数字媒体与网络技术

Human Computer Interaction

Design, prototyping and construction

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Overview

- Prototyping and construction
- Conceptual design
- Physical design

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- Prototyping and construction
- Conceptual design
- Physical design
- Tool support

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Prototyping and construction

- What is a prototype?
- Why prototype?
- Different kinds of prototyping
  - low fidelity
  - high fidelity
- Compromises in prototyping
  - vertical
  - horizontal
- Construction

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What is a prototype?

In other design fields a prototype is a small-scale model:

- a miniature car
- a miniature building or town

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What is a prototype?

In interaction design it can be (among other things):

- a series of screen sketches
- a storyboard, i.e. a cartoon-like series of scenes
- a Powerpoint slide show
- a video simulating the use of a system
- a lump of wood (e.g. PalmPilot)
- a cardboard mock-up
- a piece of software with limited functionality written in the target language or in another language

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Why prototype?

- Evaluation and feedback are central to interaction design
- Stakeholders can see, hold, interact with a prototype more easily than a document or a drawing
- Team members can communicate effectively
- You can test out ideas for yourself
- It encourages reflection (careful consideration): very important aspect of design
- Prototypes answer questions, and support designers in choosing between alternatives

What to prototype?

- Technical issues
- Work flow, task design
- Screen layouts and information display
- Difficult, controversial(争议的), critical areas

Low-fidelity Prototyping

- Uses a medium which is unlike the final medium, e.g. paper, cardboard
- Is quick, cheap and easily changed
- Examples:
  - sketches of screens, task sequences, etc
  - 'Post-it' notes
  - storyboards
  - 'Wizard-of-Oz'

Storyboards

- Often used with scenarios, bringing more detail, and a chance to role play
- It is a series of sketches showing how a user might progress through a task using the device
- Used early in design

Sketching

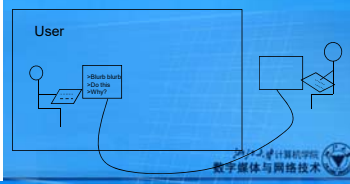
- Sketching is important to low-fidelity prototyping
- Don't be inhibited about drawing ability. Practice simple symbols

Using index cards

- Index cards (3 X 5 inches)
- Each card represents one screen
- Often used in website development

'Wizard-of-Oz' prototyping

- The user thinks they are interacting with a computer, but a developer is responding to output rather than the system.
- Usually done early in design to understand users' expectations



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High-fidelity prototyping

- Uses materials that you would expect to be in the final product.
- Prototype looks more like the final system than a low-fidelity version.
- For a high-fidelity software prototype common environments include Macromedia Director, Visual Basic, and Smalltalk.
- Danger that users think they have a full system.....see compromises

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Difference between prototype and model

- Basically a prototype is full size and functional, a model is usually of a scale size and does not necessarily function.
- A prototype is the first full size or 'pilot' model of a device or process. Sometimes the term is used to mean the first complete item of what subsequently becomes a production series.

A model is any arrangement of parts that demonstrates the way they work together. Scale is arbitrary.

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Compromises in prototyping

- All prototypes involve compromises
- For software-based prototyping maybe there is a slow response? sketchy icons? limited functionality?
- Two common types of compromise
  - 'horizontal': provide a wide range of functions, but with little detail
  - 'vertical': provide a lot of detail for only a few functions
- Compromises in prototypes mustn't be ignored. Product needs engineering

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Prototyping cultures

- The culture of an organization has a strong influence on the quality of the innovations that the organization can products.
- Primarily two kinds of organizational culture for innovation: specification culture and prototyping culture.
- Specification culture: new products and development are driven by written specifications.
- Prototyping culture: understanding requirements and developing the new product are driven by prototyping.
- Organizations wanting to be innovative need to move to a prototyping-driven culture.

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Construction: from design to implementation

- Taking the prototypes (or learning from them) and creating a whole
- Quality must be attended to: usability (of course), reliability, robustness, maintainability, integrity, portability, efficiency, etc
- Product must be engineered
  - Evolutionary prototyping
  - 'Throw-away' prototyping

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Conceptual design: from requirements to design

- Transform user requirements/needs into a conceptual model
- "a description of the proposed system in terms of a set of integrated ideas and concepts about what it should do, behave and look like, that will be understandable by the users in the manner intended"
- Don't move to a solution too quickly. Iterate, iterate, iterate
- Consider alternatives: prototyping helps

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Three perspectives for a conceptual model

- Which interaction mode?
  - How the user invokes actions
  - Activity-based: instructing, conversing, manipulating and navigating, exploring and browsing.
  - Object-based: structured around real-world objects

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Conceptual models: from interaction mode to style: Recap

- Interaction mode:
  - what the user is doing when interacting with a system, e.g. instructing, talking, browsing or other
- Interaction style:
  - the kind of interface used to support the mode, e.g. speech, menu-based, gesture

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Three perspectives for a conceptual model

- Which interaction paradigm?
  - desktop paradigm, with WIMP interface
  - ubiquitous computing/pervasive computing
  - wearable computing
  - mobile devices and so on.

-e.g. Library catalog service

- Is there a suitable metaphor?
  - (contd)….

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Is there a suitable metaphor?

- Interface metaphors combine familiar knowledge with new knowledge in a way that will help the user understand the product.

-"teaching software"--classroom

- Three steps: understand functionality, identify potential problem areas, generate metaphors
- Evaluate metaphors:
  - How much structure does it provide?
  - How much is relevant to the problem?
  - Is it easy to represent?
  - Will the audience understand it?
  - How extensible is it?

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Expanding the conceptual model

- What functions will the product perform?
  - What will the product do and what will the human do (task allocation)?
- How are the functions related to each other?
  - sequential or parallel?
  - categorisations, e.g. all actions related to telephone memory storage
- What information needs to be available?
  - What data is required to perform the task?
  - How is this data to be transformed by the system?

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Using scenarios in conceptual design

- Express proposed or imagined situations
- Used throughout design in various ways
  - scripts for user evaluation of prototypes
  - concrete examples of tasks
  - as a means of co-operation across professional boundaries
- Plus and minus scenarios to explore extreme cases

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Class activity

- Consider an in-car navigation device for planning routes, and suggest one plus and one minus scenario.

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Class activity: comments

•Beth is in a hurry to get to her firiend's house. She jumps into the car and switches on her in-car navigation system. The display appears quickly, showing her local area and indicating the current location of her car with a bright white dot. She calls up the memory function of the device and chooses her friend's address. A number of her frequent destinations are stored like this in the device, ready for her to pick the one she wants. She chooses the "shortest route" option and the device thinks for a few seconds before showing her a bird's-eye-view of her route. This feature is very useful because she can get an overall view of where she is going.

Once the engine is started, the display reverts to a close-up view to show the details of her journey. As she pulls away from the pavement, a calm voice tells her to "drive straight on for half a mile, then turn left." After half a mile, the voice says again "turn left at the next junction." As Beth has traveled this route many times before, she doesn't need to be told when to turn left or right, so she turns off the voice output and relies only on the display, which shows sufficient detail for her to see the location of her car, her destination and the roads she needs to use."

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Class activity: comments

•Beth is in a hurry to get to her friend's house. She gets in her car and turns on the in-car navigation system. The car's battery is faulty so all the information she had entered into the device has been lost. She has to tell the device her destination by choosing from a long list of towns and roads. Eventually, she finds the right address and asks for the quickest route. The device takes ages to respond, but after a couple of minutes displays an overall view of the route it has found. To Beth's dismay, the route chosen includes one of the main roads that is being dug up over this weekend, so she cannot use the route. She needs to find another route, so she presses the cancel button and tries again to search for her friend's address through the long list of towns and roads. By this time, she is very late."

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Using prototypes in conceptual design

- Allow evaluation of emerging ideas
- Low-fidelity prototypes used early on, high-fidelity prototypes used later

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Physical design: getting concrete

- Considers more concrete, detailed issues of designing the interface
- Iteration between physical and conceptual design
- Guidelines for physical design
  - Nielsen's heuristics (2001)
  - Shneiderman's eight golden rules (1998)

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Shneiderman's eight golden rules

- Strive for consistency
- Enable frequent users to use shortcuts
- Offer informative feedback
- Design dialogs to yield closure
- Offer error prevention and simple error handling
- Permit easy reversal of actions.
- Support internal locus of control
- Reduce short-term memory load

Physical design: getting concrete

- Different kinds of widget (dialog boxes, toolbars, icons, menus etc)
  - menu design
  - icon design
  - screen design
  - information display

Menu design

- How long is the menu to be?
- In what order will the items appear?
- How is the menu to be structured, e.g. when to use sub-menus, dialog boxes?
- What categories will be used to group menu items?

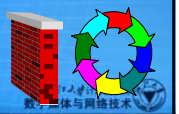
Menu design

- How will division into groups be denoted, e.g. different colors, dividing lines?
- How many menus will there be?
- What terminology to use? (results of requirements activities will indicate this)
- How will any physical constraints be accommodated, e.g. mobile phone?

Icon design

- Good icon design is difficult
- Meaning of icons is cultural and context sensitive
- Some tips:
  - always draw on existing traditions or standards
  - concrete objects or things are easier to represent than actions
- From clip art, what do these mean to you?





Screen design

Two aspects:

- How to split across screens
  - moving around within and between screens
  - how much interaction per screen?
  - serial or workbench style?
- Individual screen design
  - white space: balance between enough information/interaction and clarity
  - grouping items together: separation with boxes? lines? colors?

Screen design: splitting functions across screens

- Task analysis as a starting point
- Each screen contains a single simple step?
- Frustration if too many simple screens
- Keep information available: multiple screens open at once

Screen design: individual screen design

- Draw user attention to salient point, e.g. colour, motion, boxing
- Animation is very powerful but can be distracting
- Good organization helps: grouping, physical proximity
- Trade off between sparse population and overcrowding

Information display

- Relevant information available at all times
- Different types of information imply different kinds of display
- Consistency between paper display and screen data entry

Summary

- Different kinds of prototyping are used for different purposes and at different stages
- Prototypes answer questions, so prototype appropriately
- Construction: the final product must be engineered appropriately
- Conceptual design (the first step of design)
- Physical design: e.g. menus, icons, screen design, information display
- Prototypes and scenarios are used throughout design

Thank you.