UNIT – IV

USER INTERFACE DESIGN AND REAL TIME SYSTEMS

User Interface Design

1. What are the golden rules for user interface design?

A. There are three golden rules for user interface design?

1. Place the user in control:

- Define interaction modes in a way that does not force a user into unnecessary or undesired actions.
- Provide for flexible interaction.
- Allow user interaction to be interruptible and undoable.
- Streamline interaction as skill levels advance and allow the interaction to be customized.
- Hide technical internals from the casual user. Design for direct interaction with objects that appear on the screen.

2. Reduce the user's memory load: Mandel defines design principles that enable an interface to reduce the user's memory load:

- Reduce demand on short-term memory.
- Establish meaningful defaults.
- Define shortcuts that are intuitive.
- The visual layout of the interface should be based on a real-world metaphor.
- Disclose information in a progressive fashion.

3. Make the interface consistent: The interface should present and acquire information in a consistent fashion.

- Maintain consistency across a family of applications
- If past interactive models have created user expectations, do not make changes unless there is a compelling reason to do so.

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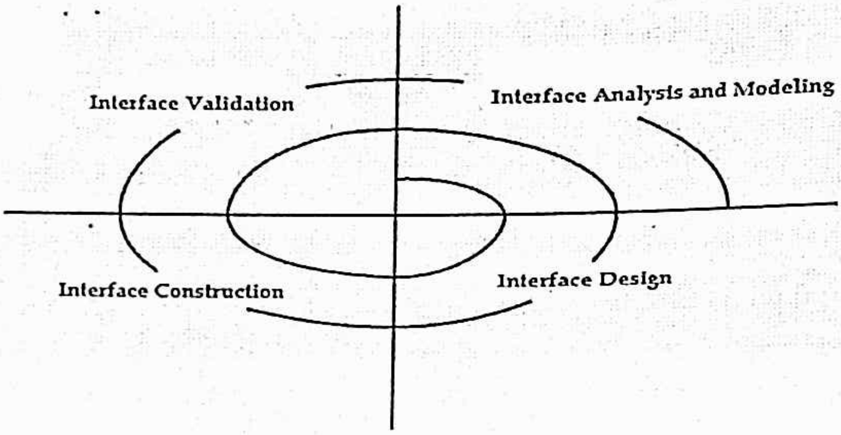
2. Explain user interface analysis and design?

A. The overall process for analyzing and designing a user interface begins with the creation of different models of system function.

Interface Analysis and Design Model: Four different models come into play when a user interface is to be analyzed and designed. A human engineer (or the software engineer) establishes a *user model*, the software engineer creates a *design model*, and the end user develops a mental image that is often called the *user's mental model* or the *system perception*, and the implementers of the system create an *implementation model*.

The Process: The analysis and design process for user interfaces is iterative and it follows the steps:

(1) Interface analysis and modeling,
(2) Interface design,
(3) Interface construction, and
(4) Interface validation.



Interface analysis focuses on the profile of the users who will interact with the system. The goal of *interface design* is to define a set of interface objects and actions *Interface construction* normally begins with the creation of a prototype that enables usage scenarios to be evaluated. *Interface validation* focuses on (1) the ability of the interface to implement every user task correctly, to accommodate all task variations, and to achieve all general user requirements; (2) the degree to which the interface is easy to use and easy to learn, and (3) the users' acceptance of the interface as a useful tool in their work.

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3. Explain Task analysis and Modeling?

A. The goal of task analysis is to answer the following questions:

- What work will the user perform in specific circumstances?
- What tasks and subtasks will be performed as the user does the work?
- What specific problem domain objects will the user manipulate as work is performed?
- What is the sequence of work tasks—the workflow?
- What is the hierarchy of tasks?

To answer these questions, techniques are drawn, these techniques are applied to the user interface.

Use Cases: Use case provides a basic description of one important work task for the computer-aided design system. From it, you can extract tasks, objects, and the overall flow of the interaction.

Task Elaboration: Task analysis for interface design uses an elaborative approach to assist in understanding the human- activities the user interface must accommodate. Task analysis can be applied in-two ways – interactive and manual.

Object Elaboration: Rather than focusing on the tasks that a user must perform, you can examine the use case and other information obtained from the user and extracts the physical objects that are used by the interior designer. These objects can be categorized into classes.

Workflow Analysis: When a number of different users, each playing different roles, makes use of a user interface, it is sometimes necessary to go beyond task analysis and object elaboration and apply *workflow analysis*. This technique allows understanding how a work process is completed when several people are involved.

Hierarchical Representation: A process of elaboration occurs as you begin to analyze the interface. Once workflow has been established, a task hierarchy can be defined for each user type. The hierarchy is derived by a stepwise elaboration of each task identified for the user.

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4. Explain Interface Design Steps?

A. Once interface analysis has been completed, all tasks (or objects and actions) required by the end user have been identified in detail and the interface design activity commences. Although many different user interface design models have been proposed, all suggest some combination of the following steps:

1. Using information developed during interface analysis; define interface objects and actions (operations).
2. Define events (user actions) that will cause the state of the user interface to change.
3. Depict each interface state as it will actually look to the end user.
4. Indicate how the user interprets the state of the system from information provided through the interface.

Applying interface design steps: Once the objects and actions have been defined and elaborated iteratively, they are categorized by type. Target, source, and application objects are identified. A source object (e.g., a report icon) is dragged and dropped onto a target object.

User interface design patterns: Graphical user interfaces have become so common that a wide variety of user interface design patterns has emerged.

Design Issues: As the design of a user interface evolves, four common design issues almost always surface: system response time, user help facilities, error information handling, and common labeling.

Response Time: System response time is the primary complaint for many interactive applications. In general, system response time is measured from the point at which the user performs some control action (e.g., hits the return key or clicks a mouse) until the software responds with desired output or action.

Help Facilities: Almost every user of an interactive, computer-based system requires help now and then.

Error Handling: Error messages and warnings are "bad news" delivered to users of interactive systems when something has gone awry.

Menu and Command labeling: A number of design issues arises when typed commands or menu labels are provided as a mode of interaction:

- Will every menu option have a corresponding command?
- Are menu labels self-explanatory within the context of the interface?
- Are submenus consistent with the function implied by a master menu item?

Application Accessibility: A variety of accessibility guidelines—many designed for Web applications but often applicable to all types of software—provide detailed suggestions for designing interfaces that achieve varying levels of accessibility.

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5. Explain software User Interface Design?

A. User interface is the front-end application view to which user interacts in order to use the software. User can manipulate and control the software as well as hardware by means of user interface. Today, user interface is found at almost every place where digital technology exists, right from computers, mobile phones, cars, music players, airplanes, ships etc.

User interface is part of software and is designed such a way that it is expected to provide the user insight of the software. UI provides fundamental platform for human-computer interaction.

UI can be graphical, text-based, audio-video based, depending upon the underlying hardware and software combination. UI can be hardware or software or a combination of both.

The software becomes more popular if its user interface is:

- Attractive
- Simple to use
- Responsive in short time
- Clear to understand .
- Consistent on all interfacing screens

UI is broadly divided into two categories:

- Command Line Interface
- Graphical User Interface

Command Line Interface (CLI)

CLI has been a great tool of interaction with computers until the video display monitors came into existence. CLI is first choice of many technical users and programmers. CLI is minimum interface software can provide to its users.

CLI provides a command prompt, the place where the user types the command and feeds to the system. The user needs to remember the syntax of command and its use. Earlier CLI were not programmed to handle the user errors effectively.

A text-based command line interface can have the following elements:

- **Command Prompt** - It is text-based notifies that is mostly shows the context in which the user is working. It is generated by the software system.
- **Cursor** - It is a small horizontal line or a vertical bar of the height of line, to represent position of character while typing. Cursor is mostly found in blinking state. It moves as the user writes or deletes something.
- **Command** - A command is an executable instruction. It may have one or more parameters. Output on command execution is shown inline on the screen. When output is produced, command prompt is displayed on the next line.

Graphical User Interface:

Graphical User Interface provides the user graphical means to interact with the system. GUI can be combination of both hardware and software. Using GUI, user interprets the software.

Typically, GUI is more resource consuming than that of CLI. With advancing technology, the programmers and designers create complex GUI designs that work with more efficiency, accuracy and speed.

GUI Elements

GUI provides a set of components to interact with software or hardware.

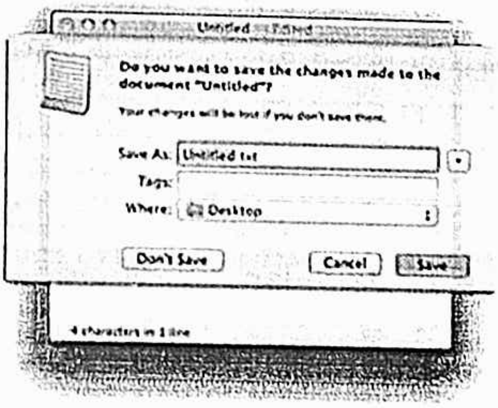
Every graphical component provides a way to work with the system. A GUI system has following elements such as:

- **Window** - An area where contents of application are displayed. Contents in a window can be displayed in the form of icons or lists, if the window represents file structure. It is easier for a user to navigate in the file system in an exploring window. Windows can be minimized, resized or maximized to the size of screen. They can be moved anywhere on the screen. A window may contain another window of the same application, called child window.
- **Tabs** - If an application allows executing multiple instances of itself, they appear on the screen as separate windows. **Tabbed Document Interface** has come up to open multiple documents in the same window. This interface also helps in viewing preference panel in application. All modern web-browsers use this feature.
- **Menu** - Menu is an array of standard commands, grouped together and placed at a visible place (usually top) inside the application window. The menu can be programmed to appear or hide on mouse clicks.
- **Icon** - An icon is small picture representing an associated application. When these icons are clicked or double clicked, the application window is opened. Icon displays application and programs installed on a system in the form of small pictures.
- **Cursor** - Interacting devices such as mouse, touch pad, digital pen are represented in GUI as cursors. On screen cursor follows the instructions from hardware in almost real-time. Cursors are also named pointers in GUI systems. They are used to select menus, windows and other application features.

Application specific GUI components

A GUI of an application contains one or more of the listed GUI elements:

- **Application Window** - Most application windows uses the constructs supplied by operating systems but many use their own customer created windows to contain the contents of application.
- **Dialogue Box** - It is a child window that contains message for the user and request for some action to be taken. For Example: Application generate a dialogue to get confirmation from user to delete a file.



Do you want to save the changes made to the document "Untitled"?

Your changes will be lost if you don't save them.

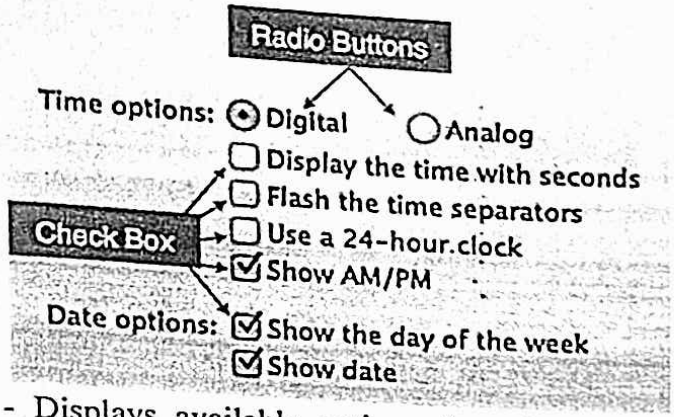
Save As: Untitled.txt

Tags:

Where: Desktop

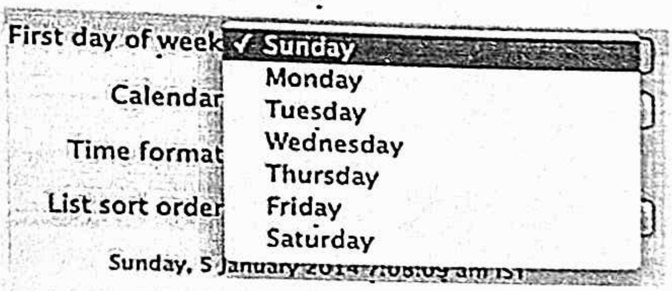
- **Text-Box** - Provides an area for user to type and enter text-based data.

- **Buttons** - They imitate real life buttons and are used to submit inputs to the software.



Time options: ● Digital ○ Analog
☐ Display the time with seconds
☐ Flash the time separators
☐ Use a 24-hour clock
☑ Show AM/PM
Date options: ☑ Show the day of the week
☑ Show date

- **Radio-button** - Displays available options for selection. Only one can be selected among all offered.
- **Check-box** - Functions similar to list-box. When an option is selected, the box is marked as checked. Multiple options represented by check boxes can be selected.
- **List-box** - Provides list of available items for selection. More than one item can be selected.



First day of week: ✓ Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Calendar
Time format
List sort order
Sunday, 5 January 2014 7:06:09 am IST

Other impressive GUI components are:

- Sliders
- Combo-box
- Data-grid
- Drop-down list

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