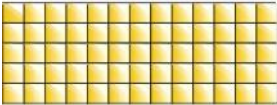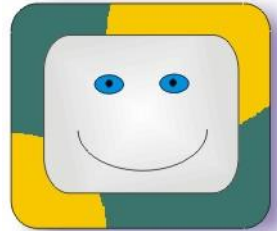s1stem0s
Programų
Inf0rmat1ka

Conceptual models in interaction design

dr. Kristina Lapin

Outline

- Problem space analysis
- Conceptual models
- Interface metaphor
- Interaction types
- Paradigms, theories, models, and frameworks

Recap

- HCI has moved beyond designing interfaces for desktop machines
- About extending and supporting all manner of human activities in all manner of places
- Facilitating user experiences through designing interactions
  - Make work effective, efficient and safer
  - Improve and enhance learning and training
  - Provide enjoyable and exciting entertainment
  - Enhance communication and understanding
  - Support new forms of creativity and expression

Problem space
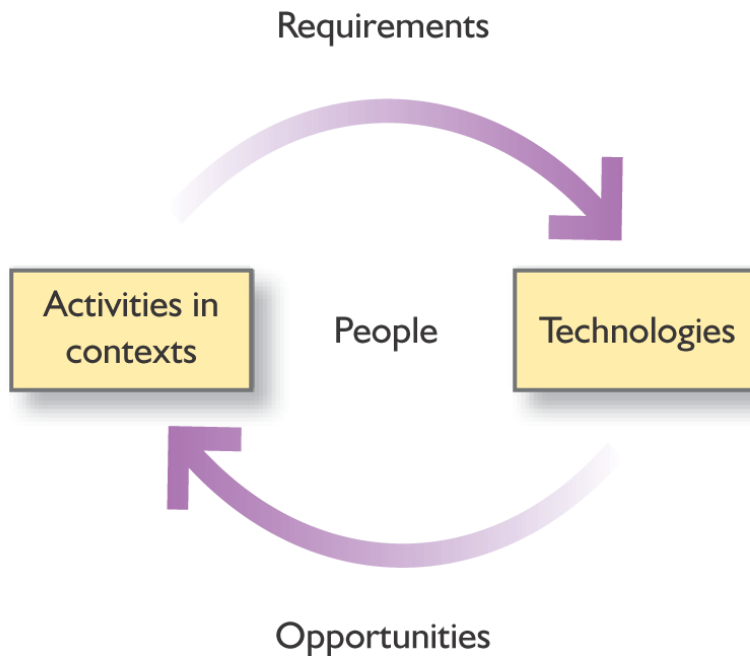
- What do you want to create?
- What are your assumptions?
- Will it achieve what you hope it will?

What is an assumption?

- taking something for granted when it needs further investigation
  - e.g. people will want to watch TV while driving

What is a claim?

- stating something to be true when it is still open to question
  - e.g. a multimodal style of interaction for controlling GPS — one that involves speaking while driving — is safe

A framework for analyzing the problem space

- Are there problems with an existing product or user experience? If so, what are they?

- Why do you think there are problems?

- How do you think your proposed design ideas might overcome these?

- If you are designing for a new user experience how do you think your proposed design ideas support, change, or extend current ways of doing things?

Activity

- What are the assumptions and claims made about 3D TV?

Assumptions: realistic or wish-list?

- People would not mind wearing the glasses that are needed to see in 3D in their living rooms - reasonable
- People would not mind paying a lot more for a new 3D-enabled TV screen- not reasonable
- People would really enjoy the enhanced clarity and color detail provided by 3D - reasonable
- People will be happy carrying around their own special glasses - reasonable only for a very select bunch of users

Benefits of conceptualizing

- ## Orientation
  - enables design teams to ask specific questions about how the conceptual model will be understood

- ## Open-minded
  - prevents design teams from becoming narrowly focused early on

- ## Common ground
  - allows design teams to establish a set of commonly agreed terms

From problem space to design space

- Having a good understanding of the problem space can help inform the design space
  - e.g. what kind of interface, behavior, functionality to provide
- But before deciding upon these it is important to develop a conceptual model

Conceptual model

- A conceptual model is:
  - "a high-level description of how a system is organized and operates" (Johnson and Henderson, 2002, p 26)

- Enables
  - "designers to straighten out their thinking before they start laying out their widgets" (p 28)

Components

- Metaphors and analogies
  - understand what a product is for and how to use it for an activity
- Concepts that people are exposed to through the product
  - task–domain objects, their attributes, and operations (e.g. saving, revisiting, organizing)
- Relationship and mappings between these concepts

First steps in formulating a conceptual model

- What will the users be doing when carrying out their tasks?
- How will the system support these?
- What kind of interface metaphor, if any, will be appropriate?
- What kinds of interaction modes and styles to use?
  - always keep in mind when making design decisions how the user will understand the underlying conceptual model

Conceptual models

- Many kinds and ways of classifying them

- We describe them in terms of core activities and objects

- Also in terms of interface metaphors

Interface metaphors
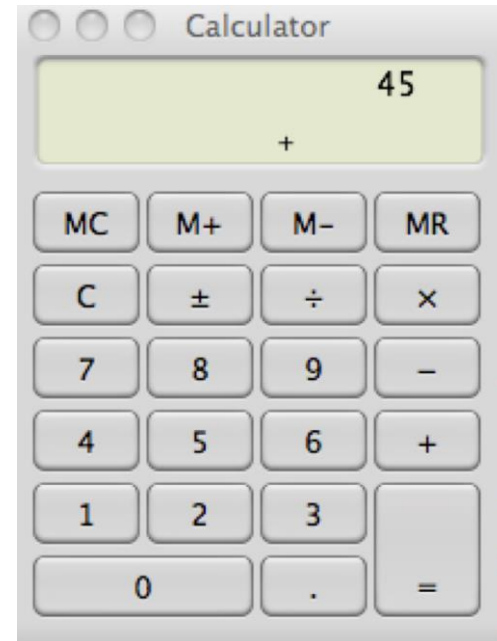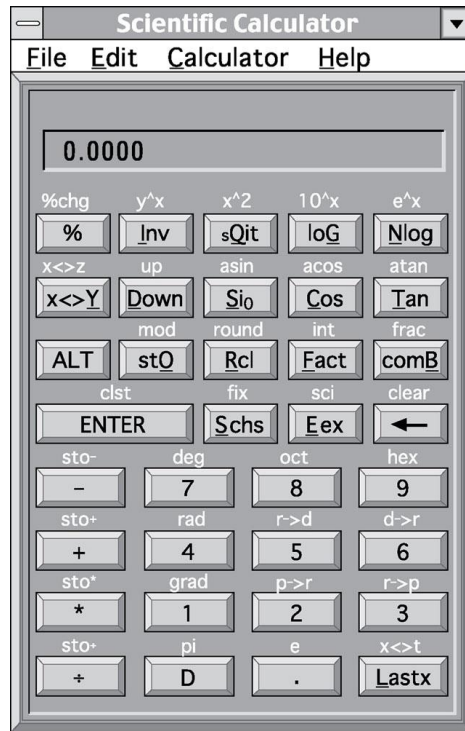
Interface metaphors

- Conceptualizing what we are doing, e.g. surfing the web
- A conceptual model instantiated at the interface, e.g. the desktop metaphor
- Visualizing an operation,
  - e.g. an icon of a shopping cart for placing items into

Interface metaphors

- Interface designed to be similar to a physical entity but also has own properties
  - e.g. desktop metaphor, web portals
- Can be based on activity, object or a combination of both
- Exploit user's familiar knowledge, helping them to understand 'the unfamiliar'
- Conjures up the essence of the unfamiliar activity, enabling users to leverage of this to understand more aspects of the unfamiliar functionality

Benefits of interface metaphors

- Makes learning new systems easier
- Helps users understand the underlying conceptual model
- Can be very innovative and enable the realm of computers and their applications to be made more accessible to a greater diversity of users

Problems with interface metaphors

- Break conventional and cultural rules
  - e.g. recycle bin placed on desktop
- Can constrain designers in the way they conceptualize a problem space
- Conflict with design principles
- Forces users to only understand the system in terms of the metaphor
- Designers can inadvertently use bad existing designs and transfer the bad parts over
- Limits designers' imagination in coming up with new conceptual models

Interaction types

- Instructing
  - issuing commands and selecting options
- Conversing
  - interacting with a system as if having a conversation
- Manipulating
  - interacting with objects in a virtual or physical space by manipulating them
- Exploring
  - moving through a virtual environment or a physical space

1. Instructing

- Where users instruct a system and tell it what to do
  - e.g. tell the time, print a file, save a file
- Very common conceptual model, underlying a diversity of devices and systems
  - e.g. word processors, VCRs, vending machines
- Main benefit is that instructing supports quick and efficient interaction
  - good for repetitive kinds of actions performed on multiple objects

Which is easiest and why?

2. Conversing

- Underlying model of having a conversation with another human

- Range from simple voice recognition menu-driven systems to more complex 'natural language' dialogs

- Examples include timetables, search engines, advice-giving systems, help systems

- Also virtual agents, toys and pet robots designed to converse with you

Conversing

- Apple agent vision (**1987**!)

Apple's 1987 Knowledge Navigator Video

Keywords & Questions

Privacy Policy · Home · About · Help · Parents · AJKids' Books

You asked: how many legs does a centipede have

Jeeves knows these answers:

Where can I see an image of the human [arm and leg muscles (cut views) ▲▼] ?

Where can I find the free online arcade game [Centipede ▲▼] ?

Why does my leg or other limb fall asleep?

Where can I find advice on controlling the garden pest [millipedes and centipedes ▲▼] ?

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Would you talk with Anna?

IKEA Help Center

close window

Welcome to IKEA. I'm Anna, IKEA USA's Online Assistant. You can ask me about IKEA and our products and our services. I'll answer your questions, sometimes opening up relevant web pages along the way. Your inputs will be used to improve and expand my knowledge base. Thanks very much.

Go
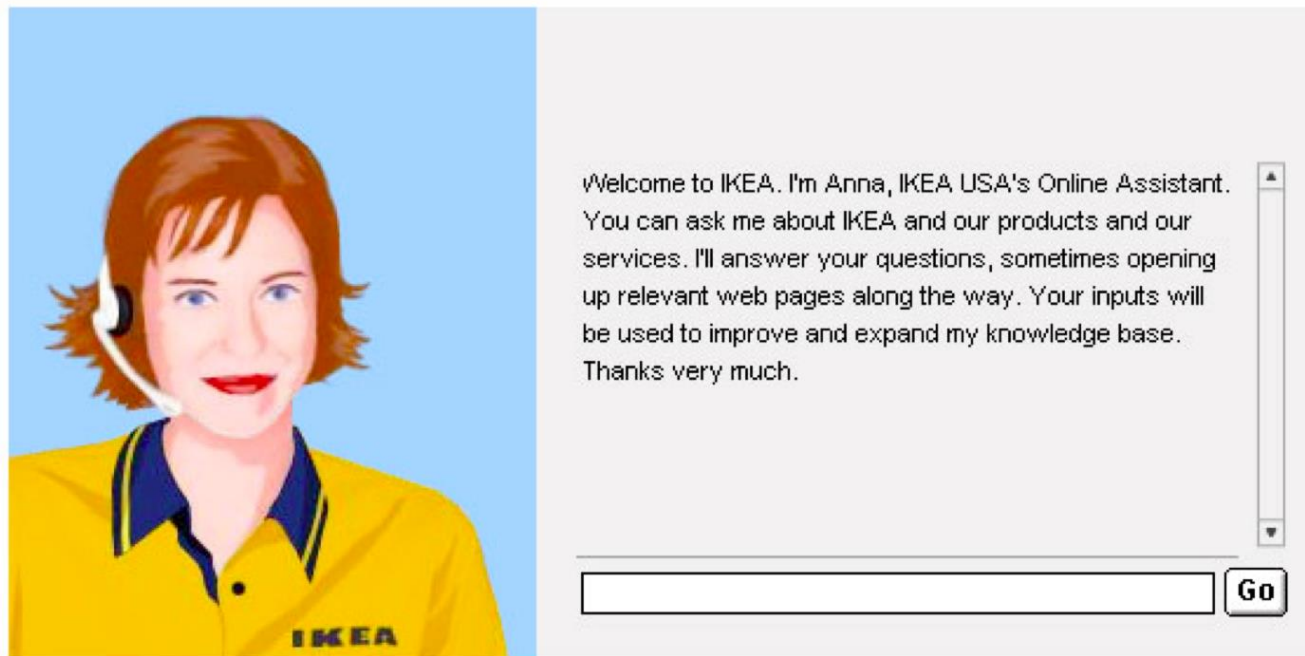
® Inter IKEA Systems B.V. 1999 - 2004

Pros and cons of conversational model

- Allows users, especially novices and technophobes, to interact with the system in a way that is familiar
  - makes them feel comfortable, at ease and less scared

- Misunderstandings can arise when the system does not know how to parse what the user says

3. Manipulating

- Involves dragging, selecting, opening, closing and zooming actions on virtual objects

- Exploit's users' knowledge of how they move and manipulate in the physical world

- Can involve actions using physical controllers (e.g. Wii) or air gestures (e.g. Kinect) to control the movements of an on screen avatar

- Tagged physical objects (e.g. balls) that are manipulated in a physical world result in physical/digital events (e.g. animation)

Direct Manipulation

- Shneiderman (1983) coined the term DM, came from his fascination with computer games at the time

    – Continuous representation of objects and actions of interest
    – Physical actions and button pressing instead of issuing commands with complex syntax
    – Rapid reversible actions with immediate feedback on object of interest

A VISICALC™ Screen:

www.bricklin.com/history/refcards.htm

Star office

Differences?

Mac darbalaukis (1987)

Mac OS X darbalaukis (2005)

Pirmasis iPad
interfeisas (2010)

Manipuliavimas fiziniais objektais (PicoCrickets)
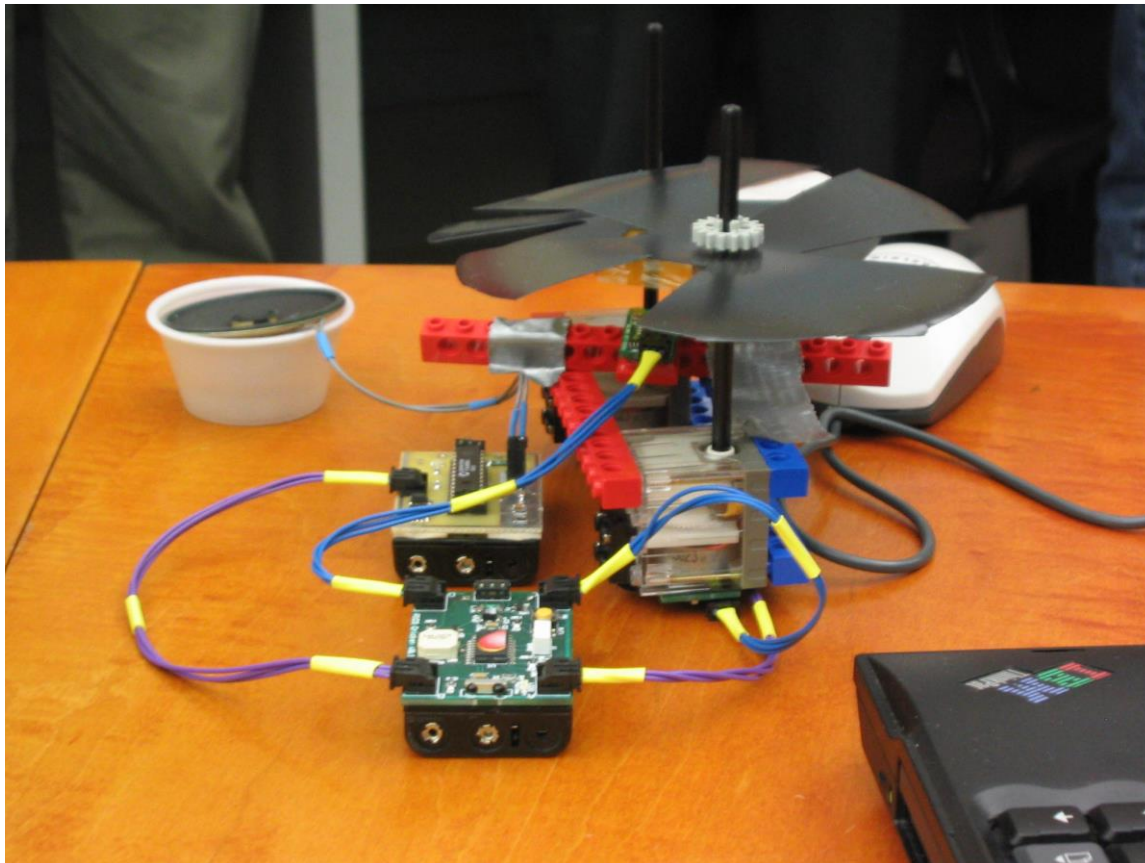
Why are DM interfaces so enjoyable?

- Novices can learn the basic functionality quickly
- Experienced users can work extremely rapidly to carry out a wide range of tasks, even defining new functions
- Intermittent users can retain operational concepts over time
- Error messages rarely needed
- Users can immediately see if their actions are furthering their goals and if not do something else
- Users experience less anxiety
- Users gain confidence and mastery and feel in control

What are the disadvantages with DM?

- Some people take the metaphor of direct manipulation too literally
- Not all tasks can be described by objects and not all actions can be done directly
- Some tasks are better achieved through delegating
  - e.g. spell checking
- Can become screen space 'gobblers'
- Moving a mouse around the screen can be slower than pressing function keys to do same actions

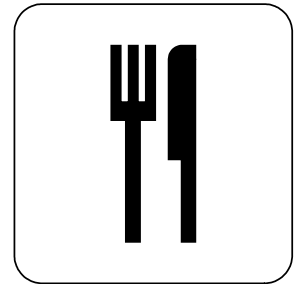# WIMP: window metaphor

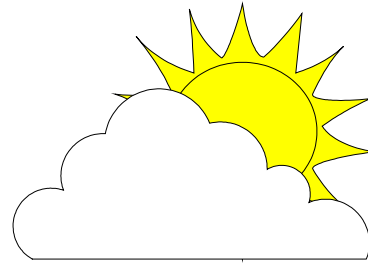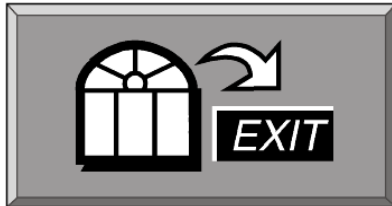- Computer screen shows parallel processes
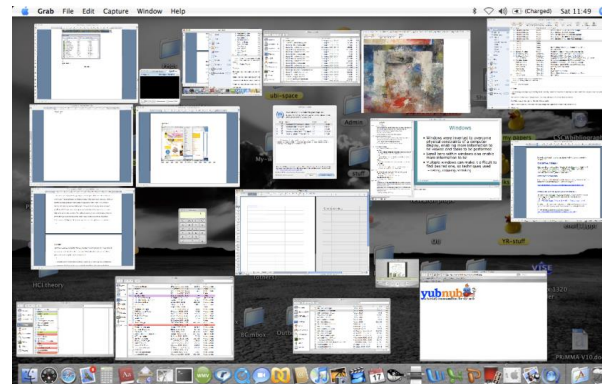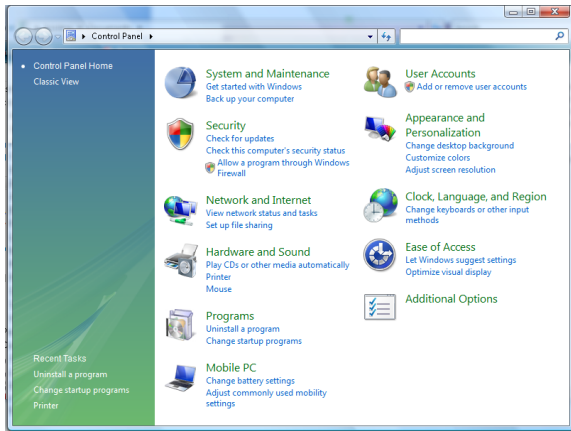
Icons

- Help to recognise how to use the object
- First metaphors – Xerox Star
- 1980 – 1990: active research

Icon design

- Metaphors
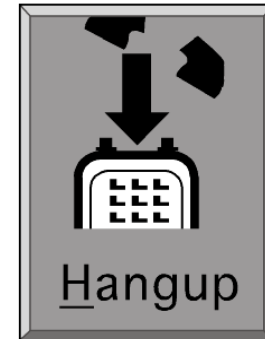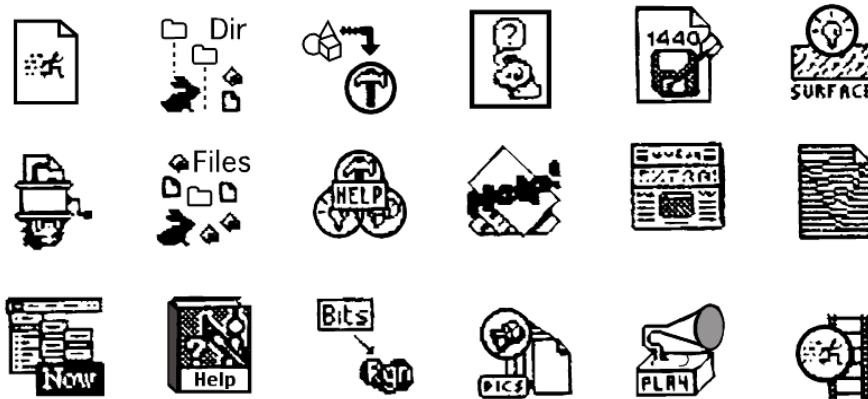 - Similarity
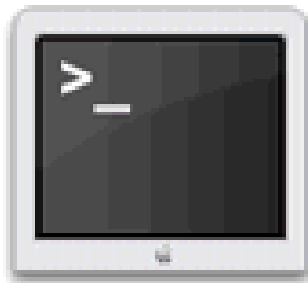 - Typical exemplars
  - Symbolical

Initial icons

(a)

(b)   Talk   Hangup

(c)

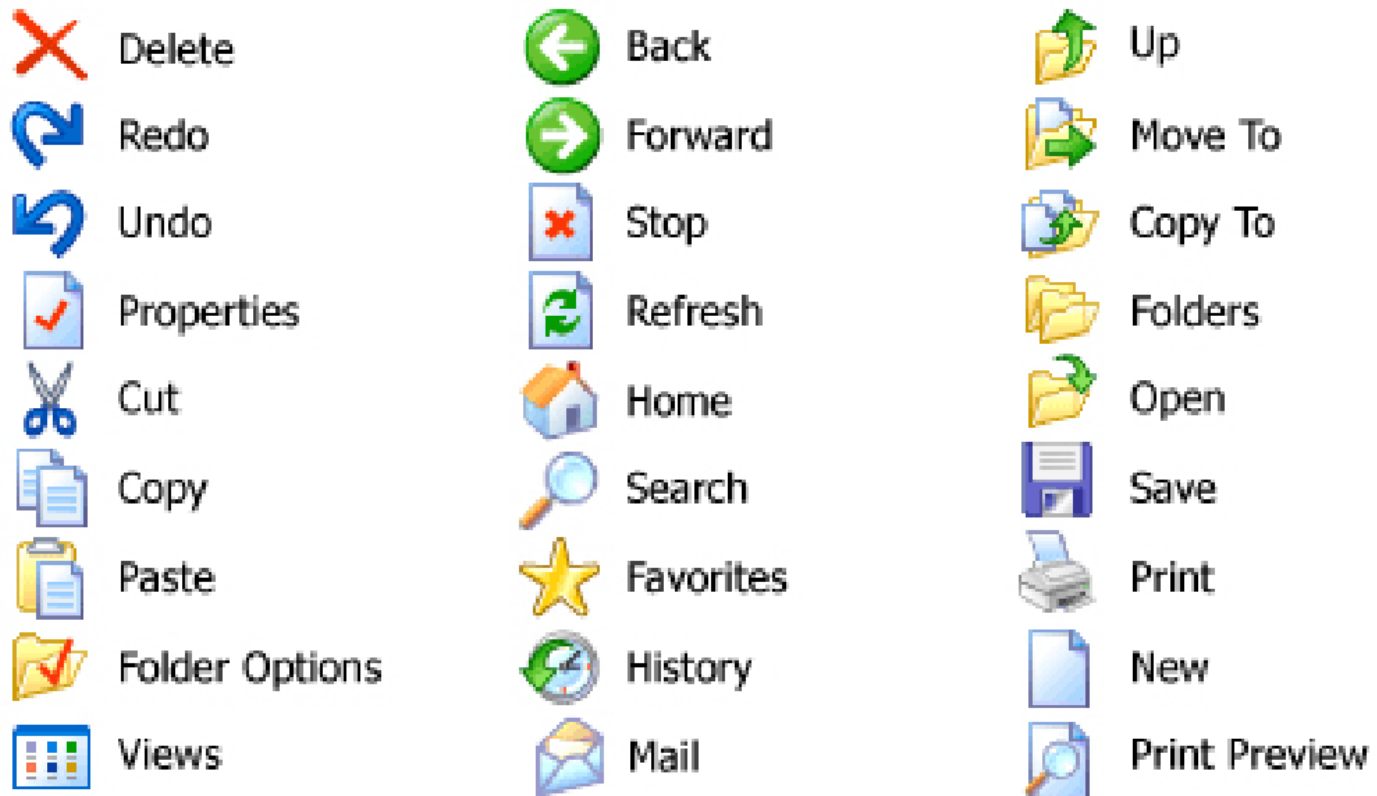(d)   Dir   Files   Bits

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Contemporary icons

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Horton's icon checklist

- Understandable
- Familiar
- Unambigous
- Memorable
- Informative
- Few
- Distinct
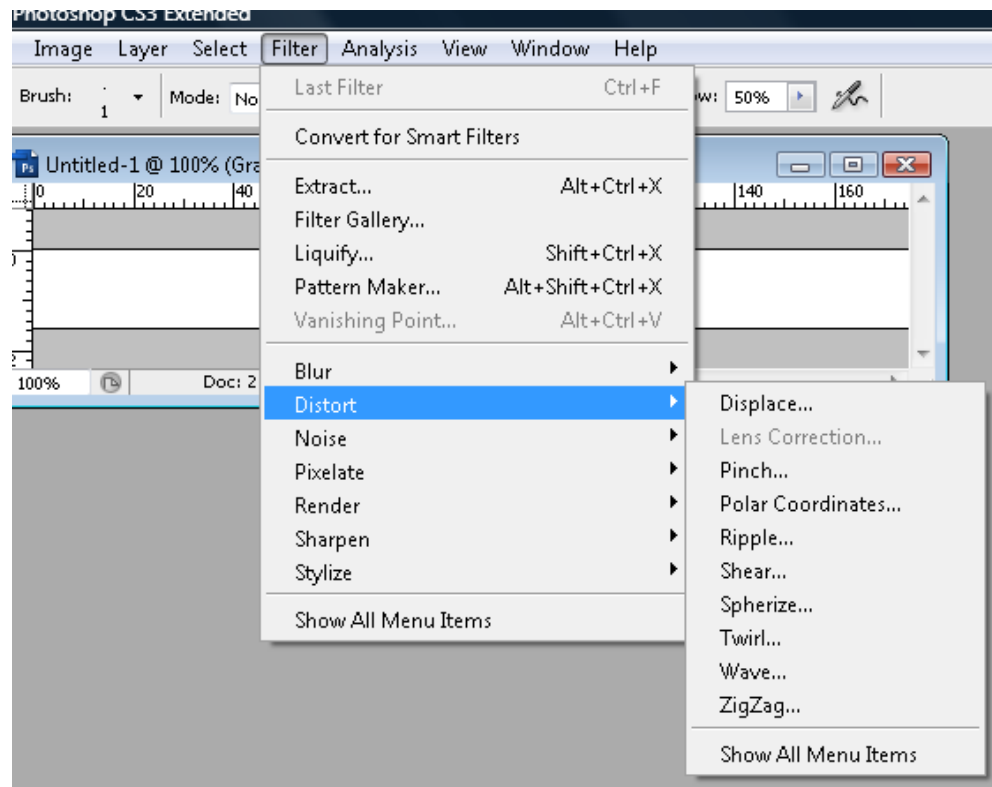- Attractive
- Legible
- Compact
- Coherent
- Extensible

Horton, W. (1991) Illustrating Computer Documentation: The Art of Presenting Graphically on Paper On-line. Wiley.

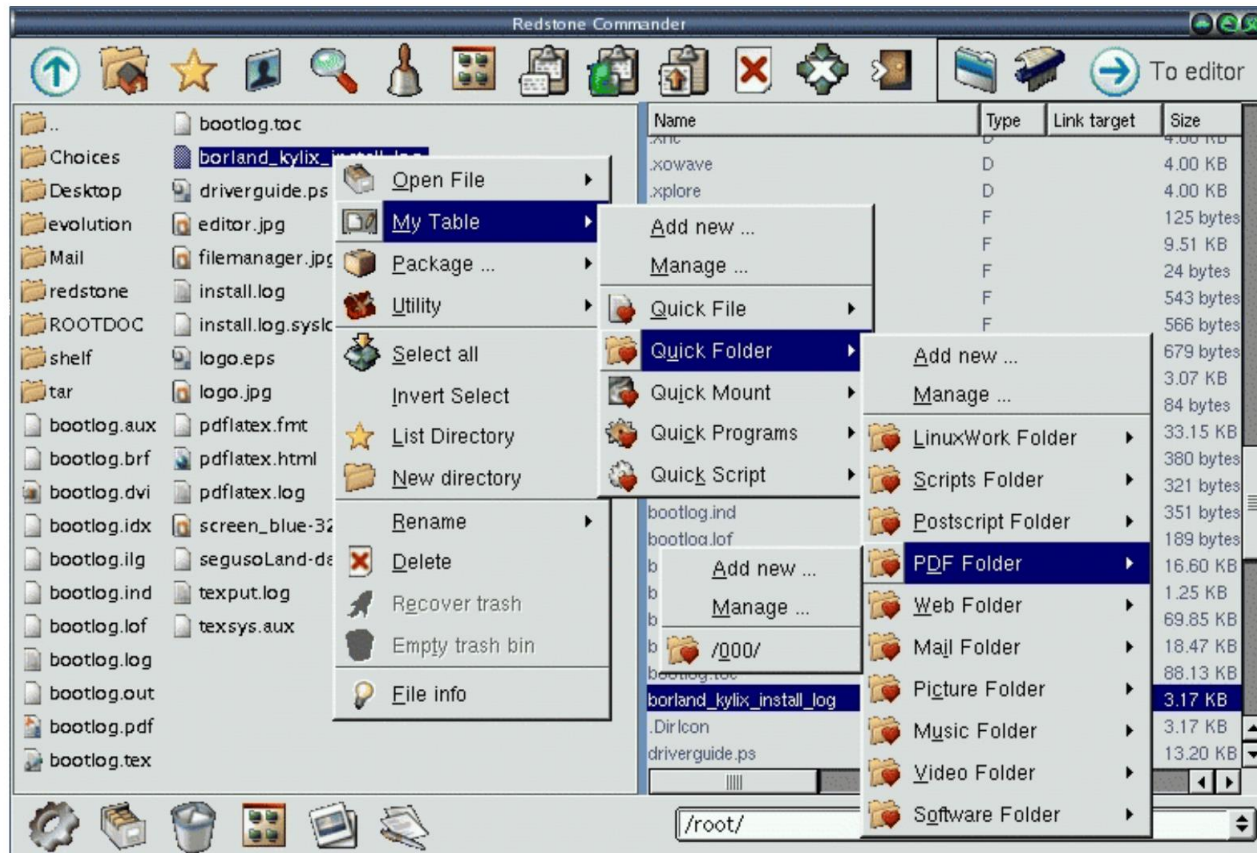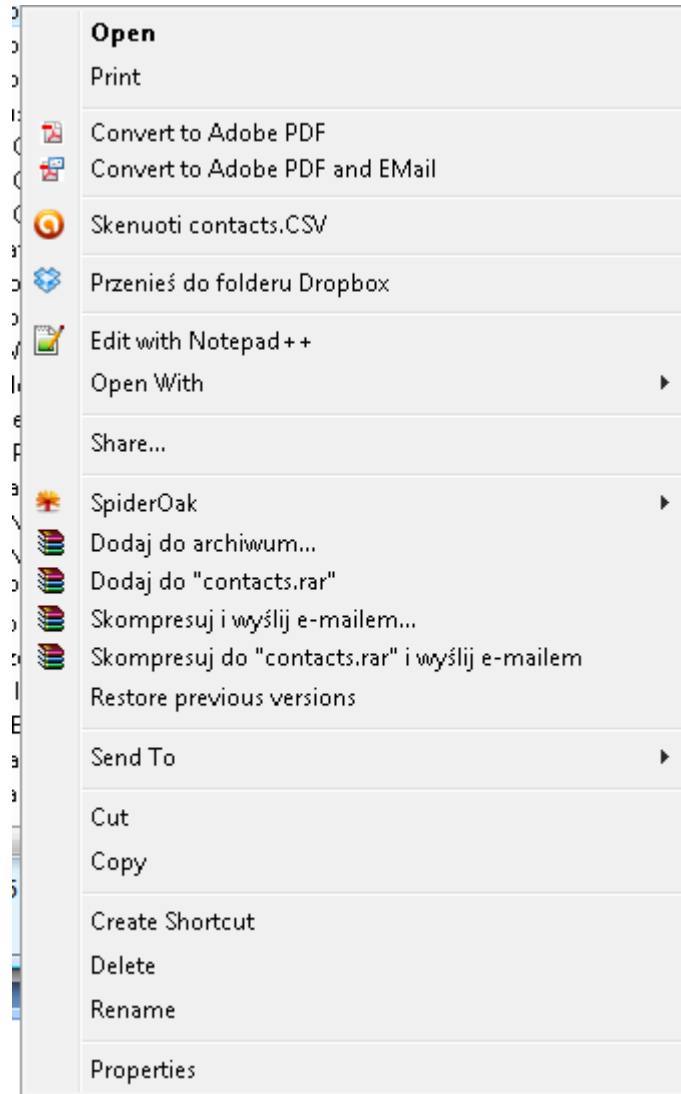# Simple and distinguishable icons with labels
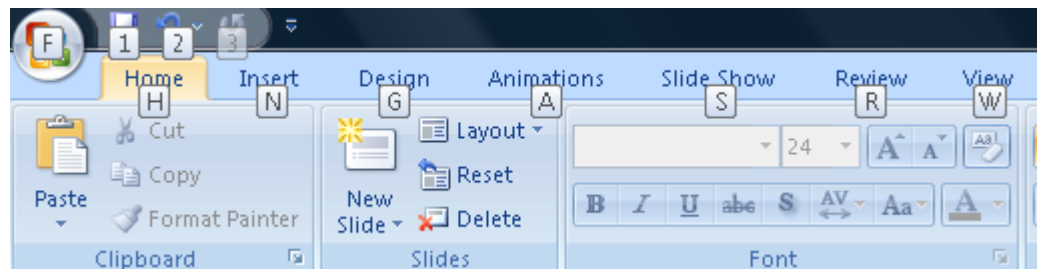
Menus

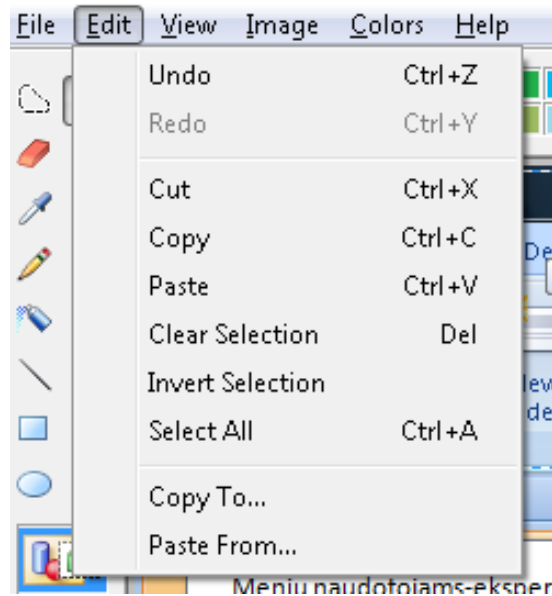- Hierarchical menu

Cascading menu

Context menu

- Actions are grouped by objects

Shortcuts

Pointers
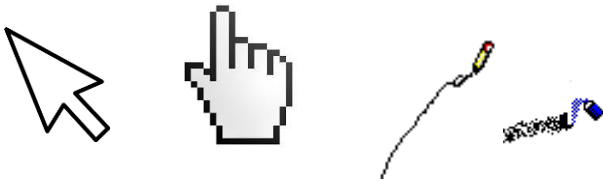
- Cursors
- Collaborative tools – more than one cursor
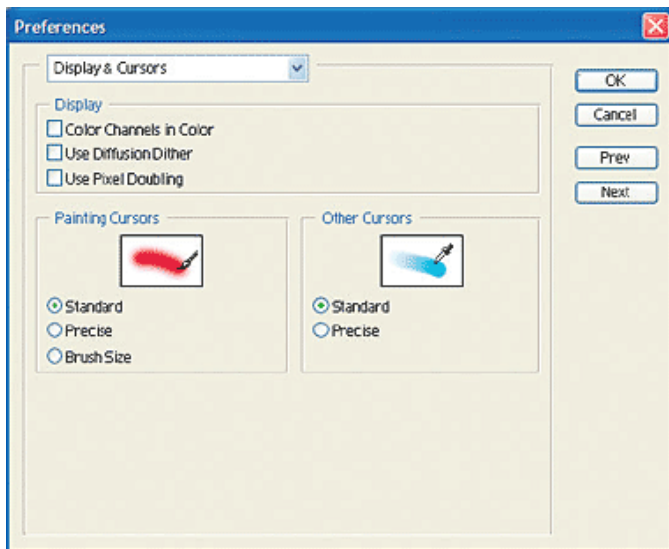
Microsoft Bob desktop metaphor

Microsoft Bob desktop

Darbalaukis – kambario erdvė

Robertson, George et al. "*The Task Gallery: A 3D Window Manager.*" In Proceedings of CHI 2000

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4. Exploring

- Involves users moving through virtual or physical environments

- Physical environments with embedded sensor technologies
  - Context aware

Virtual world

The priest wont last much longer...

CAVE

http://www.youtube.com/watch?v=08x0hT5f9Z4

Which conceptual model is best?

- Direct manipulation is good for 'doing' types of tasks, e.g. designing, drawing, flying, driving, sizing windows
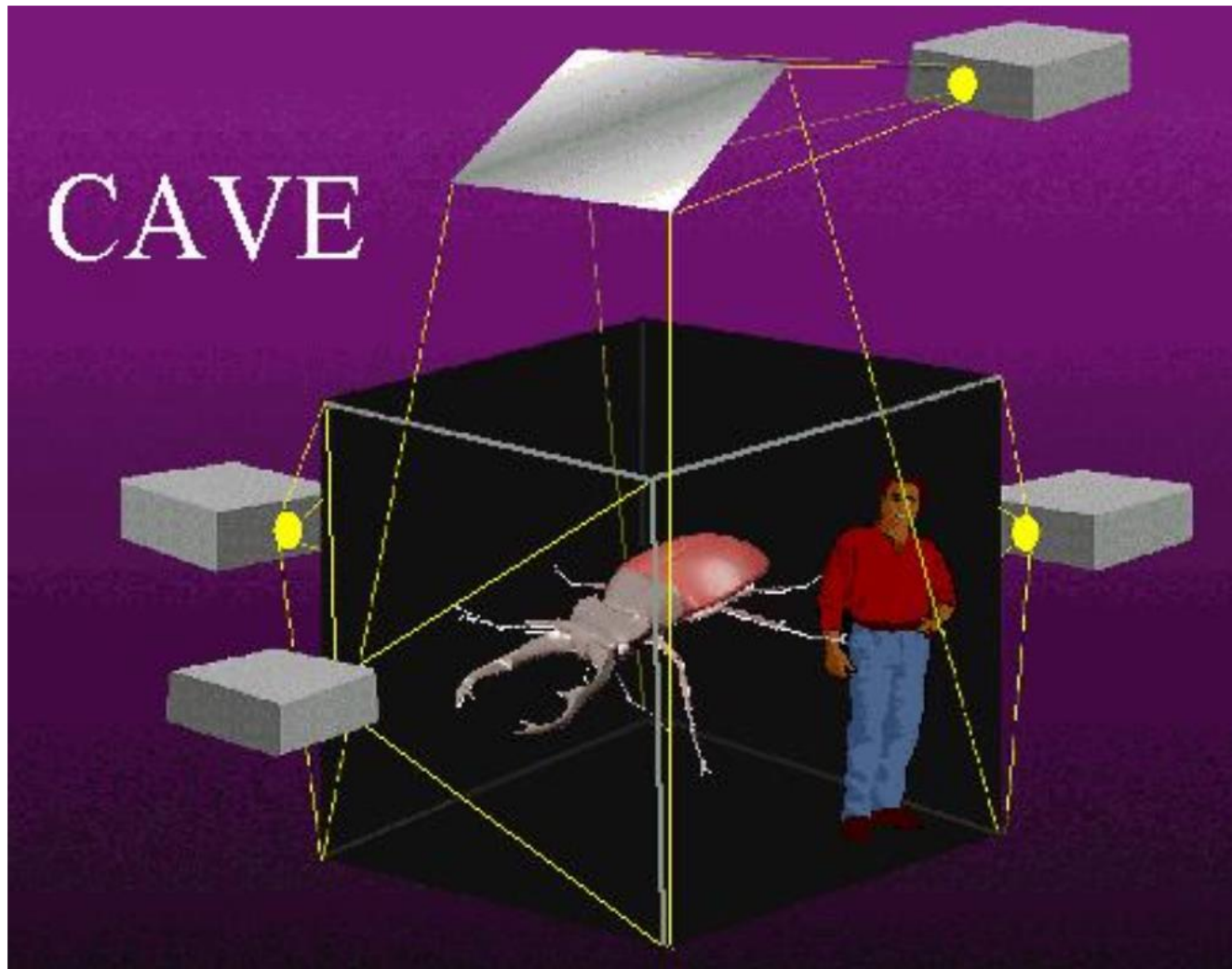
- Issuing instructions is good for repetitive tasks, e.g. spell-checking, file management

- Having a conversation is good for children, computer-phobic, disabled users and specialized applications (e.g. phone services)

- Hybrid conceptual models are often employed, where different ways of carrying out the same actions is supported at the interface - but can take longer to learn

Conceptual models: interaction and interface

- Interaction type:
  - what the user is doing when interacting with a system, e.g. instructing, talking, browsing or other

- Interface type:
  - the kind of interface used to support the mode, e.g. speech, menu-based, gesture

Many kinds of interface types available...

- Command
- Speech
- Data-entry
- Form fill-in
- Query
- Graphical
- Web
- Pen
- Augmented reality
- Gesture

(for more see chapter 6)

Which interaction type to choose?

- Need to determine requirements and user needs

- Take budget and other constraints into account

- Also will depend on suitability of technology for activity being supported

- This is covered in course when designing conceptual models

Paradigm

- Inspiration for a conceptual model
- General approach adopted by a community for carrying out research
  - shared assumptions, concepts, values, and practices
  - e.g. desktop, ubiquitous computing, in the wild

Examples of new paradigms

- Ubiquitous computing (mother of them all)
  - Pervasive computing
  - Wearable computing
  - Tangible bits, augmented reality
  - Attentive environments
  - Transparent computing
  - and many more….

Reading

- P Preece Jennifer, Yvonee Rogers, Helen Sharp. Interaction design: Beyond human – computer interaction. John Wiley & Sons
  - conceptual models