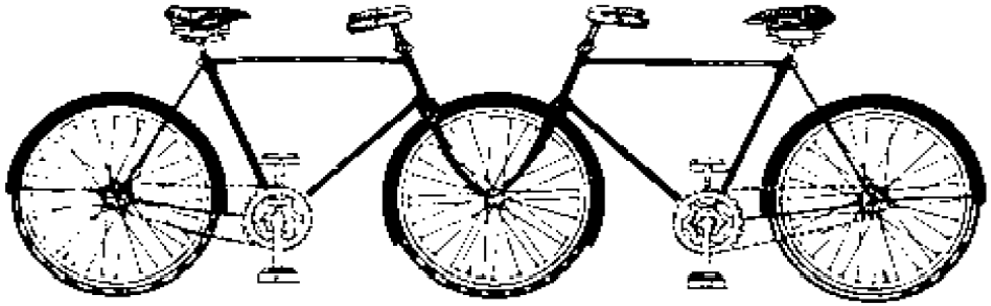
  - They compare the outcomes of their mental models with the real-world systems:
  - When the outcomes correspond, a mental model is accurate
  - When the outcomes do not correspond, the mental model is inaccurate or incomplete

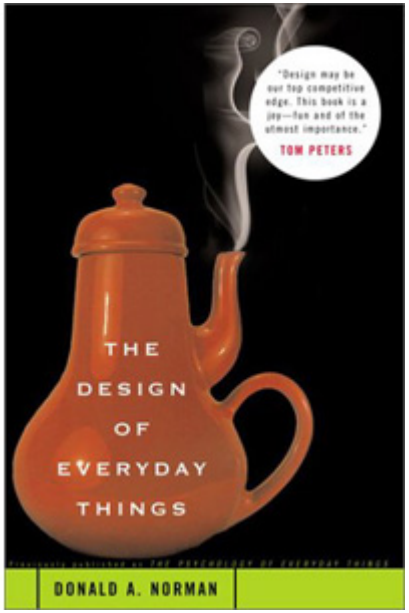
Mental model (1)

- A mental model allows the user to simulate the operation of the device
- A good mental model allows the user to predict the effects of their actions
- Mental models built from:
  - Affordances and constraints
  - Mappings
  - Transfer effects
  - Population stereotypes/cultural standards
  - Instructions
  - Interactions

Mental model (2)

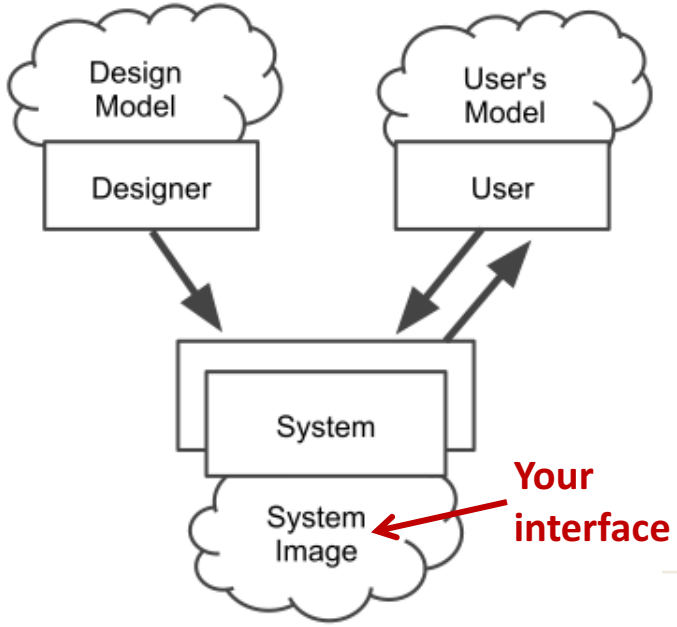
- Models allow people to mentally simulate operation of design (device, software,...)
- Models may be wrong, particularly if the above attributes are misleading





Mental model (3)

- With regards to design, there are two basic types of mental models
  - System models – mental models of how systems work
  - Interaction models – mental models of how people interact with systems
- Designers have accurate system (design) models, but weak interaction model
- Users have inaccurate system models, but through use and experience attain accurate interaction models
- Optimal design only when designers have accurate system and interaction model
  - Usability testing, observing people unfamiliar with the system, this course ☺



Mental model: the case of ABS (4)

- Anti-lock braking system (ABS) vs. conventional brakes

- Statistics show that ABS have not reduced the frequency or cost of accidents
  - In spite of the fact that they have measurable safety benefits in controlled tests
  - Why is this so?

- We can explain this by using the concept of wrong mental model of ABS

Mental model: the case of ABS (5)

- Good interaction model for conventional brakes
  - On slick surfaces
    - Depress the brake pedal smoothly
    - Pump brakes to prevent them from locking up
    - Do not steer while braking, except to counter-steer
    - Noise and vibrations are signs that something is wrong

- Good interaction model for ABS
  - On slick surfaces
    - Depress the brake pedal fast and hard
    - Do not pump breaks
    - Steer while braking
    - Noise and vibrations are signs that the system is operating properly

Mental model: the case of ABS (6)

- The likely cause that ABS have not made the difference
  - People are not using ABS properly (**wrong mental model**)
  - They transfer the knowledge from conventional breaks
  - All this simply means that ABS are not properly designed
  - It also suggests that designers gave little consideration to the
  - interaction model of the target audience in the design process
- **So, design with people's interaction models in mind**

Final thoughts: individual differences

- Who do you design for?
- People are different
- It is rarely possible to accommodate all people perfectly
- Rule of thumb:
  - Designing for the average is a mistake
    - May exclude half the audience
  - Design should aim at 95% of audience
    - But means 5% of population may be (seriously!) compromised
- Examples:
  - Cars and height: headroom, seat size
  - Computers and visibility:
    - Font size, line thickness, alternatives to color for color blind people?

Final thoughts: individual differences

- You do NOT necessarily represent a good representative user of equipment or systems you design
- Do not expect others to think and behave as you do, or as you might like them to
- People vary in thought and behaviour just as they do physically
- **Design for and with a user!**

What you know now

- Many so-called human errors are actually errors in design
  - Don’t blame the user!

- Designers help make things easier to use by providing a good mental/conceptual model through
  - Affordances
  - Constraints
  - Mapping
  - Visibility
  - Population stereotypes
  - Positive transfers

- Design to accommodate individual differences
  - Decide on the range of users

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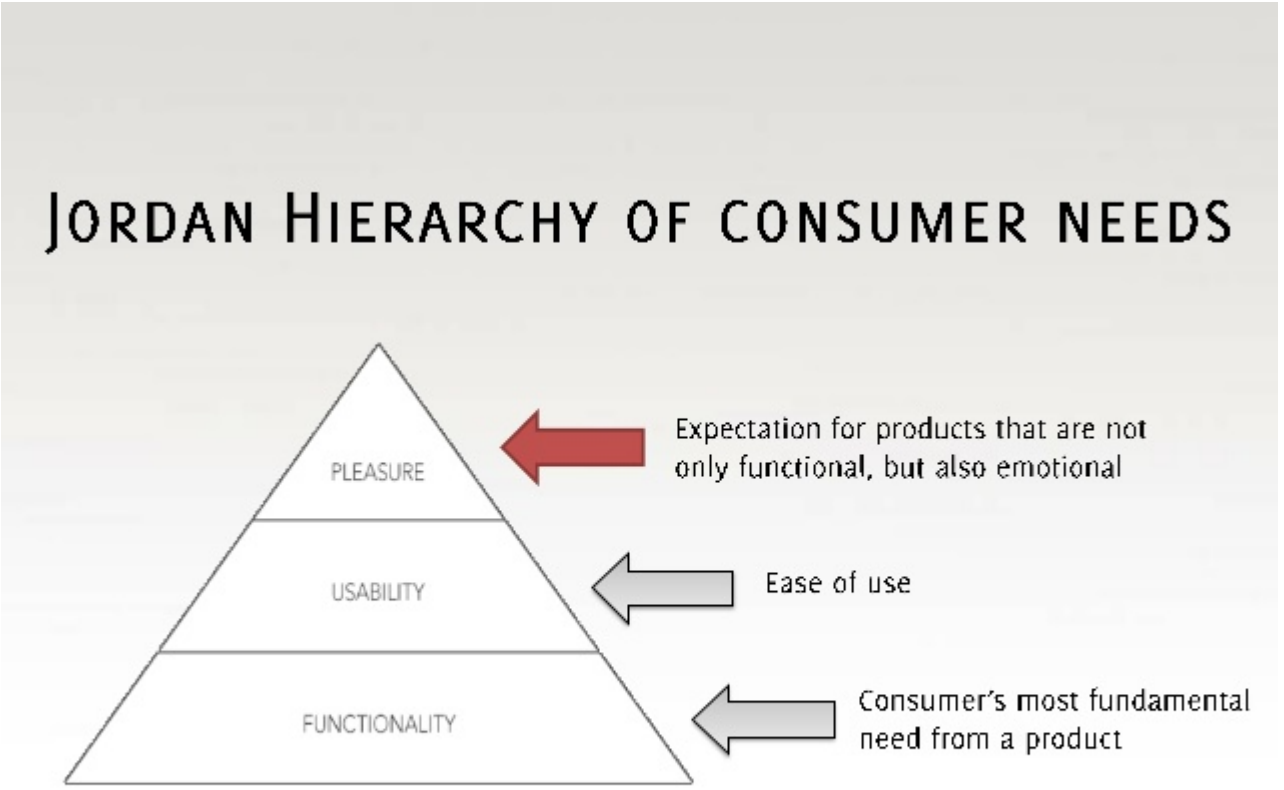
Patrick Jordan approach is the first model on user needs



Patrick Jordan Model is based on Ecological Approach of Visual perception of James Gibson

James J. Gibson

- "The Ecological Approach to Visual Perception" (1986)
- Coined the term "affordance"
- Environments provide niches of appropriate affordances
- Animals survive/thrive when they can exploit the affordances in their niche

"An affordance is a quality of an object, or an environment, which allows an individual to perform an action."

LAYER 7 TECHNOLOGIES

10

James Gibson Model of visual perception is a process

The Information Flow

- James Jerome Gibson: Perception
  - A continuously ongoing process
  - Detecting the invariants of the environment
  - The function of the brain is to orient the organs of perception for seeking information
  - Perception and action are not separate processes
  - Perception cannot be separated from the environment
  - Our perceptive system evolved in the environment, i.e. based on the information that is present in that environment
  - Perception, action and the environment are tightly related

12

Donald Norman Model is most influential in HCI

Interaction

Donald Norman Model of Interaction

- Norman's model of interaction (1988)- most influential in HCI. Provides a framework for examining interaction. Norman's model concentrates on user's view of the interface
  - Has two principal players
  - interaction cycle has two major phases - Execution and Evaluation
- Has Seven stages
  - user establishes the goal
  - formulates intention
  - specifies actions at interface
  - executes action
  - perceives system state
  - interprets system state
  - evaluates system state with respect to goal

Donald Norman's model

- Seven stages
  - user establishes the goal
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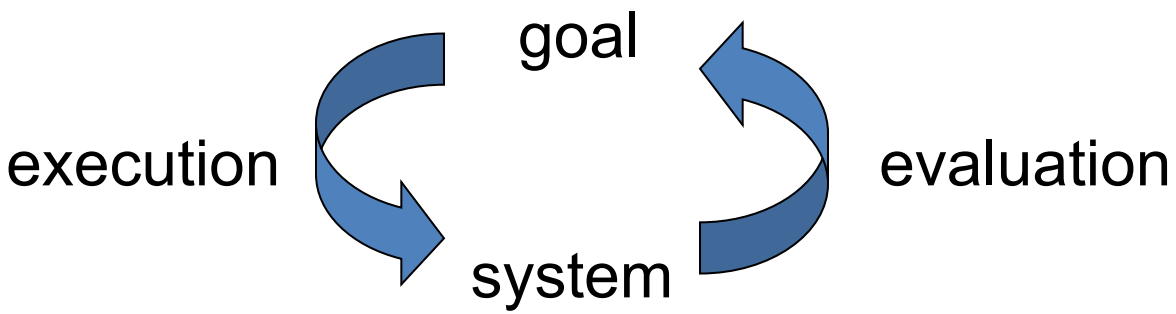
- Norman's model concentrates on **user's view of the interface**

Execution/evaluation loop



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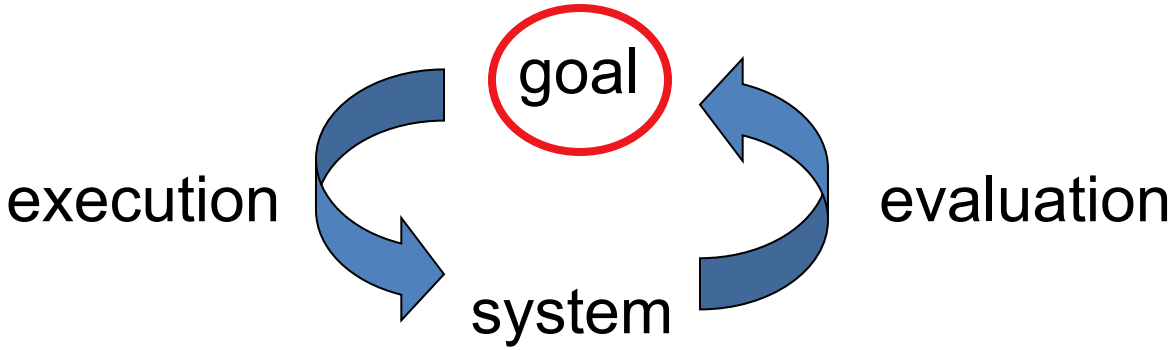

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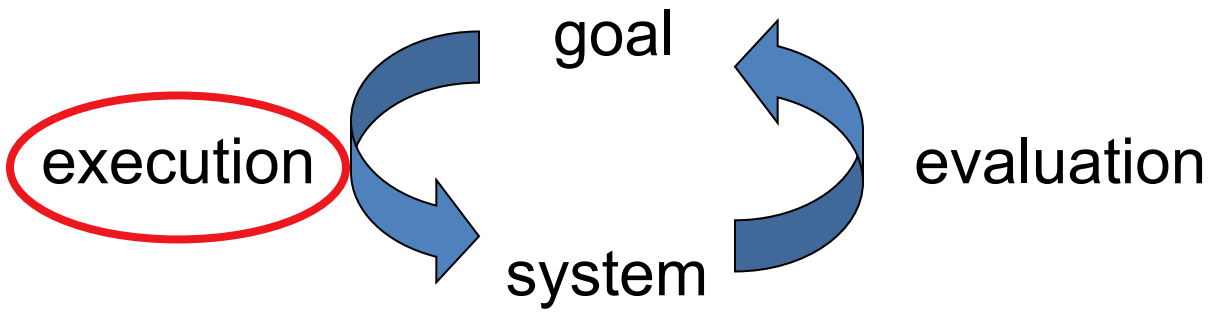

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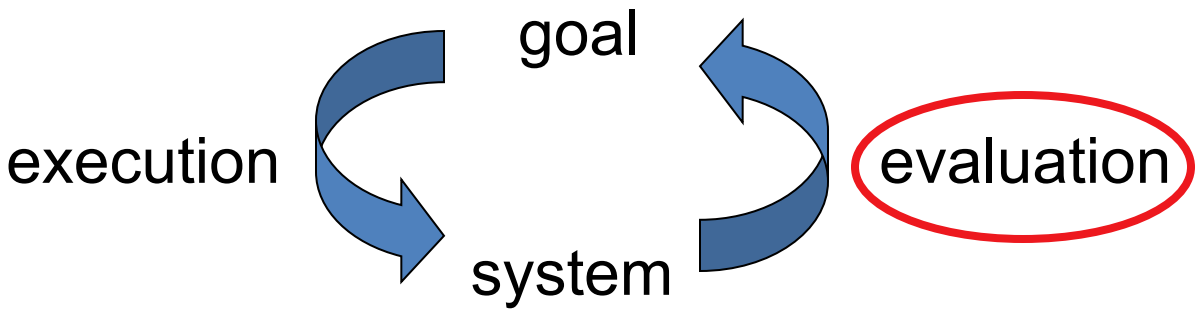

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Using Norman's model

Some systems are harder to use than others

Gulf of Execution

user's formulation of actions

≠ actions allowed by the system

Gulf of Evaluation

user's expectation of changed system state

≠ actual presentation of this state

Human error - slips and mistakes

slip

- understand system and goal
- correct formulation of action
- incorrect action

mistake

- may not even have right goal!

Fixing things?

slip – better interface design

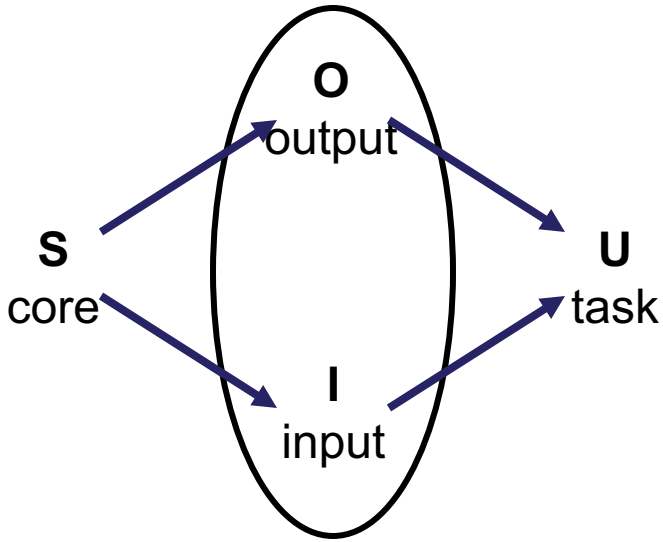
mistake – better understanding of system

Abowd and Beale framework

extension of Norman…

their interaction framework has 4 parts

- user
- input
- system
- output



each has its own unique language

interaction $\Rightarrow$ translation between languages

problems in interaction = problems in translation

Using Abowd & Beale's model

user intentions
→ translated into actions at the interface
→ translated into alterations of system state
→ reflected in the output display
→ interpreted by the user

general framework for understanding interaction

- not restricted to electronic computer systems
- identifies all major components involved in interaction
- allows comparative assessment of systems
- an abstraction

Agenda

- Introduction
- Usability Principles
- HMI Model
- **Ergonomics**
- Interactivity
- Components of User Experience (CUE) Model

Ergonomics

- Study of the physical characteristics of interaction
- Also known as human factors – but this can also be used to mean much of HCI!
- Ergonomics good at defining standards and guidelines for constraining the way we design certain aspects of systems

Ergonomics - examples

- arrangement of controls and displays
  - e.g. controls grouped according to function or frequency of use, or sequentially
- surrounding environment
  - e.g. seating arrangements adaptable to cope with all sizes of user
- health issues
  - e.g. physical position, environmental conditions (temperature, humidity), lighting, noise,
- use of colour
  - e.g. use of red for warning, green for okay, awareness of colour-blindness etc.

Industrial interfaces

Office interface vs. industrial interface?

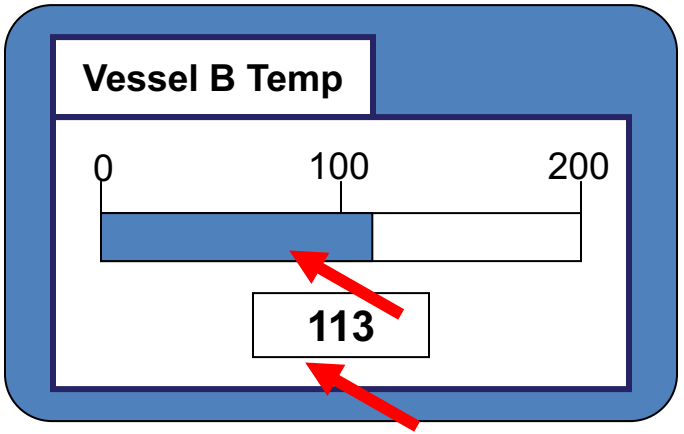
Context matters!

	office	industrial
type of data	textual	numeric
rate of change	slow	fast
environment	clean	dirty

… the oil soaked mouse!

Glass interfaces ?

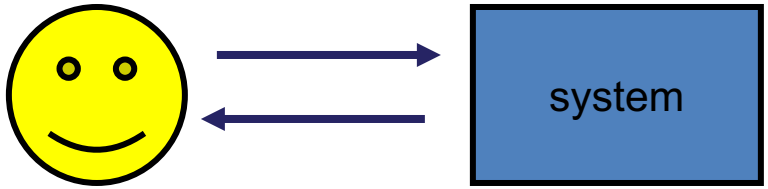
- industrial interface:
  - traditional … dials and knobs
  - now … screens and keypads
- glass interface
  - \+ cheaper, more flexible, multiple representations, precise values
  - not physically located, loss of context, complex interfaces
- may need both



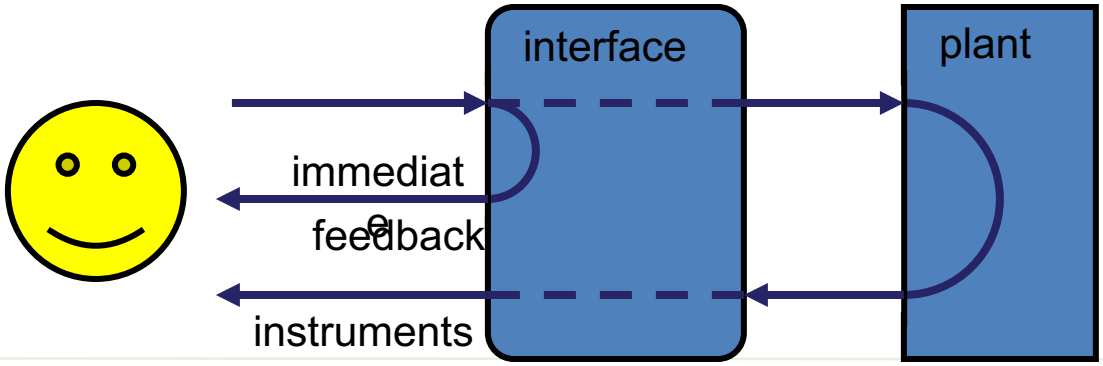
multiple representations
of same information

Indirect manipulation

- office– direct manipulation
  - user interacts with artificial world



- industrial – indirect manipulation
  - user interacts *with* real world *through* interface
- issues ..
  - feedback
  - delays



interaction styles

dialogue … computer and user

distinct styles of interaction

Common interaction styles

- command line interface
- menus
- natural language
- question/answer and query dialogue
- form-fills and spreadsheets
- WIMP
- point and click
- three–dimensional interfaces

Command line interface

- Way of expressing instructions to the computer directly
  - function keys, single characters, short abbreviations, whole words, or a combination

- suitable for repetitive tasks
- better for expert users than novices
- offers direct access to system functionality
- command names/abbreviations should be meaningful!

Typical example: the Unix system

Menus

- Set of options displayed on the screen
- Options visible
  - less recall - easier to use
  - rely on recognition so names should be meaningful
- Selection by:
  - numbers, letters, arrow keys, mouse
  - combination (e.g. mouse plus accelerators)
- Often options hierarchically grouped
  - sensible grouping is needed
- Restricted form of full WIMP system

Natural language

- Familiar to user
- speech recognition or typed natural language
- Problems
  - vague
  - ambiguous
  - hard to do well!
- Solutions
  - try to understand a subset
  - pick on key words

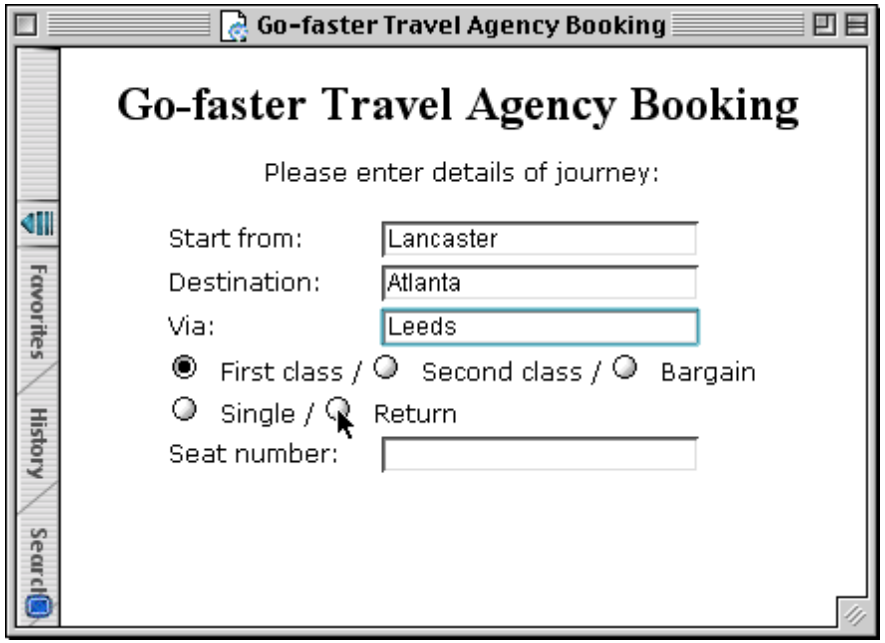
Query interfaces

- Question/answer interfaces
  - user led through interaction via series of questions
  - suitable for novice users but restricted functionality
  - often used in information systems

- Query languages (e.g. SQL)
  - used to retrieve information from database
  - requires understanding of database structure and language syntax, hence requires some expertise

Form-fills

- Primarily for data entry or data retrieval
- Screen like paper form.
- Data put in relevant place
- Requires
  - good design
  - obvious correction facilities



Spreadsheets

- first spreadsheet VISICALC, followed by Lotus 1-2-3
- MS Excel most common today
- sophisticated variation of form-filling.
  - grid of cells contain a value or a formula
  - formula can involve values of other cells
    e.g. sum of all cells in this column
  - user can enter and alter data spreadsheet maintains consistency

WIMP Interface

Windows

Icons

Menus

Pointers

… or windows, icons, mice, and pull-down menus!

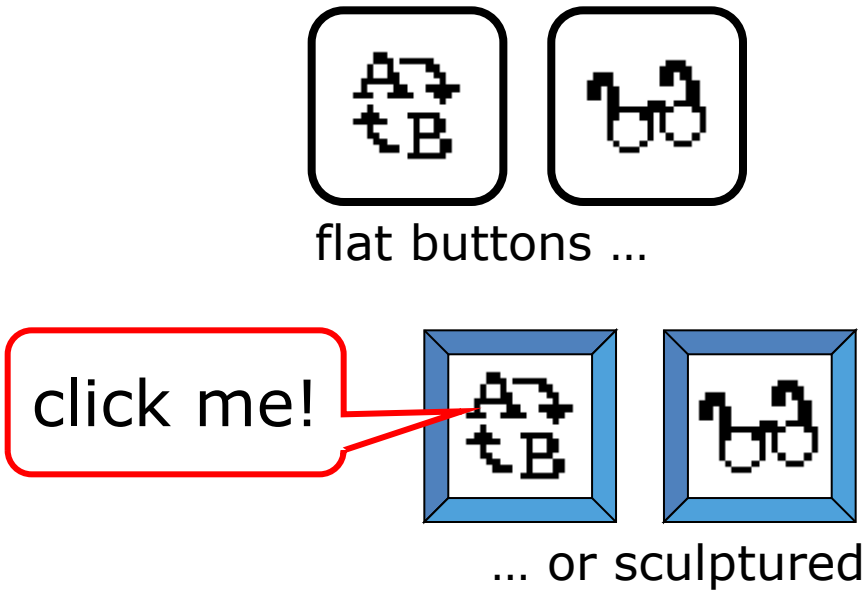
- default style for majority of interactive computer systems, especially PCs and desktop machines

Point and click interfaces

- used in ..
  - multimedia
  - web browsers
  - hypertext
- just click something!
  - icons, text links or location on map
- minimal typing

Three dimensional interfaces

- virtual reality
- ‘ordinary’ window systems
  - highlighting
  - visual affordance
  - indiscriminate use
    just confusing!
- 3D workspaces
  - use for extra virtual space
  - light and occlusion give depth
  - distance effects



elements of the wimp interface

windows, icons, menus, pointers

+++

buttons, toolbars,
palettes, dialog boxes

also see supplementary material
on choosing wimp elements

~~Windows~~

- Areas of the screen that behave as if they were independent
  - can contain text or graphics
  - can be moved or resized
  - can overlap and obscure each other, or can be laid out next to one another (tiled)

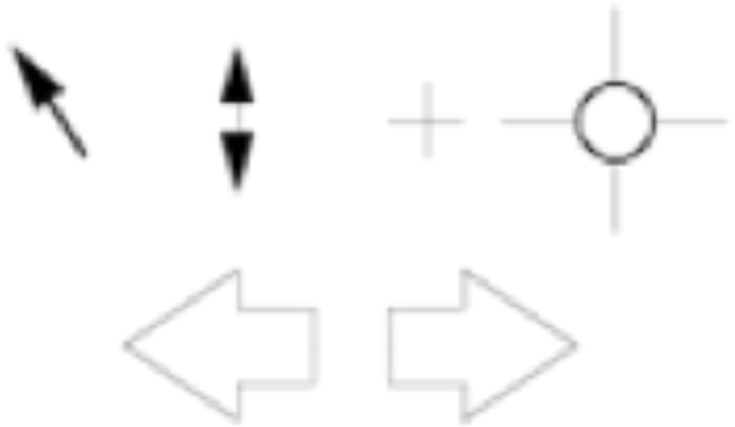
- scrollbars
  - allow the user to move the contents of the window up and down or from side to side
- title bars
  - describe the name of the window

Icons

- small picture or image
- represents some object in the interface
  - often a window or action
- windows can be closed down (iconised)
  - small representation fi many accessible windows
- icons can be many and various
  - highly stylized
  - realistic representations.

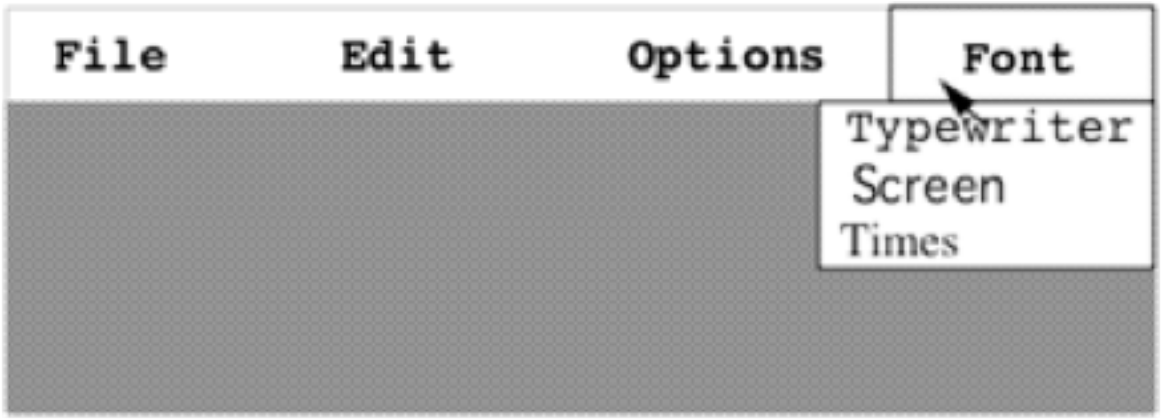
Pointers

- important component
  - WIMP style relies on pointing and selecting things
- uses mouse, trackpad, joystick, trackball, cursor keys or keyboard shortcuts
- wide variety of graphical images



Menus

- Choice of operations or services offered on the screen
- Required option selected with pointer



problem – take a lot of screen space

solution – pop-up: menu appears when needed

Kinds of Menus

- Menu Bar at top of screen (normally), menu drags down
  - pull-down menu - mouse hold and drag down menu
  - drop-down menu - mouse click reveals menu
  - fall-down menus - mouse just moves over bar!

- Contextual menu appears where you are
  - pop-up menus - actions for selected object
  - pie menus - arranged in a circle
    - easier to select item (larger target area)
    - quicker (same distance to any option)
      … but not widely used!

Menus extras

- Cascading menus
  - hierarchical menu structure
  - menu selection opens new menu
  - and so in ad infinitum

- Keyboard accelerators
  - key combinations - same effect as menu item
  - two kinds
    - active when menu open – usually first letter
    - active when menu closed – usually Ctrl + letter

  usually different !!!

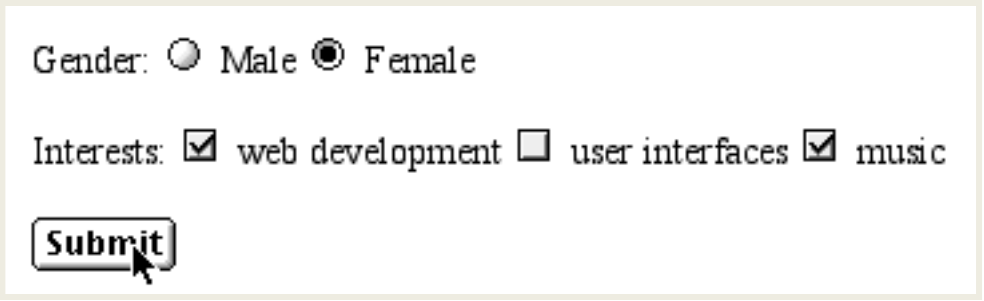
Menus design issues

- which kind to use
- what to include in menus at all
- words to use (action or description)
- how to group items
- choice of keyboard accelerators

Buttons

individual and isolated regions within

a display that can be selected to invoke an action



Special kinds

- radio buttons
  - set of mutually exclusive choices
- check boxes
  - set of non-exclusive choices

Toolbars

- long lines of icons …
  … but what do they do?

- fast access to common actions

- often customizable:
  - choose *which* toolbars to see
  - choose *what* options are on it

Palettes and tear-off menus

- Problem
  menu not there when you want it

- Solution
  palettes – little windows of actions
    - shown/hidden via menu option
      e.g. available shapes in drawing package

  tear-off and pin-up menus
    - menu ‘tears off’ to become palette

Dialogue boxes

- information windows that pop up to inform of an important event or request information.

  e.g: when saving a file, a dialogue box is displayed to allow the user to specify the filename and location. Once the file is saved, the box disappears.

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- **Interactivity**
- Components of User Experience (CUE) Model

Speech–driven interfaces

- rapidly improving …
  … but still inaccurate

- how to have robust dialogue?
  … interaction of course!

e.g. airline reservation:
reliable “yes” and “no”
+ system reflects back its understanding
“you want a ticket from New York to Boston?”

Look and … feel

- WIMP systems have the same elements:
  windows, icons., menus, pointers, buttons, etc.

- but different window systems
  … *behave* differently

  e.g. MacOS vs Windows menus

appearance + behaviour = look and feel

Initiative

- who has the initiative?
  - old question–answer – computer
  - WIMP interface – user
- WIMP exceptions …
  - *pre-emptive* parts of the interface
- modal dialog boxes
  - come and won't go away!
  - good for errors, essential steps
  - but use with care

Error and repair

can’t always avoid errors …
… but we can put them right

make it easy to *detect* errors
… then the user can *repair* them

hello, this is the Go Faster booking system

what would you like?

(user) *I want to fly from New York to London*

you want a ticket from New York to Boston

(user) *no*

sorry, please confirm one at a time

do you want to fly from New York

(user) yes

… … …

Context

Interaction affected by social and organizational context

- other people
  - desire to impress, competition, fear of failure
- motivation
  - fear, allegiance, ambition, self-satisfaction
- inadequate systems
  - cause frustration and lack of motivation

Experience, engagement and fun

designing experience

physical engagement

managing value

Experience?

- home, entertainment, shopping
  - not enough that people can use a system
  - they must want to use it!

- psychology of experience
  - flow (Csikszentimihalyi)
  - balance between anxiety and boredom

- education
  - zone of proximal development
  - things you can just do with help

- wider ...
  - literary analysis, film studies, drama

Designing experience

- real crackers
  - cheap and cheerful!
  - bad joke, plastic toy, paper hat
  - pull and bang

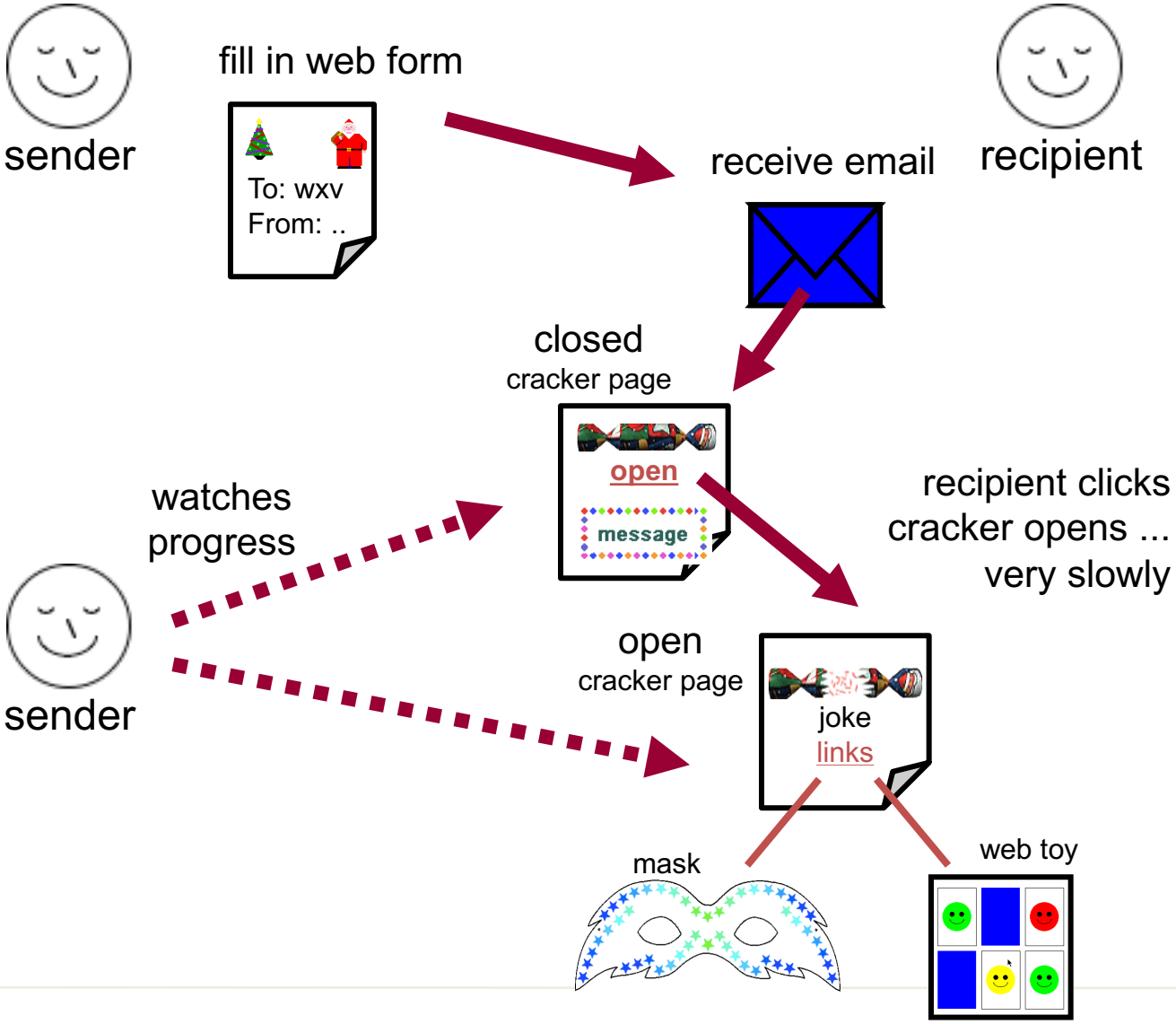
Designing experience

- virtual crackers
  - cheap and cheerful
  - bad joke, web toy, cut-out mask
  - click and bang

Designing experience

- virtual crackers
  - cheap and cheerful
  - bad joke, web toy, cut-out mask
  - click and bang

how crackers work



The crackers experience

	real cracker	**virtual cracker**
Surface elements		
design	cheap and cheerful	simple page/graphics
play	plastic toy and joke	web toy and joke
dressing up	paper hat	mask to cut out
Experienced effects		
shared	offered to another	sent by email message
co-experience	pulled together until opened by recipient	sender can't see content
excitement	cultural connotations	recruited expectation
hiddenness	contents inside	first page - no contents
suspense	pulling cracker	slow ... page change
surprise	bang (when it works)	WAV file (when it works)

Physical design

- many constraints:
  - ergonomic – minimum button size
  - physical – high-voltage switches are big
  - legal and safety – high cooker controls
  - context and environment – easy to clean
  - aesthetic – must look good
  - economic – … and not cost too much!

Design trade-offs

constraints are contradictory … need trade-offs

within categories:

e.g. safety – cooker controls

front panel – safer for adult

rear panel – safer for child

between categories

e.g. ergonomics vs. physical – MiniDisc remote

ergonomics – controls need to be bigger

physical – no room!

solution – multifunction controls & reduced functionality

Fluidity

- do external physical aspects reflect logical effect?
  - related to affordance (chap 5)

logical state revealed in physical state?

e.g. on/off buttons

inverse actions inverse effects?

e.g. arrow buttons, twist controls

inverse actions

- yes/no buttons
  - well sort of
- ‘joystick’
- also left side control

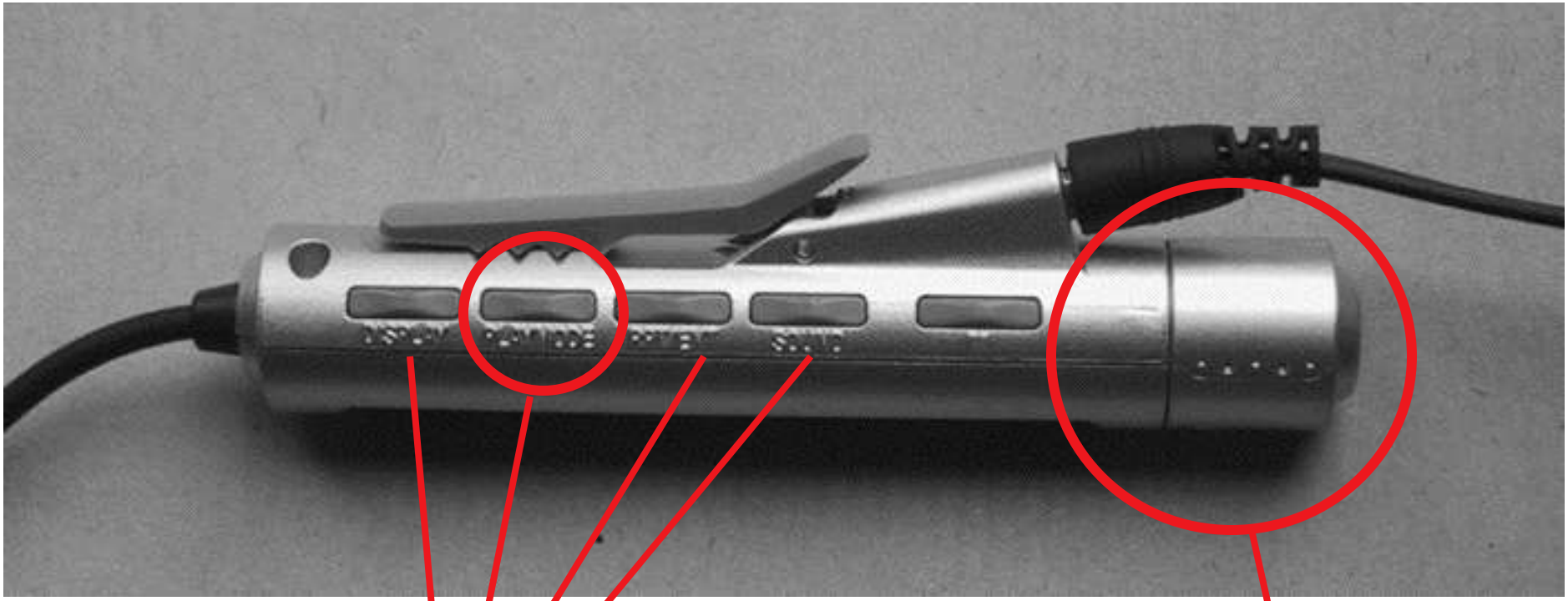
spring back controls

- one-shot buttons
- joystick
- some sliders

good – large selection sets

bad – hidden state

a minidisk controller



series of spring-back controls
each cycle through some options
–natural inverse back/forward

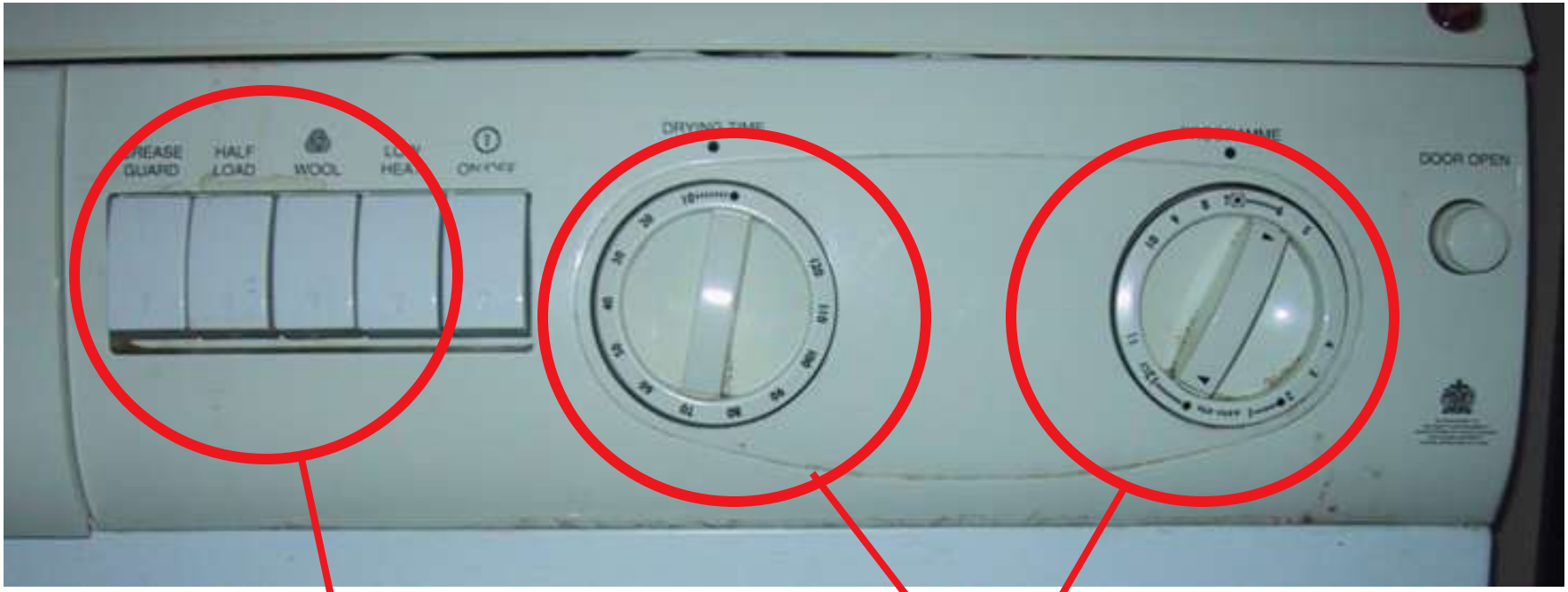
twist for track movement
pull and twist for volume
– spring back
– natural inverse for twist

physical layout

controls:

logical relationship
~ spatial grouping

compliant interaction



state evident in
mechanical buttons

rotary knobs reveal internal state and can
be controlled by both user and machine

Managing value

people use something

ONLY IF

it has perceived value

AND

value exceeds cost

BUT NOTE

- exceptions (e.g. habit)
- value **NOT** necessarily personal gain or money

Weighing up value

value

- helps me get my work done
- fun
- good for others

cost

- download time
- money £, $, €
- learning effort

Discounted future

- in economics Net Present Value:
  - discount by $(1+\text{rate})^{\text{years to wait}}$

- in life people heavily discount
  - future value and future cost
  - hence resistance to learning
  - need low barriers
    and high perceived present value

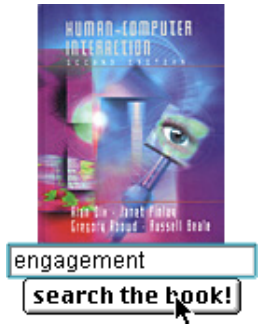
example – HCI book search

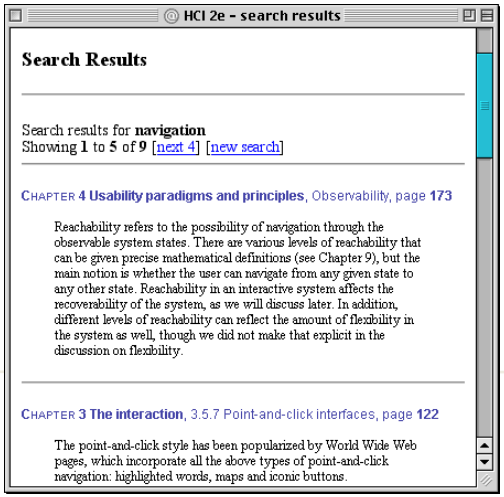
- value for people *who have* the book
  helps you to look up things
  - chapter and page number

- value for those *who don't* …
  sort of online mini-encyclopaedia
  - full paragraph of context

… but also says "buy me"!!

… but also says "buy me"!!





Value and organisational design

- coercion
    - tell people what to do!
    - value = keep your job
- enculturation
    - explain corporate values
    - establish support (e.g share options)
- emergence
    - design process so that individuals value → organisational value

General lesson …

if you want someone to do something …

- make it easy for them!
- understand their values

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- **Components of User Experience (CUE) Model**

Components of User Experience Model