Projektas Informatikos ir programų sistemų studijų programų kokybės gerinimas (VP1-2.2-ŠMM-07-K-02-039)



Conceptual models in interaction design

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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?

Source: after Carroll (2002), Figure 3.1, p. 68.

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

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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 menudriven 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!)



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20 244

http://www.youtube.com/watch?v=HGYFEI6uLy0 26

1:57 / 5:46



Jeeves knows these answers:

Ask Where can I see an image of the human arm and leg muscles (cut views) ? Ask Where can I find the free online arcade game Centipede ?? Ask Why does my leg or other limb fall asleep? (Ask Where can I find advice on controlling the garden pest millipedes and centipedes ? ?

Would you talk with Anna?

IKEA Help Center

close windov



® 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



www.bricklin.com/history/refcards.htm

Star office



Differences?



Mac darbalaukis (1987)





Pirmasis iPad interfeisas (2010)

Mac OS X darbalaukis (2005)

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

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 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









Pirmosios piktogramos



(a)



(b)





Šiuolaikinės piktogramos

















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.

Paprastos ir lengvai atskiriamos piktogramos su antrašte







Menu

Hierarchical menu

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Context menu

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	Send To 🔸
	Cut Copy
	Create Shortcut Delete Rename
	Properties

Actions are grouped by objects

Shortcuts





Pointers



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Use Pixel Doubling		Next
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O Brush Size		

• 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

4. Exploring

- Involves users moving through virtual or physical environments
- Physical environments with embedded sensor technologies
 - Context aware

Virtual world





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....

PSICHOLOGICAL PRINCIPLES AND INTERFACE DESIGN

Gestalt principles

Intuitive perception guidelines: Gestalt laws



Gestalt laws



UX research and design

Darbai

- Dizaino darbai
- Patogumo naudotis darbai

Paslaugos

- Patogumo vertinimas
- Vartotojų testavimas
- Informacijos architektūra
- Vartotojų sąsajos dizainas

Kompanija

- Kontaktai
- Bendradarbiavimas

Proximity to organize buttons

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	Do you want to save changes to Untitled?
	Save Don't Save Cancel

Equal distances in Windows Vista

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h			Close

Buttons in OS X ir SpiderOak cloud

Similarity





Similar type file as blocks

Unordered files – difficult to understand

Continuity



- Scrollbar refers the invisible part
 - indicates that about 80% is visible

Closure

• we perceive as a connection

- bit it is not continous



Paieškos langas OS X

- Short-term memory
 - George Miller lae (1956):
 - short-time memory is limited to 7 \pm 2 small chunks=
 - Cowan (2002): 4 ± 1
- Chunked dialogs

Accordion menu	Flash menu	Flash menu
SEO friendly	▼ SEO friendly	▼ SEO friendly
Ajax embedded	Flash menu	> Fast
SEO friendly	Dreamweaver extension	> Effective
Fast	Classic design	> Elexible
Cross browser		
Easy to use	Ajax embedded	> Stylish
Stylish	Customizable	Ajax embedded
Ready-to-use	Ready-to-use	▶ Customizable
Compact	Compact	▶ Ready-to-use

- Time limitations
 - memories in short-term memory persist for only 30 sec.,
 - Important information should be more persistent



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Recognition

- menu shows available options
- images help selection



Recall

- autocomplete help to recall the names
 - airports


Principles for memory and attention







- colours
 - maximum 5 + 2
 - use central and peripheral colours
 - do not use simultaneous high-chroma, spectral colours
 - Use familiar consistent codings with appropriate references

Information design

- Goal present large amount of data in easily understandable form
- 1. Sir Edward Playfair (XVII a.), Jacques Bertin (1981)
 - the proper representation helps to solve the problem

Harry Beck's London underground rail network



Information design

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Change in Home Prices (year over year)

From New York Times Economix blog

• gestalt laws

Wurman, Understanding USA (2000)



http://designarchives.aiga.org/#/entries/%2Bid%3A83/_/detail/relevance/a sc/0/7/83/understanding-usa-website/1

Interaktive visualizations

- Ben Shneiderman
 - overview first
 - zoom and filter
 - then details on demand

Film finder, Ahlberg, Shneiderman (1994





Film finder, Ahlberg, Shneiderman (1994)





ConeTree

• 3D file system tree



smartMoney.com



- stock market
- colours changes in values
- blocks companies
- mousing over the block
 - shows name,
- clicking
 - details

Vizualus tezaurus

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www.visualthesaurus.com/app/view											
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http://www.visualthesaurus.com/

Reading

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

conceptual models

- David Benyon. Designing Interaction Systems: A comprehensive guide to HCI and interaction design.
 - in second edition: chapter 14. Interface design: visual aspects