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Human Computer Interaction

Interaction Styles

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Conceptual models: from interaction mode to style


- 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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Many kinds of interaction styles available...

- Command Line
- Menu-Based Interface
- Form Fill-In
- Question and Answer
- Direct Manipulation
- Metaphors
- Web Navigation
- Three-Dimensional Environments
- Zoomable Interface
- Natural Language



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Which interaction style to choose?

- Need to determine requirements and user needs
- Take the budget and other constraints into account
- Also will depend on suitability of technology for activity being supported
- This topic will be covered more later when discuss how to actually design conceptual models

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Interaction Styles

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Interaction Styles - Command Line

- Command-line interfaces are fast and powerful.
 - Many commands are abbreviated
 - quick and efficient
 - Commands can be applied to many objects simultaneously
 - fast input
 - Some commands have multiple parameters that can be set and altered
 - precise and flexible

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Interaction Styles - Command Line

- Command Line and the EEAC
 - Intention formation, specification of the action, and the execution stages are complex
 - Requires a rather accurate mental model of the computer's internal processing
- Command Line and the Interaction Framework
 - Translating the user's task language into the input language requires knowledge of the core language
 - The output language can be confusing for inexperienced users - there is very little feedback

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Interaction Styles - Command Line

- Advantages of command-line interfaces:
 - Suitable for repetitive tasks
 - Advantageous for expert users
 - Offer direct access to system functionality
 - Efficient and powerful
 - Not encumbered with graphic controls
 - Low visual load
 - Not taxing on system resources

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Interaction Styles - Command Line

- Disadvantages of command-line interfaces:
 - Steep learning curve
 - High error rates
 - Heavy reliance on memory
 - Frustrating for novice users

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Interaction Styles

- Command Line
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Interaction Styles - Menu-Based Interface

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MS-DOS Version 6
Fixed Disk Setup Program
(C)Copyright Microsoft Corp. 1993 - 1993

FDISK Options

Current fixed disk drive: 1

Choose one of the following:

1. Create DOS partition or Logical DOS Drive
2. Set active partition
3. Delete partition or Logical DOS Drive
4. Display partition information

Enter choice: 1

Press Esc to exit FDISK
  
```

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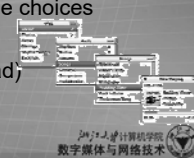
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Interaction Styles - Menu-Based Interface

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Menus are based on recognition as opposed to recall

- No need to remember commands
- Users search from a list of possible choices
- List provides constraints
- Appropriate for small screens (iPad)



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Interaction Styles - Menu-Based Interface

- Menu-based interfaces and the EEAC
 - Menu constraints can help the user to form the proper intentions and specify the proper action sequence
 - Provide a context to evaluate the output language

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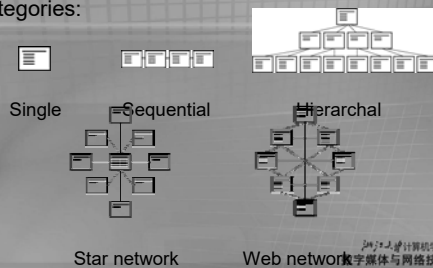
Interaction Styles - Menu-Based Interface

- Menu-based interfaces and :
 - **Affordances**
 - Menu elements present affordances

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Interaction Styles - Menu-Based Interface

- Most menus are a variation on a few basic categories:



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Interaction Styles - Menu-Based Interface

- Advantages of menu-based interfaces:
 - Low memory requirements
 - Self-explanatory
 - Easy to undo errors
 - Appropriate for beginners
- Disadvantages of menu-based interfaces:
 - Rigid and inflexible navigation
 - Inefficient for large menu navigation
 - Inefficient use of screen real estate
 - Slow for expert users

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Interaction Styles

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Interaction Styles - Form Fill-In

- Similar to menu interfaces – present screens of information
- Different than menu interfaces - used to capture information and proceed linearly not to navigate a hierarchical structure

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Interaction Styles - Form Fill-In

MAXIM

Always inform the user about the length of paged forms and where they are within the structure

- Forms can be presented using
 - Single scrolling screens
 - Multiple linked pages
- Form elements must be grouped logically
- Include “You Are Here” indications

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Interaction Styles - Form Fill-In

MAXIM

Form elements must be unambiguously labeled to increase data integrity

- Users must understand what data is required and what format should be used

– Date information formats

4/21/2020, 21/4/2020, or April 21, 2020?

YYMMDD vs MMDDYY

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Interaction Styles - Form Fill-In

- Advantages of form fill-in interfaces:
 - Low memory requirements
 - Self-explanatory
 - Can gather a great deal of information in little space
 - Present a context for input information
- Disadvantages of form fill-in interfaces:
 - Require valid input in valid format
 - Require familiarity with interface controls
 - Can be tedious to correct mistakes

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Interaction Styles - Question and Answer

- Question and answer interfaces are also called wizards.
- They are restricting for expert users
- They are easy for novice users
 - However, they may not know the required information

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Users must be able to cancel a menu without affecting the state of the computer

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Interaction Styles - Question and Answer

- Microsoft Add Network Place Wizard



(a) Add Network Place wizard. (b) Select a service provider. (c) Address of the network place.

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Interaction Styles - Question and Answer

- Advantages of question and answer interfaces:
 - Low memory requirements
 - Self-explanatory
 - Simple linear presentation
 - Easy for beginners
- Disadvantages of question and answer interfaces:
 - Require valid input supplied by user
 - Require familiarity with interface controls
 - Can be tedious to correct mistakes

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Interaction Styles - Direct Manipulation

- Ben Shneiderman (1982)
 - Continuous representations of the objects and actions of interest with meaningful visual metaphors.
 - Physical actions or presses of labeled buttons instead of complex syntax.
 - Rapid, incremental, reversible actions whose effects on the objects of interest are visible immediately.

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Interaction Styles - Direct Manipulation

- Three phases in Direct Manipulation - Cooper, Reimann (2003)
 - **Free Phase**—How the screen looks before any user actions
 - **Captive Phase**—How the screen looks during a user action (click, click-drag, etc.)
 - **Termination Phase**—How the screen looks after a user action

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Interaction Styles - Direct Manipulation

- Direct Manipulation and the EEAC
 - The range of possible intentions is consistently wide
 - Users usually have multiple options for specifying action sequences
 - Can be overwhelming of novice users
 - Provide multiple ways of executing action sequences

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Interaction Styles - Direct Manipulation

- Advantages of direct manipulation interfaces:
 - Easy to learn
 - Low memory requirements
 - Easy to undo
 - Immediate feedback to user actions
 - Enables user to use spatial cues
 - Easy for beginners
- Disadvantages of direct manipulation interfaces:
 - Not self-explanatory
 - Inefficient use of screen real estate
 - High graphical system requirements

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Interaction Styles - Metaphors

- GUIs use visual relationships to real-world objects (metaphors)
- Metaphors can help people relate to complex concepts and procedures by drawing on real-world knowledge
- Real-world affordances can be reflected
- What metaphors are used by contemporary GUIs?

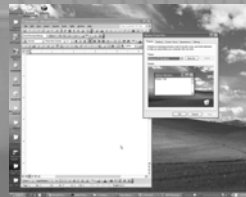
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Interaction Styles - Metaphors

Microsoft Windows

Apple OS X



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Interaction Styles - Metaphors

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A metaphor's function must be consistent with real-world expectations

- Metaphors that do not behave the way people expect will cause confusion and frustration
- Macintosh trashcan



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Interaction Styles - Metaphors

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Don't force a metaphor

- Potential problems with metaphors
 - Run out of metaphors
 - Some virtual processes and objects have no real-world counter parts
 - Mixed metaphors
 - Carry connotations(内涵) and association

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Interaction Styles - Web Navigation

- Two basic interaction styles
 - Link-based navigation
 - Search


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Interaction Styles – 3D Environments

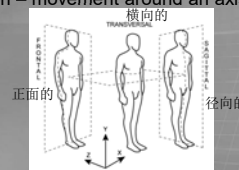
- 3D interaction is natural in the real-world
- 3D environments are common in digital games
- Rich graphical 3D environment are processor intensive

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Interaction Styles – 3D Environments

- 3D Navigation
 - Involves two types of movement
 - Translation – movement on a plane
 - Rotation – movement around an axis




Yaw



Pitch


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Interaction Styles – 3D Environments

- Web-based 3D
 - Use vector-based graphics to decrease file size
 - Virtual Reality Modeling Language (VRML)
 - Uses polygons with parameters
 - Transparency
 - Texture maps
 - shininess
 - X3D is XML based - Web3D.org
 - Offers greater flexibility and control
 - WebGL

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Interaction Styles – 3D Environments

- Desktop 3D
 - Current GUIs are predominantly 2D
 - 3D environments presented on 2D screens are difficult to navigate

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Three-dimensional navigation can quickly become difficult and confusing

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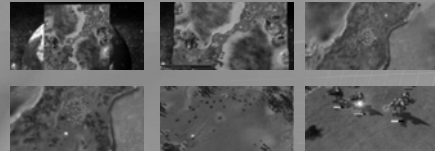
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Interaction Styles - Zoomable Interface

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Zoomable interfaces allow us to use our sense of relative positioning



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Interaction Styles - Natural Language

- Natural Language Interaction (NLI) - Interacting with computers using everyday language
- Obstacles
 - Language is ambiguous
 - Meaning depends on context
 - “Search results”
 - “She said she did not know”
 - Dependant on visual cues

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Interaction Styles - Natural Language

- Applications for NLI
 - Speech Input
 - Hands-free operation
 - Poor Lighting Situations
 - Mobile Applications
 - In the home
 - Speech Output
 - On-board navigational systems

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Interaction Styles - Natural Language

- Two areas of development
 - Speech recognition
 - Semantics
 - Grammar issues
 - Vague meanings
 - Contradictory statements

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NLIs may require constant clarification of linguistic ambiguities

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Interaction Styles - Natural Language

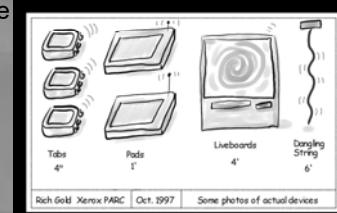
- Advantages of NLI:
 - Ease of learning
 - Low memory requirements
 - Flexible interaction
 - Low screen requirements
 - Appropriate for beginners
- Disadvantages of NLI:
 - Requires knowledge of the task domain
 - May require tedious clarification dialogues
 - Complex system development

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Interaction paradigms

- Another form of inspiration for conceptual models
- From the desktop to ubiquitous computing (embedded in the environment)



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Analyzing Interaction Paradigms

- Interaction paradigm: A model or pattern of human-computer interaction that encompasses all aspects of interaction, including physical, virtual, perceptual, and cognitive
- An interaction paradigm defines the “who, what, where, when, why, and how” (5W+H) of computer system use.

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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....

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Dilemma

- One of the challenges facing interaction designers is whether to use realism or abstraction when designing an interface to instantiate (实例) their conceptual model.



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4.26上下周二的课

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Summary points

- Important to have a good understanding of the problem space
- Fundamental aspect of interaction design is to develop a conceptual model
- Interaction modes and interface metaphors provide a structure for thinking about which kind of conceptual model to develop
- Interaction styles are specific kinds of interfaces that are instantiated as part of the conceptual model
- Interaction paradigms can also be used to inform the design of the conceptual model

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Thank you.

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