

Introduction and Overview

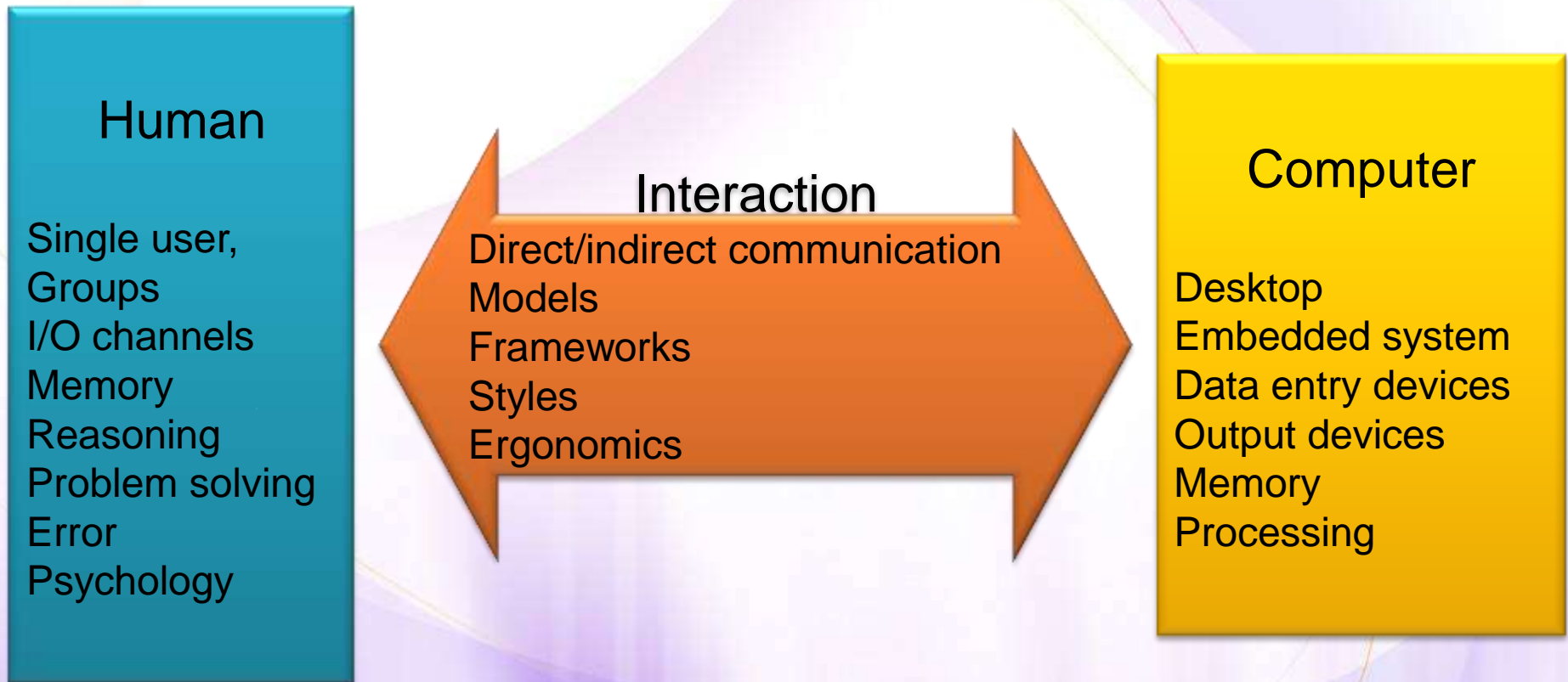
Introduction

- User interfaces should be designed to match the skills, experience and expectations of its anticipated users.
- System users often judge a system by its interface rather than its functionality.
- A poorly designed interface can cause a user to make catastrophic errors.
- Poor user interface design is the reason why so many software systems are never used.

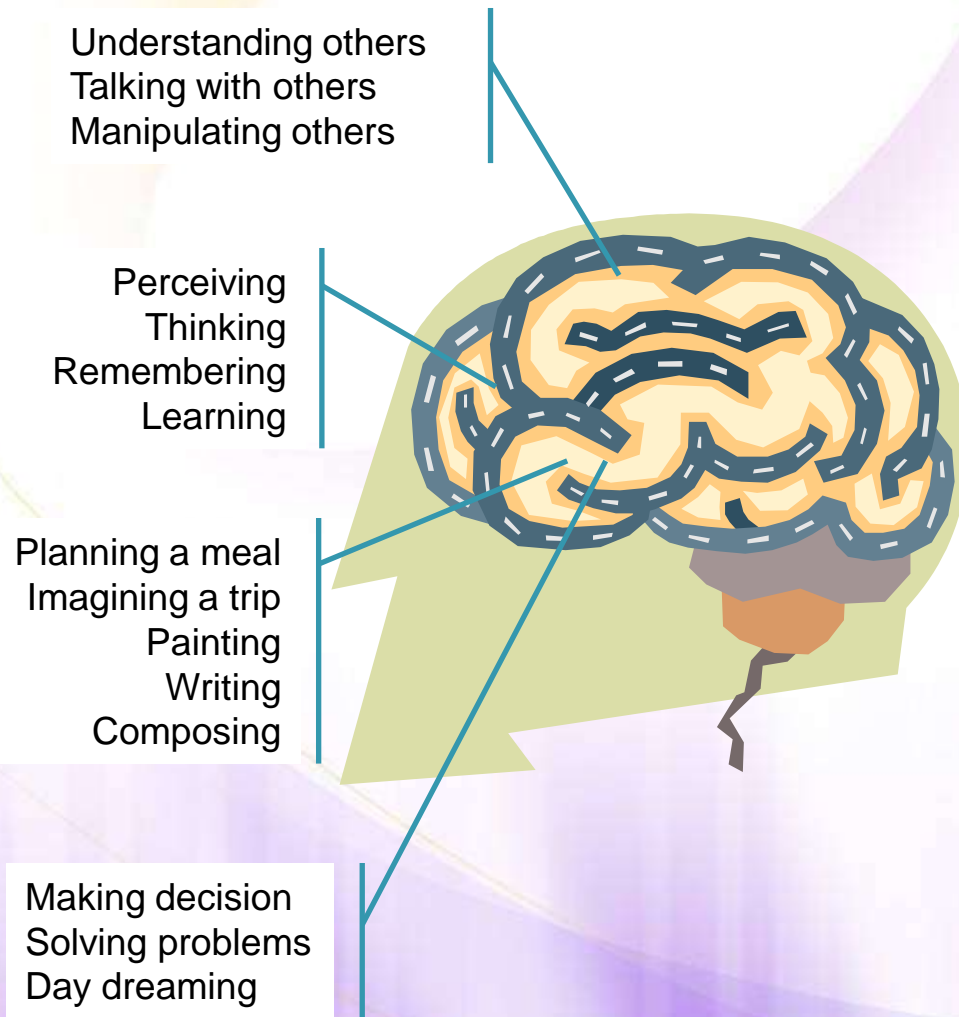
Covered topics

- Human and computer issues
- Interaction styles
- Human interface

1. Main issues



Human: What go in the mind ?



- **Limited short-term memory**
 - Instantaneously remember about 7 items of information.
 - If present more than this → more liable to make mistakes.
- **People make mistakes**
 - Inappropriate alarms and messages can increase stress → more mistakes.
- **People are different**
 - People have a wide range of physical capabilities.
 - Designers should not just design for their own capabilities.
- **People have different interaction preferences**
 - Some like pictures, some like text.

Covered topics

- Human and computer issues
- Interaction styles
- Human interface

2. Interaction style

- Interaction dialogue - computer and the user
- Interaction (interface) styles include :
 - Command language style
 - Menus
 - Question and response
 - Forms
 - Natural language interaction style
 - Direct manipulation / WIMP / point and click
 - Virtual reality

2.1. Command language style

- Expresses instructions directly to computer,
- Using function keys, single characters, abbreviations or whole word commands
- Advantages ???
powerful, flexible, quick
- Disadvantages ???
poor learn-ability, no cues, experts usually, inconsistent features, typing errors
- Examples ???
 - DOS or UNIX operating systems
 - programming languages
 - natural language interaction
 - accelerated access in menu screens in window systems

Guidelines for command languages

- no excess functionality
- cautious use of powerful destructive operations (eg. DEL *.*)
- consider tailoring the language to suit different users
- a unifying concept, model, or metaphor can be useful
- consistency in the ordering of keywords and parameters
- a hierarchical structure for a large number of commands
- consistent abbreviation strategies should be used
- mnemonics should be meaningful

2.2. Menu interaction style

Menu selection is especially useful when users:

- have little training
- do not use the system frequently
- are unfamiliar with the terminology of the system
- need help in structuring their decision making process.

Menus: Semantic Organisation

- Primary goal for menu designers
 - Create a sensible, comprehensible, memorable, and convenient semantic organisation relevant to the user's task: break into logical categories
 - Hierarchical decomposition
 - every item belongs to a single category
 - Organisation is done before considering the screen display.
- Choices for sequencing
 - Chronological ordering
 - Numeric ordering
 - Alphabetically sequence of terms
 - Groupings of related items (functional)
 - Most frequent items first
 - More important items first

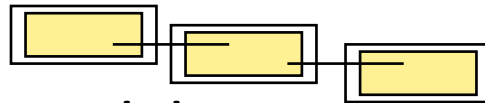
Guidelines for item presentation sequence

- by natural order, if any
- if small number of options (7 or less) order by:
 - sequence of occurrence
 - frequency of occurrence
 - importance
- alphabetical order for long lists
- consistency in ordering

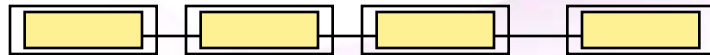
Menu systems



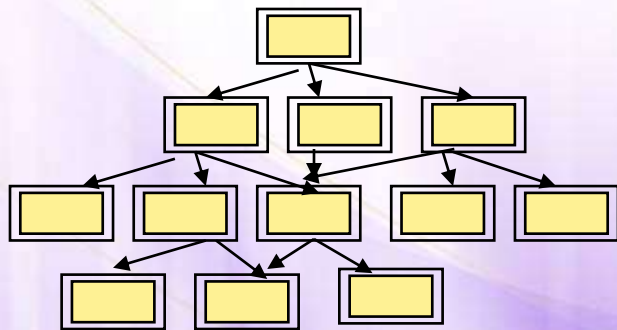
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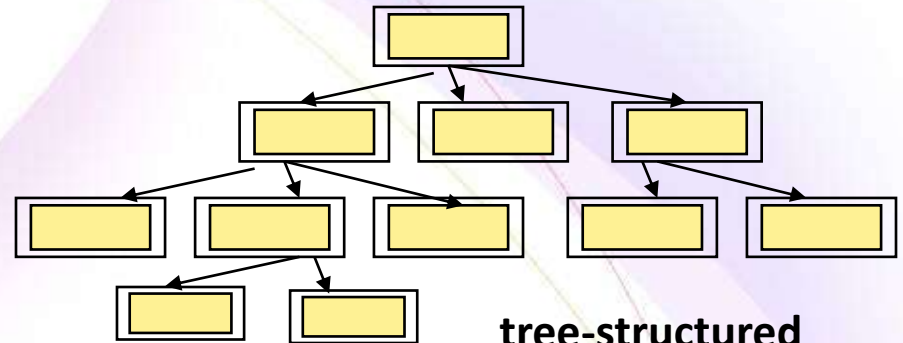
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linear sequence

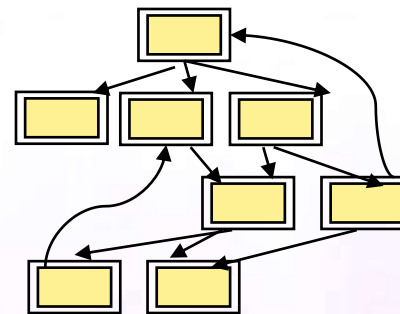


acyclic network



tree-structured

- hierarchical
- pull down
- pop-up
- circular

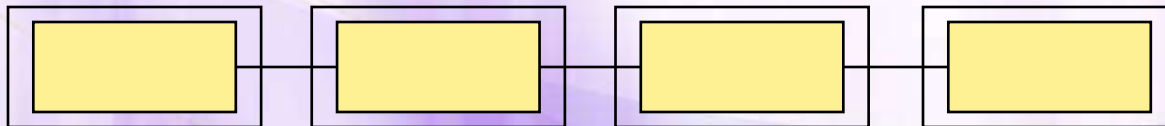


cyclic network

Guidelines for linear menus

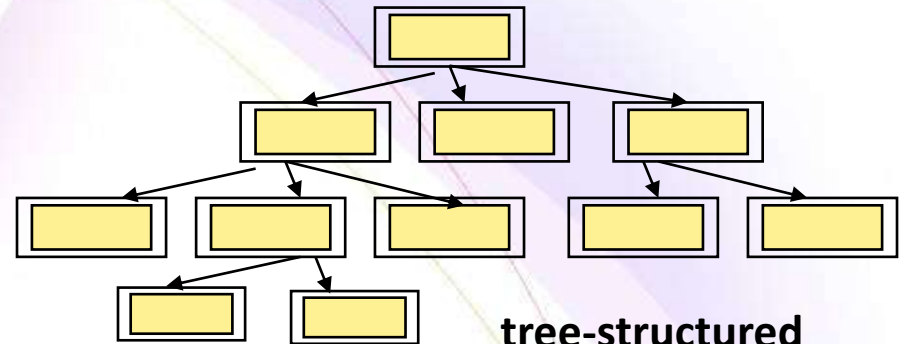
The user should:

- be able to go back to previous screens
- be able to terminate or restart the sequence
- be presented with the choices in an order that matches their expectations
- have a feeling for where they are in the sequence.



Guidelines for tree structure menu type

- A general or main menu
- Use terminology from the user's task domain
- Breadth is preferred over depth
- No more than three or four levels deep without logical categorisation, limit choices to 4-8 items
- Distinct items
- A printed index, or "map", for large systems to orient users
- Improve design after feedback from users.



tree-structured
- hierarchical
- pull down
- pop-up
- circular

Approaches for quick access in menus

- **Menus with type ahead**
 - users types a string characters to represent particular menu choices
 - ensure distinct first letters of each item in menu layer
- **Menu names and item numbers**
 - option to initially type these in and go to the particular item
- **Menu macros**
 - individual tailoring of the system to represent frequently used choices
 - users define own pathways with macro, and assign own name to macro

Screen Design

- List ideas to do with
 - Titles
 - Phrasing of menu items
 - Graphical Layout
 - Colour

Screen Design

- Titles
 - Main Menu
 - Same words -menu layers option to title
 - Place titles consistently
- Phrasing of menu items
 - Use familiar and consistent terminology
 - Distinct item names
 - Use consistent and concise phrasing
 - Place keywords in menu items on the left.

Screen Design

- Graphical Layout :
Techniques to indicate
position in menu

- titles
- different fonts
- typefaces
- highlighting techniques
- cascading
- menu map

- constraints of screen: width and length, display rate, character set, and highlighting techniques
- titles: centred or left justified
- item placement: left justified
- instructions: identical on each menu and placed in same position
- error messages and status reports: consistent position
- formats consistent

Menus: Screen Design

- Colour

- three components:

- hue,
 - intensity
 - saturation

- **generally overused so care is needed**

- change to black and white image to determine legibility

- do not use colour alone to carry key information

- colour blind people (8% male, 1% female) cannot distinguish between red and green

- cultural connections

- red- danger, anger,
 - green - safe,
 - blue- cool,
 - orange - warm

- blue should not give critical information, since difficult to perceive

2.3. Question and answer style

- Use with:

- novice or casual users
- some specific application areas
 - CAL ~ computer aided learning
 - DSS ~ decision support systems
 - ES ~ expert systems

- Note:

- Limited in functionality and power compared to other interface styles.

Guidelines for question-and-answer dialogues

- one idea or question at a time
- make questions precise
- short user responses
- keep previous questions displayed
- field widths 25-40 characters
- fields are left-centered
- distinguish computer messages from keyed entries

2.4. Form fill-in style

- Advantages :
 - easy to learn
 - easy to use
 - is reassuring, because the user can see the whole screen of data at once
 - is quick
 - needs few instructions

Guidelines for form fill-in design

- meaningful title
- comprehensible instructions
- logical grouping and sequencing of fields
- nice layout
- familiar field labels
- consistent terminology and abbreviations
- visible space and boundaries for fields
- convenient cursor movement: tab, arrows
- error correction for characters and fields
- error messages for unacceptable values
- optional fields clearly marked
- explanatory messages for fields
- completion signal

2.5. Natural language style

- Advantages:
 - the user does not have to learn a command syntax or mode of operation.
- Problems:
 - ambiguity of input
 - possibility of misunderstanding
 - requires lengthy, slow, data entry
 - the user may not be given help in structuring input
 - pointing and selecting from visual displays may be more attractive to users

2.6. Direct manipulation

- Allows users to select and manipulate objects from screen in order to perform tasks.
- Continuous representation of object of interest
- Physical actions not syntax or commands
- Response is immediate
- Easily reversible, visible action
- Example: icon based imagery in drawing package, desktop metaphor

Direct manipulation

- Consider “thinking in pictures” to match conceptual image of task
 - Piaget’s theory of human development locates a stage of concrete relationships prior to abstract conceptualisation.
 - Polya (1957) suggested drawing a picture to represent mathematical problems
- Metaphors - use visual representations of problem that are familiar to use
 - Example: desktop metaphors: waste-basket, files, folders, clipboard.

Direct manipulation

- The interface in direct manipulation bridges the gaps in both the “gulf of execution” and “gulf of explanation”.
 - Gulf of execution is the difference between the user formulation of actions to reach the goal and the actions allowed by system
 - Gulf of explanation (or evaluation) is the distance between the physical representation of the system state and the expectation of the user.

Direct manipulation

Advantages:

- engenders enthusiasm
- novices learn basic functionality quickly
- experienced users work rapidly
- error messages are rarely needed
- users can see immediately if their actions are furthering their goals, and how to change it
- user experiences less anxiety, actions are reversible
- user gain confidences since they initiate the action, feel in control and predict system responses

Disadvantages

- not all tasks can be described as concrete objects
- not all actions can be performed directly
- Example:
 - How to make concrete the concept of a buffer
 - Apple Macintosh overcame this through cutting, pasting and hidden clipboard.

WIMP interface

Windows

Icon

Menus (or Mice)

Pointers (or Pull-down menus)

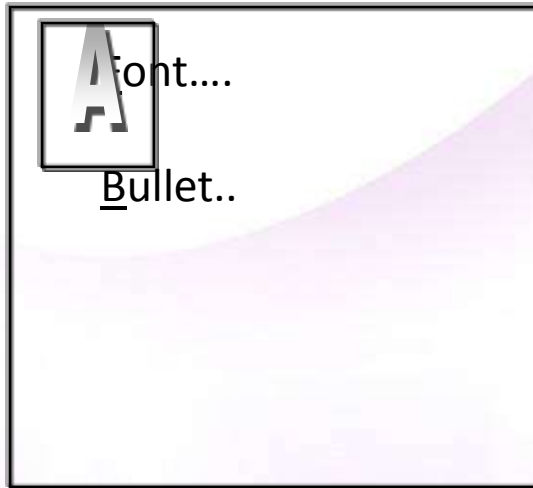
- Today's interface, in PC and desktop workstation areas- Microsoft Windows, MacOS, Unix window based systems
- elements of WIMP interface are called **widgets**

WIMP interface

- Windows
 - elements of the screen that act as independent terminals
- Icon :
 - small picture to represent a closed window
 - represent other aspects of system - waste-basket
- Menus
 - menu bar, pop-up menus, pull down menus, circular menus
- Pointers
 - point and select
 - modes
 - hot spot - location where the image points

WIMP interface

- Learning toolbar/ keyboard accelerator



- key combinations + icon representation + select menu option

WIMP interface

• Buttons

- user can push to initiate a display
- multi-choice - radio buttons
 - select one feature from a set of mutually exclusive options, such as sizes in font
- binary selection: - on / off
 - eg page orientation
 - also called check boxes

• Palettes

- a collection of icons to represent various modes of interaction
- eg drawing package - pixel colour or pattern
- toolbar palletes may be torn off from toolbar

• Dialog Boxes

- information window used by system to bring user's attention to important information

2.7. Virtual Reality

- Interaction styles
 - sense of direct physical presence: cues include visual, aural or haptic (touch)
 - sensory cues in three dimensions
 - Sound is used to aid navigation and location, being aware of other activities in the virtual world
 - Example: aircraft training
 - natural interaction: gestures typical of manipulating everyday objects
 - picking up, turning around, throwing and so on.

Immersion vs. desktop

- Immersion

- “looking in” perspective
- Providing a subjective feeling of environment, e.g:
 - helmet, data gloves and 3D world
 - metaphor of racing car travel compare to theme park activity - 3d world

- Desktop

- “looking at” perspective
- Changing environments to indicate motion, e.g.:
 - single screen for input and output, 3d mouse and keyboard, use of shadow
 - metaphor of moving through rooms as in games and 3d web environments

VR technologies

- visual display
 - 60 degrees vertically, 10 degrees horizontally
- head position sensing
 - - head movement shows different imagery
- hand position sensing
 - data glove provides very accurate input
- force feedback
 - hand-operated devices
- sound input and output
 - bouncing balls, beating hearts, dropping objects
- other sensations - tilting, vibrating, smell?

Guidelines for virtual reality

- Users should be able to select actions rapidly by pointing or gesturing
- Need incremental and reversible control
- Need immediate display feedback
- No complex syntax
- Minimize computer concepts
- The VR should contain representations for objects and actions, e.g. a tool to change the shape of windows, as well as the windows.
- Designers should gain knowledge of cognitive psychology and human perception, so as to give feelings such as depth and movement realistically.

Exercices: Interaction styles

Interaction style	Main advantages	Main disadvantages	Application examples
Direct manipulation	Fast and intuitive interaction Easy to learn	May be hard to implement. Only suitable where there is a visual metaphor for tasks and objects.	Video games CAD systems
Menu selection	Avoids user error Little typing required	Slow for experienced users. Can become complex if many menu options.	Most general-purpose systems
Form fill-in	Simple data entry Easy to learn Checkable	Takes up a lot of screen space. Causes problems where user options do not match the form fields.	Stock control, Personal loan processing
Command language	Powerful and flexible	Hard to learn. Poor error management.	Operating systems, Command and control systems
Natural language	Accessible to casual users Easily extended	Requires more typing. Natural language understanding systems are unreliable.	Information retrieval systems

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3. Design principles

Principle	Description
User familiarity	The interface should use terms and concepts which are drawn from the experience of the people who will make most use of the system.
Consistency	The interface should be consistent in that, wherever possible, comparable operations should be activated in the same way.
Minimal surprise	Users should never be surprised by the behaviour of a system.
Recoverability	The interface should include mechanisms to allow users to recover from errors.
User guidance	The interface should provide meaningful feedback when errors occur and provide context-sensitive user help facilities.
User diversity	The interface should provide appropriate interaction facilities for different types of system user.

Human Interface Engineering Key Functions

- UI Design
 - User research
 - User interaction design
 - Graphic design
- Technical Writing
 - Technical documentation
 - Online help
- Localization
 - UI and manual translation into local languages