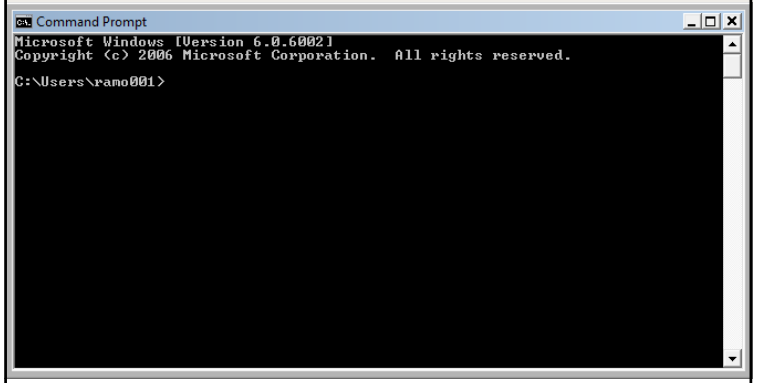
Lecture 11
Interaction Styles

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

Heim, Chapter 2.3

IEEE Spectrum 03/2011

Interaction Styles - *Command Line*



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

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

Interaction Styles - *Command Line*

- Command Line and Articulatory Distance
  - Articulatory distance is large because we are presented with only the command prompt - no indication of functionality

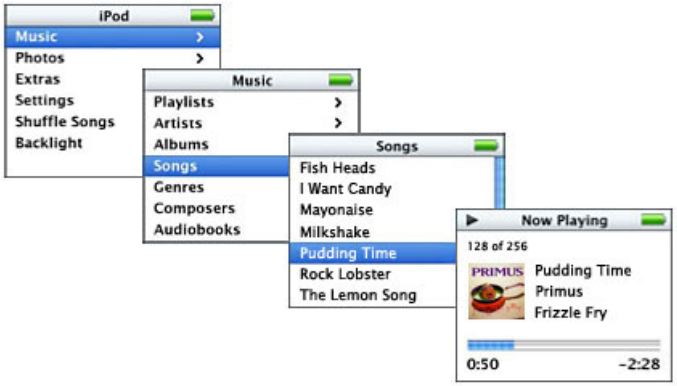
Interaction Styles - *Command Line*

- 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
  - Scriptable

Interaction Styles - *Command Line*

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

Interaction Styles - *Menu-Based Interface*



www.apple.com/support/ipod101/anatomy/2/

Interaction Styles - *Menu-Based Interface*

- Menu-driven interfaces present users with sequential hierarchal menus that offer lists of functions.
  - Textual: key-in number of option
  - Graphical: use arrow keys or pointing device

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 (iPod)

Interaction Styles - *Menu-Based Interface*

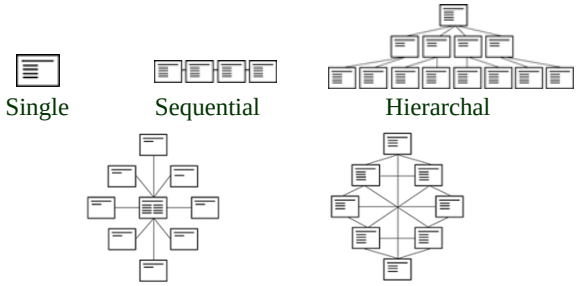
- Menu-based interfaces and the EEAC
  - Menu constraints can help the user to form the proper intentions and specify the proper action sequence
  - Provide a context to evaluate the output language

Interaction Styles - *Menu-Based Interface*

- Menu-based interfaces and :
  - **Articulatory Distance**
    - Menu options create small articulatory distance
  - **Mental Models**
    - Menu construction has a direct impact on user's mental model
  - **Affordances**
    - Menu elements present affordances

Interaction Styles - *Menu-Based Interface*

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

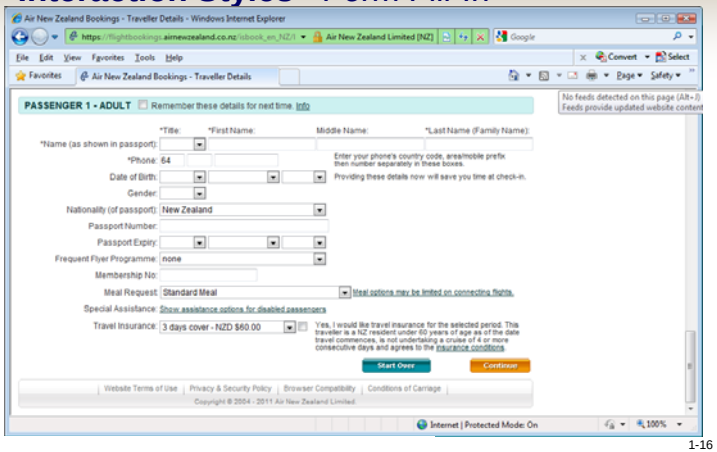


Interaction Styles - *Menu-Based Interface*

- 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

Interaction Styles - *Form Fill-In*



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

Interaction Styles - *Form Fill-In*

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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

Interaction Styles - *Form Fill-In*

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Form elements must be unambiguously labeled to increase data integrity

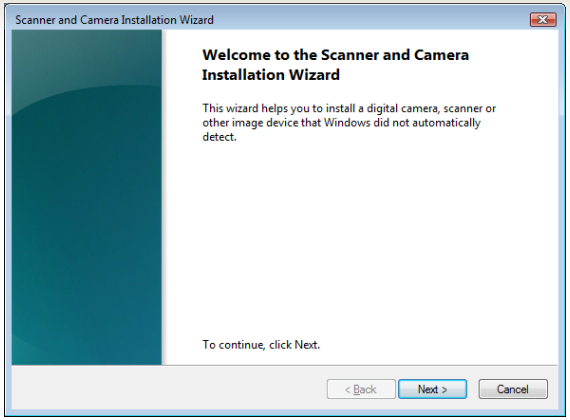
- Users must understand what data is required and what format should be used
  - Date information formats

1/29/2005, 29/1/2005, or January 29, 2005?

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

Interaction Styles - *Question and Answer*



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

Interaction Styles - *Question and Answer*

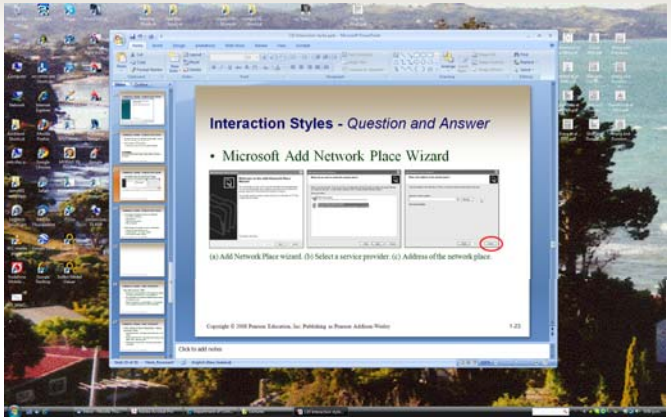
- Microsoft Add Network Place Wizard

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

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

Interaction Styles - *Direct Manipulation*



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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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Video Browsing by direct manipulation

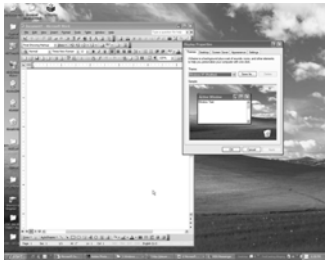
Interaction Styles - *Direct Manipulation*

- 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

Imagine that you want to copy all images from every directory down a folder hierarchy into a single folder. Discuss the advantages of a Direct Manipulation interface versus a Command Line interface for this task.

Interaction Styles - *Metaphors*

Microsoft Windows XP



Apple OS X

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?

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 

Interaction Styles - *Metaphors*

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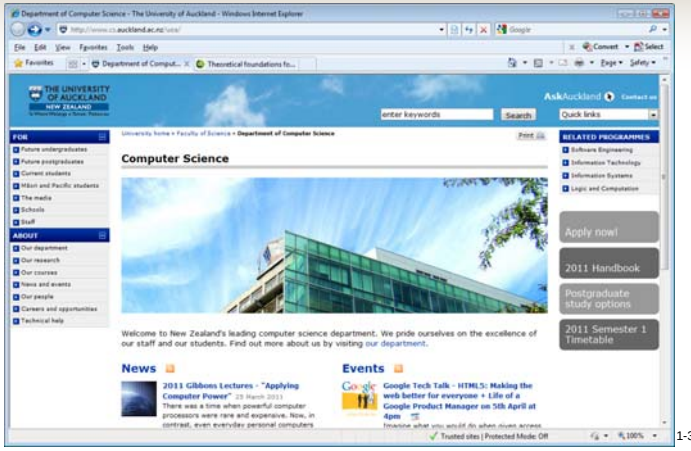
Don't force a metaphor

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

Interaction Styles - *Web Navigation*



Interaction Styles - *Web Navigation*

- Two basic interaction styles
  - Link-based navigation
    - Sensitive to articulatory distance
    - Ambiguous link labels increase the gulf of evaluation
  - Search
    - Sensitive to semantic distance
    - Inadequate search engine algorithms increase the gulf of execution
    - Slight advantage in development of mental models

http://gigaom.com/2010/09/13/usability-study-shows-kids-dont-search/

- Adult Internet users increasingly “search dominant”
- Kids navigate the web using bookmarks, remembering their favorite sites, and accessing paid subscription content and games

Interaction Styles – *3D Environments*

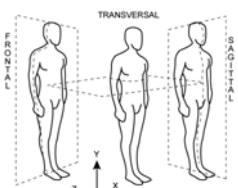
AR1 VR1

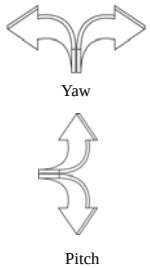
Interaction Styles – *3D Environments*

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

Interaction Styles – *3D Environments*

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





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
  - X3-D is XML based - **Web3D.org**
    - Offers greater flexibility and control

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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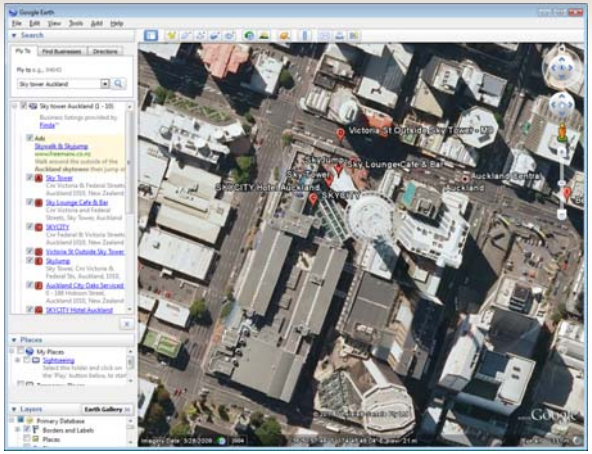
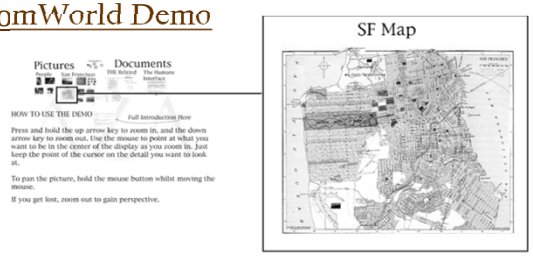
Three-dimensional navigation can quickly become difficult and confusing

Interaction Styles - *Zoomable Interface*



Interaction Styles - *Zoomable Interface*

- ZoomWorld (Jeff Raskin) is based on the zooming interface paradigm (ZIP)
- ZoomWorld Demo



Zoomed Out Zoomed In

Interaction Styles - *Zoomable Interface*

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Zoomable interfaces allow us to use our sense of relative positioning

- ZIP is based on landmarks and relative positioning (organizational cues)
  - Proportion
  - Color
  - Patterns
  - Proximity
- **Pad++:** Zoomable User Interface (ZUI)

Interaction Styles - *Natural Language*

itunes.apple.com

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

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

Interaction Styles - *Natural Language*

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

MAXIM

NLIs may require constant clarification of linguistic ambiguities

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

Consider the abilities of Natural Language Interfaces versus Menu-based Interfaces. Specify environments and tasks which would be better suited for each of these interface styles.

Summary

- Large number of possible interaction styles available, each with advantages and disadvantages for particular projects
- Choice of appropriate style should be based on the needs of the project and the deployment technology
- Interaction styles will evolve with new technologies coming onto the market