THE INTERACTION PARADIGMS

Another form of inspiration for conceptual models. From the desktop to ubiquitous computing (embedded in the environment) Examples of new paradigms

Ubiquitous computing (mother of them all), Pervasive computing, Wearable computing,

Tangible bits, augmented reality, Attentive environments, Transparent computing, 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

VARIOUS INTERACTION STYLES

Model of Interaction - Norman's model of interaction (1988) most influential in HCI

interaction cycle has two major phases - Execution and Evaluation

Establish the goal, Forming the intention, Specifying the action sequence, Executing the action, Perceiving the system state, Interpreting the system state, Evaluating the system state w.r.t. goals, and intentions

Interaction is achieved through both the dialogue design and Interface styles in which Execution and evaluation depends on input language (dialogue)

The user's ease in manipulating the interface through the input device.

Clear mapping from dialogue to task 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.

Command language style - *Method*...expresses instructions directly to computer, using function keys, single characters, abbreviations or whole word commands. Examples dos or unix operating systems, programming languages, natural language interaction, accelerated access in menu screens in window systems

Advantages: powerful, flexible, quick, 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

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.

Primary goals for menu designers

Break into logical categories - Create a sensible, comprehensible, memorable, and convenient semantic organisation relevant to the user's task:

Hierarchical decomposition - *every item belongs to a single category*

Organization 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

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.

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

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

Colour - three components: hue, intensity, saturation generally overused so care is needed change to black and white image to determine legibility, 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 to perceive do not use colour alone to carry key information

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.
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.
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, 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,
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. The interface in direct manipulation bridges the gaps in both the "gulf of execution" and "gulf of explanation".
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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. 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
eg desktop metaphors: waste-basket, files, folders, clipboard.
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, eg 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), 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 bars, pop-up menus, pull down menus, circular menus
Pointers point and select, modes, hot spot - location where the image points
Learning toolbar/ keyboard accelerator key combinations + icon representation + select menu option
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

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, eg aircraft training natural interaction: gestures typical of manipulating everyday objects. picking up, turning around, throwing and so on.

Immersion versus desktop

immersion-"looking in" perspective helmet, datagloves and 3d world, providing a subjective feeling of environment metaphor of racing car travel: compare to theme park activity - 3d world

desktop - "looking at" perspective single screen for input and output, 3d mouse and keyboard, use of shadow, changing environments to indicate motion eg metaphor of moving through rooms as in games and 3d web environments

Technology includes:

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?

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

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