UNIT- II

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The Graphical User Interface

A user interface is a collection of techniques and mechanisms to interact with something.

In Graphical interface, the primary interaction mechanism is a pointing device of some kind.

→ User interacts with collection of elements referred to as objects. They can be seen, heard, touched, or otherwise perceived (become aware of).

→ People perform operations on objects, called actions. The operations include accessing and modifying objects by pointing, selecting, and manipulating. All objects have standard resulting behaviors.

The Popularity of Graphics

Graphics revolutionized design and the user interface. The older text-based screen possessed a one-dimensional, text-oriented, form-like quality, graphic screens assumed a three-dimensional look. Information floated in windows, small rectangular boxes seemed to rise above the background plane. windows could also float above other windows. controls appeared to rise above the screen and move when activated. Lines appeared to be etched into the screen. Information could appear, and disappear, as needed. Text could be replaced by graphical images called icons. These icons could represent objects or actions.

Screen navigation and commands are executed through menu bars and Pull-downs. Menus "Popup" on the screen. In the screen body, selection fields such as radio buttons, checkboxes, list boxes, and Palettes coexisted with the

reliable old text entry field. Screen objects and actions were selected through use of pointing mechanisms, such as mouse or joystick, instead of the traditional keyboard.

Increased computer power and the vast improvement in the display enable the user's actions to be reacted to quickly, dynamically, and meaningfully. Through use WIMP interface: windows, icons, menus, and pointers.

advantages of Graphics 1. reduces memory loads.
2. faster information transfer.
3. more compact representation of information.

The concept of direct manipulation

Direct manipulation systems posses the following characteristics:

describe
- The system is portrayed as an extension of the real world.
- continuous visibility of objects and actions.

WYSIWYG

one problem with direct manipulation, there is no direct analogy on the desk for all necessary windowing operations. windows can shrink & grow.

- Actions are rapid and incremental with visible display of results.
- Incremental actions are easily reversible.
  incorrect actions can be undone

Indirect manipulation In practice, direct manipulation of all screen objects and actions may not be feasible because of the following:

- The operation may be difficult to conceptualize in the graphical system.
- The graphics capability of the system may be limited.

- The amount of space available for placing manipulation controls in the window border may be limited.
- It may be difficult for people to learn and remember all the necessary operations and actions.

Most window systems are a combination of both direct and indirect manipulation.

→ A menu may be accessed by pointing at a menu icon and then selecting it (direct manipulation).

→ The menu itself is a textual list of operations (indirect manipulation).

Graphical Systems: Advantages and Disadvantages

Advantages

- Symbols recognized faster than text.
- Faster learning.
- Faster use and problem solving: symbols have also been found to be effective in conveying simple instructions.
- Easier remembering.
- More natural
- Exploits visual/spatial cues: visually thinking is believed to be better than logical thinking.
- Fosters more concrete thinking: The need for abstract thinking is therefore minimized.
- Provides content.
- Fewer errors: more concrete thinking affords fewer opportunities for errors
- Increased feeling of control.
- Immediate feedback: learning is quickened.
- Predictable system responses.
- Easily reversible actions.
- Less anxiety concerning use.

- more attractive.
- may consume less space.
- Replaces national languages.
- easily augmented with text displays.
- Low typing requirements.
- Smooth transition from command language system.

Disadvantages

- Greater design complexity. Poor design can undermine acceptance.
- Learning still necessary. The meanings of many words & icons may not be known.
- Lack of experimentally-derived design guidelines.
- Inconsistencies in technique & terminology.
- working domain is the present.
- not always familiar.
- Human comprehension limitations.
- window manipulation requirements.
- Production limitations.
- Few tested icons exist.
- Inefficient for touch typists. moving a mouse is slower.
- Inefficient for expert users.
- not always the preferred style of interaction.
- not always fastest style of interaction.
- Increased chances of clutter and confusion.
- The flitz and fiddle factor.
- may consume more screen space.
- Hardware limitations.

characteristics of the GUI

- sophisticated visual presentation. windows (primary, secondary, dialog boxes), menus (menu bar, pull-down, pop-up, cascading), icons, asserted screen-based controls (text boxes, list boxes, combination boxes, settings, scroll bars, and buttons) and a mouse and cursor.
- Pick-and-click interaction. Pick & click ; keyboard.
- Restricted set of Interface options
- visualization.
- Object orientation. A graphical system consists of objects & classes - 3 actions. relationships
Data objects, container objects, Device objects, collection, constraint, composite container, etc.
  Properties of attributes of objects
  - Actions
  - Appln vs object & Data Orientation.
  - views : composed, contents, settings & help
- Use of Recognition memory.
- Concurrent performance of Functions.

The web User Interface

It is essentially the design of navigation and the presentation of information. It is about content, not data. The web is a navigation environment where people move between pages of information, not an application environment. web interface design is difficult for the following reasons.

(i) its underlying design language, HTML.
(ii) Browser navigation set created to the Pre-GUI era.

The Popularity of the web

while the GUI revolutionized the user interface, the web has revolutionized Computing. It allows millions of people scattered across the globe to communicate, access information, publish, and be heard. It allows people to control much of the display and the rendering of web pages.

web usage has reflected this popularity. The number of internet hosts has risen dramatically. In 1984, hosts online exceeded 1,000; in 1987, 10,000; in 1989, 1,00,000, in 1990, 3,00,000; in 1992 hosts exceeded one million. In 1993, Internet traffic was expanding at a 3,41,634 percent annual growth rate. In 1996, there were nearly 10 million hosts online and 40 million connected people.

characteristics of a web Interface

GUI vs web Design

	GUI	web
Devices	- user h/w variations limited. - user h/w characteristics well defined. - screens appear exactly as specified	- user h/w variations enormous. - screen appearance ~~instead~~ influenced by h/w being used.
User focus	- Data & applications	- Information & navigation
Data/Information	- Typically created & used by known & trusted sources. - Properties generally known. - Typically placed into system by users or known people & organizations. - Typically organized in a meaningful fashion. - A notion of private & shared data exists	- Full of unknown content - source not always trusted. - often not placed onto the web by users or known people & organizations - Highly variable organization. - Privacy often suspect.
User tasks	- Install, configure, personalize, start, use, and upgrade programs. - open, use, and close data files. - Fairly long times spent within an appln. - Familiarity with applications often achieved.	- link to a site, browse or read pages, fill out forms, register for services, participate in transactions, download & save things. - Movement b/n pages & sites very rapid. - Familiarity with many sites not established.

	GUI	WEB
User's conceptual space	- controlled and constrained by program.	- Infinite and generally unorganized.
Presentation Elements	- windows, menus, controls, data, toolbars, and soon. - Many transient, dynamically appearing and disappearing. - Presented as specified by designer. - Generally standardized by toolkits and style guides.	- Two components, browser & page. - within page, any combination of text, images, audio, video, & animation. - may not be presented as specified by the designer dependent on browser, monitor, and user specs. - little standardization.
Navigation	- Through menus, lists, trees, dialogs, and wizards. - not a strong & visible concept. - constrained by design. - Generally standardized by toolkits & style guides.	- Through links, book marks, and typed URLs. - Significant and highly visible concept. - Few constraints, frequently causing a lost "sense of place". - Few standards. - Typically part of page design, fostering a lack of consistency.
context	- Enables maintenance of a better sense of context - Restricted navigation paths. - multiple viewable windows.	- Poorer maintenance of a sense of context - Single-page entities. - Unlimited navigation paths. - Contextual clues become limited & are difficult to find.
Interaction	- Interactions such as clicking menu choices, pressing buttons, selecting list choices, and cut/copy/paste occur within context of active program.	- Basic interaction is a single click. This can cause extreme change in context, which may not be noticed.

	GUI	Web
Response time	nearly instantaneous.	quite variable, depending on transmission speeds, page content, and so on. Long times can upset the user.
visual style	- Typically prescribed and constrained by toolkit. - visual creativity allowed but difficult. - Little significant personalization.	- Fosters a more artistic, individual, and unrestricted presentation style. complicated by differing browser and display capabilities, and bandwidth limitations. - limited personalization available.
System capability	unlimited	limited by constraints
Task efficiency	- Targeted to a specific audience with specific tasks. - only limited by the amount of programming undertaken to support it.	- Actual user audience usually not well understood - often intended for anyone & everyone. - limited by browser and n/w capabilities.
consistency	- major objective exists within & across apps.	- little consistency across sites.
user assistance	- Provided through Functional keys (F1, Help etc)	- 00 such help systems.
Integration	- seamless integration of all applications into the platform environment a major objective.	- Apparent for some basic functions within most web sites (navigation, printing, & so on).
Security	- security is not an issue for most PC users.	- Renowned for security exposures.
Reliability	- not an issue	- A lack of reliability can be a great inhibitor of web use.

Printed Pages vs Web Pages

- Page size. Printed pages are generally larger than their web counterparts. They are also fixed in size, not variable like web pages.
- Page rendering. Printed pages are immensely superior to web pages in rendering. web pages' elements often rendered slowly.
- Page layout. printed page- layout is precise webpage- layout is more of an approximation.
- Page Resolution. screen reading is still slower than reading from a document.
- User focus.
- Page navigation. navigating printed materials is as simple as page turning. webpage - links should be followed.
- Sense of place.
- Interactivity.
- Page Independence. moving b/n web pages is so easy.

Principles of User Interface Design

The interface itself should serve as both a connector and a separator: a connector in that it ties the user to the power of the computer, and a separator in that it minimizes the possibility of the participants damaging one another.

Principles for the Xerox STAR

first mouse introduced in 1981

- The illusion of manipulable objects: displayed objects that are selectable and manipulable must be created. graphics with handles on it.
- visual order and viewer focus: pointer is usually the focus of viewer attention.
- ~~Reliable~~ Revealed structure: The distance b/n one's intention and the effect must be minimized. the underlying structure is often revealed during the selection process.

- consistency: consistency aids learning.
- Appropriate effect & emotional impact: The interface must provide the appropriate emotional effect on the product and its market.
- A match with the medium: The interface must also reflect the capabilities of the device on which it will be displayed.

General Principles

The design goals for creating a UI are described below.

Aesthetically pleasing A design aesthetic, or visually pleasing composition, is attractive to the eye. It draws attention subliminally, conveying a message clearly & quickly

Provide visual appeal by following these presentation & graphic design principles:
- Provide meaningful contrast bw screen elements.
- create Groupings. - Align screen elements & groups.
- Provide 3D Representation. - use color & graphics effectively & simply.

clarity The interface should be visually, conceptually, and linguistically clear, including:
- visual elements.
- Functions.
- metaphors & analogies.
- words & text.

Compatibility Provide compatability with the following:
- The user. → "know" the user" fundamental principles of UI.
- The task and job.
- The Product.

- Adopt the user's perspective.

comprehensibility

- A system should be easily learned and understood. A user should know the following:
  - what to look at
  - what to do
  - when to do it
  - where to do it.
  - why to do it.
  - How to do it.
- The flow of actions, responses, visual presentations, and information should be in a sensible order that is easy to recollect and place in context.

configurability

- Permit easy personalization, configuration, and reconfiguration of settings.
  - Enhances a sense of control.
  - Encourages an active role in understanding.

consistency

- A system should look, act, and operate the same throughout. Similar components should:
  - Have a similar look.
  - Have similar uses.
  - Operate similarly.
- The same action should always yield the same result.
- The function of elements should not change.
- The position of standard elements should not change.

control control is feeling in charge, feeling that the system is responding to your actions.

- The user must control the interaction.
  - Actions should result from explicit user requests.

- Actions should be performed quickly.
- Actions should be capable of interruption & termination.
- The user should never be interrupted for errors.

- the content maintained must be from the perspective of the user.
- The means to achieve goals should be flexible & compatible with the user's skills, experiences, habits, & preferences.
- Avoid modes since they constrain the actions available to the user.
- Permit the user to customize aspects of the interface, while always providing a proper set of defaults.

Directness Tasks should be performed directly.

- Provide direct ways to accomplish tasks.
  - Available alternatives should be visible.
  - The effect of actions on objects should be visible.

Efficiency

- minimize eye and hand movements, and other control actions.
  - transitions b/n various system controls should flow easily & freely.
  - navigation paths should be as short as possible.
  - Eye movement through a screen should be obvious & sequential.
- Anticipate the user's wants and needs whenever possible.

Familiarity

- Employ familiar concepts & use a language that is familiar to the user.
- Keep the interface natural, mimicking the user's behavior patterns.
- use real-world metaphors (analogies).

Flexibility Flexibility is the system's ability to respond to individual differences in people.

- A system must be sensitive to the differing needs of its users, enabling a level and type of performance based upon:

- Each user's knowledge and skills.
- Each user's experience.
- Each user's personal preference.
- Each user's habits.
- the conditions at that moment.

Forgiveness People will make mistakes, a system should tolerate those that are common and unavoidable. A forgiving system keeps people out of trouble.

- Tolerate and forgive common and unavoidable human errors.
- Prevent errors from occurring whenever possible.
- Protect against possible catastrophic errors.
- when an error does occur, provide constructive messages.

Predictability Anticipation, & predictability, reduces mistakes and enables tasks to be completed more quickly.

- The user should be able to anticipate the natural progression of each task.
  - Provide distinct and recognizable screen elements.
  - Provide cues to the result of an action to be performed.
- All expectations should be fulfilled uniformly and completely.

Recovery Recovery should be obvious, automatic, easy and natural to perform. The goal is stability, or returning easily to the right track when a wrong track has been taken.

- A system should permit:
  - commands or actions to be abolished or reversed.
  - Immediate return to a certain point if difficulties arise.
- Ensure that users never lose their work as a result of:
  - An error on their part.
  - H/w, s/w, or communication problems.

Responsiveness A user request must be responded to quickly.

- The system must rapidly respond to the user's requests.
- Provide immediate acknowledgement for all user actions:
  - Visual.
  - Textual.
  - Auditory.

Simplicity Simplicity is the opposite of complexity. Complexity is a measure of the no. of choices available at any point in the human-computer interaction.

- Provide as simple an interface as possible.
- Five ways to provide simplicity:
  - Use progressive disclosure, hiding things until they are needed.
    - Present common and necessary functions first.
    - Prominently feature important functions.
    - Hide more sophisticated & less frequently used functions.
  - Provide defaults.
  - Minimize screen alignment points.
  - Make common actions simple at the expense of uncommon actions being made harder.
  - Provide uniformity and consistency.

Transparency

- Permit the user to focus on the task or job, without concern for the mechanics of the interface.
  - cookings and remainders of cookings inside the computer should be invisible to the user.

Trade-offs - Final design will be based on a series of trade-offs balancing often-conflicting design principles.

Trade-offs concerning accuracy, time, cost & ease of use.

- People's requirements always take precedence over technical requirements.

How well does the system meet the needs of the user?