

LECTURE NOTES
ON
HUMAN COMPUTER INTERACTION
B.TECH CSE IV YEAR I SEMESTER
(JNTUA-R13)

Prof. R. SURESH
PROFESSOR



DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
CHADALAWADA RAMANAMMA ENGINEERING COLLEGE
CHADALAWADA NAGAR, RENIGUNTA ROAD, TIRUPATI (A.P) - 517506

HUMAN COMPUTER INTERACTION

UNIT-I

Introduction : Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design.

The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics,

Web user – Interface popularity, characteristics- Principles of user interface.

TEXT BOOK :

1. The essential guide to user interface design, by Wilbert O.Galitz, Wiley Dream Tech.

The user Interface- An Introduction and Overview

I. Introduction:

Human–computer interaction (**HCI**), alternatively man–machine interaction (**MMI**) or computer–human interaction (**CHI**) is the study of interaction between people (users) and computers.

With today's technology and tools, and our motivation to create really effective and usable interfaces and screens, why do we continue to produce systems that are inefficient and confusing or, at worst, just plain unusable? Is it because:

- We don't care?
- We don't possess common sense?
- We don't have the time?
- We still don't know what really makes good design?

Definition of HCI:

"Human-computer interaction is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them."

Goals:

1.A basic goal of HCI is

- to improve the interactions between users and computers by making computers more usable and receptive to the user's needs.

2.A long term goal of HCI is

- to design systems that minimize the barrier between the human's cognitive model of what they want
- to accomplish and the computer's understanding of the user's task

Why is HCI important?

- User-centered design is getting a crucial role!
- It is getting more important today to increase competitiveness via HCI studies (Norman, 1990)
- High-cost e-transformation investments
- Users lose time with badly designed products and services
- Users even give up using bad interface
 - Ineffective allocation of resources

Defining the User Interface:

- User interface, design is a subset of a field of study called *human-computer interaction* (HCI).
- Human-computer interaction is the study, planning, and design of how people and computers work together so that a person's needs are satisfied in the most effective way.
- HCI designers must consider a variety of factors:
 - What people want and expect, physical limitations and abilities people possess,
 - How information processing systems work,
 - What people find enjoyable and attractive.
 - Technical characteristics and limitations of the computer hardware and software must also be considered.
- The *user interface* is
 - the part of a computer and its software that people can see, hear, touch, talk to, or otherwise understand or direct.
- The user interface has essentially two components: input and output.
- *Input* is how a person communicates his / her needs to the computer.
 - Some common input components are the keyboard, mouse, trackball, one's finger, and one's voice.
- *Output* is how the computer conveys the results of its computations and requirements to the user.
 - Today, the most common computer output mechanism is the display screen, followed by mechanisms that take advantage of a person's auditory capabilities: voice and sound.
- The use of the human senses of smell and touch output in interface design still remain largely unexplored.
- Proper interface design will provide a mix of well-designed input and output mechanisms that satisfy the user's needs, capabilities, and limitations in the most effective way possible.
- The best interface is one that is not noticed, one that permits the user to focus on the information and task at hand, not the mechanisms used to present the information and perform the task.

The Importance of Good Design:

- With today's technology and tools, and our motivation to create really effective and us-able interfaces and screens, why do we continue to produce systems that are inefficient and confusing or, at worst, just plain unusable? Is it because:
 - We don't care?
 - We don't possess common sense?
 - We don't have the time?
 - We still don't know what really makes good design?
- But we never seem to have time to find out what makes good de-sign, nor to properly apply it. After all, many of us have other things to do in addition to designing interfaces and screens.
- So we take our best shot given the workload and time constraints imposed upon us. The result, too often, is woefully inadequate.
- Interface and screen design were really a matter of common sense, we developers would have been producing *almost identical* screens for representing the real world.
- Example bad designs
 - Closed door with complete wood
 - Suggestion : glass door

The Importance of the User Interface:

- A well-designed interface and screen is terribly important to our users. It is their window to view the capabilities of the system.
- It is also the vehicle through which many critical tasks are presented. These tasks often have a direct impact on an organization's relations with its customers, and its profitability.
- A screen's layout and appearance affect a person in a variety of ways. If they are con-fusing and inefficient, people will have greater difficulty in doing their jobs and will make more mistakes.
- Poor design may even chase some people away from a system permanently. It can also lead to aggravation, frustration, and increased stress.

The Benefits of Good Design:

- Poor clarity forced screen users to spend one extra second per screen.
 - Almost one additional year would be required to process all screens.
 - Twenty extra seconds in screen usage time adds an additional 14 person years.
- The benefits of a well designed screen have also been under experimental scrutiny for many years.
 - One researcher, for example, attempted to improve screen clarity and readability by making screens less crowded.

- Separate items, which had been combined on the same display line to conserve space, were placed on separate lines instead.
- The result screen users were about 20 percent more productive with the less crowded version
- Proper formatting of information on screens does have a significant positive effect on performance.
 - In recent years, the productivity benefits of well-designed Web pages have also been scrutinized.
- Training costs are lowered because training time is reduced.
- Support line costs are lowered because fewer assist calls are necessary.
- Employee satisfaction is increased because aggravation and frustration are reduced.
- Ultimately, that an organization's customers benefit because of the improved service they receive.
- Identifying and resolving problems during the design and development process also has significant economic benefits
- How many screens are used each day in our technological world?
- How many screens are used each day in your organization? Thousands? Millions?
- Imagine the possible savings. Proper screen design might also, of course, lower the costs.

A Brief History of the Human Computer Interface:

- The need for people to communicate with each other has existed since we first walked upon this planet.
- The lowest and most common level of communication modes we share are movements and gestures.
- Movements and gestures are language- independent, that is, they permit people who do not speak the same language to deal with one another.
- The next higher level, in terms of universality
- Most people can speak one language, some two or more. A spoken language is a very efficient mode of communication if both parties to the communication understand it.
- At the third and highest level of complexity is written language. While most people speak, not all can write.
- But for those who can, writing is still nowhere near as efficient a means of communication as speaking.
- In modern times, we have the typewriter, another step upward in communication complexity.
- Significantly fewer people type than write. (While a practiced typist can find typing faster and more efficient than handwriting, the unskilled may not find this the case.)

- Spoken language, however, is still more efficient than typing, regardless' of typing skill level.
- Through its first few decades, a computer's ability to deal with human communication was inversely related to what was easy for people to do.
- The computer demanded rigid, typed input through a keyboard; people responded slowly using this device and with varying degrees of skill.
- The human-computer dialog reflected the computer's preferences, consisting of one style or a combination of styles using keyboards, commonly referred to as Command Language, Question and answer, Menu selection, Function Key Selection, and Form Fill-In.
- Throughout the computer's history, designers have been developing, with varying degrees of success, other human-computer interaction methods that utilize more general, widespread, and easier-to-learn capabilities: voice and handwriting.
- Systems that recognize human speech and handwriting now exist, although they still lack the universality and richness of typed input.

Introduction of the Graphical User Interface:

- The Xerox systems, Altus and STAR, introduced the mouse and pointing and selecting as the primary human-computer communication method.
- The user simply pointed at the screen, using the mouse as an intermediary.
- These systems also introduced the graphical user interface as we know it a new concept was born, revolutionizing the human-computer interface.

A Brief History of Screen Design:

- While developers have been designing screens since a cathode ray tube display was first attached to a computer, more widespread interest in the application of good design principles to screens did not begin to emerge until the early 1970s, when IBM in-troduced its 3270 cathode ray tube text-based terminal.
- A 1970s screen often resembled the one pictured in Figure 1.1. It usually consisted of many fields (more than are illustrated here) with very cryptic and often unintelligible captions.
- It was visually cluttered, and often possessed a command field that challenged the user to remember what had to be keyed into it.
- Ambiguous messages often required referral to a manual to interpret.
- Effectively using this kind of screen required a great deal of practice and patience.
- Most early screens were mono-chromatic, typically presenting green text on black backgrounds.

The Popularity of Graphics:

- A graphical screen bore scant resemblance to its earlier text-based colleagues.
- older text-based screen possessed a one dimensional
- graphic screens assumed a three-dimensional look.
- Controls appeared to rise above the screen and move when activated.
- Information could appear, and disappear, as needed.
- Text could be replaced by graphical images called icons.
- These icons could represent objects or actions
- Selection fields such as radio but-tons, check boxes, list boxes, and palettes coexisted with the reliable old text entry field.
- More sophisticated text entry fields with attached or drop-down menus of.
- Objects and actions were selected through use of pointing mechanisms.
- Increased computer power .
- User's actions to be reacted to quickly, dynamically, and meaningfully.
- WIMP interface: windows, icons, menus, and pointers.
- Graphic presentation is much more effective than other presentation methods.
- Properly used, it re-duces the requirement for perceptual and mental information recoding and reorganization, and also reduces the memory loads.
- It permits faster information trans-fer between computers and people by permitting more visual comparisons of amounts, trends, or relationships; more compact representation of information;
- Graphics also can add appeal or charm to the inter-face and permit greater customization to create a unique corporate or organization style.

Graphical Systems: Advantages and Disadvantages:

- Reduce the memory requirements.
- More effective use of one's information
- Dramatically reduce system learning requirements.
- Experience indicates that for many people they have done all these things.

Advantages :

- Symbols recognized faster than text
- Faster learning
- Faster use and problem solving
- Easier remembering
- More natural

- Exploits visual/spatial cues
- Fosters more concrete thinking
- Provides context
- Fewer errors
- Increased feeling of control
- Immediate feedback
- Predictable system responses
- Easily reversible actions
- Less anxiety concerning use
- More attractive
- May consume less space
- Replaces national languages
- Easily augmented with text displays
- Smooth transition from command language system

Disadvantages:

- Greater design complexity
- Learning still necessary
- Replaces national languages
- Easily augmented with text displays
- Smooth transition from command language system
- Lack of experimentally-derived design guidelines
- use a pointing device may also have to be learned
- Working domain is the present
- Human comprehension limitations
- Window manipulation requirements
- Production limitations
- Few tested icons exist
- Inefficient for touch typists
- Inefficient for expert users
- Not always the preferred style of interaction
- Not always fastest style of interaction
- Increased chances of clutter and confusion
- May consume more screen space
- Hardware limitations

The Concept of Direct Manipulation:

The system is portrayed as an extension of the real world:

- It is assumed that a person is already familiar with the objects and actions in his or her environment of interest.
- The system simply replicates them and portrays them on a different medium, the screen.
- A person has the power to access and modify these objects, among which are windows.
- A person is allowed to work in a familiar environment and in a familiar way, focusing on the data, not the application and tools.
- The physical organization of the system, which most often is unfamiliar, is hidden from view and is not a distraction.

Continuous visibility of objects and actions:

- Like one's desktop, objects are continuously visible. Reminders of actions to be performed are also obvious, labeled buttons replacing complex syntax and command names.
- Cursor action and motion occurs in physically obvious and natural ways. One problem in direct manipulation, however, is that there is no direct analogy on the desk for all necessary windowing operations.
- A piece of paper on one's desk maintains a constant size, never shrinking or growing. Windows can do both. Solving this problem required embedding a control panel, a familiar concept to most people, in a window's border.
- This control panel is manipulated, not the window itself. Actions are rapid and incremental with visible display of results, the results of actions are immediately displayed visually on the screen in their new and current form.
- Auditory feedback may also be provided. The impact of a previous action is quickly seen, and the evolution of tasks is continuous and effortless. Incremental actions are easily reversible.

Earlier Direct Manipulation Systems:

- The concept of direct manipulation actually preceded the first graphical system. The earliest full-screen text editors possessed similar characteristics.
- Screens of text resembling a piece of paper on one's desk could be created (extension of real world) and then reviewed in their entirety (continuous visibility).
- Editing or restructuring could be easily accomplished (through rapid incremental actions) and the results immediately seen.
- Actions could be reversed when necessary. It took the advent of graphical systems to crystallize the direct manipulation concept, however.

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.
- When this occurs, indirect manipulation is provided. Indirect manipulation substitutes words and text, such as pull-down or pop-up menus, for symbols, and substitutes typing for pointing.
- 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, however, is a textual list of operations (indirect manipulation). When an operation is selected from the list, by pointing or typing, the system executes it as a command.
- Which style of interaction—direct manipulation, indirect manipulation, or a combination of both—is best, under what conditions and for whom, remains a question whose answer still eludes us.

Characteristics of the Graphical User Interface:

- A graphical system possesses a set of defining concepts.
- Included are sophisticated visual presentation, pick-and-click interaction, a restricted set of interface options, visualization, object orientation, extensive use of a person's recognition memory, and concurrent performance of functions.

Sophisticated Visual Presentation:

- Visual presentation is the visual aspect of the interface. It is what people see on the screen.
- The sophistication of a graphical system permits displaying lines, including drawings and icons.
- It also permits the displaying of a variety of character fonts, including different sizes and styles.
- The display of 16 million or more colors is possible on some screens. Graphics also permit animation and the presentation of photograph and motion video.
- The meaningful interface elements visually presented to the user in a graphical system include, windows (primary, secondary, or dialog boxes), menus (menu bar, pull down, pop-up, cascading), icons to represent objects such as programs or files, assorted screen-based controls (text boxes, list boxes, combination boxes, settings, scroll bar and buttons), and a mouse pointer and cursor.
- The objective is to reflect visually on screen the real world of the user as realistically, meaningfully, simply, and clearly possible.

Restricted Set of Interface Options:

- The array of alternatives available to the user is what is presented on the screen or may be retrieved through what is presented on the screen, nothing less, nothing more. This concept fostered the acronym WYSIWYG.

Pick-and-Click Interaction:

- Elements of a graphical screen upon which some action is to be performed must first be identified.

- The motor activity required of a person to identify this element for a proposed action is commonly referred to as pick, the signal to perform an action as cue .
- The primary mechanism for performing this pick-and-click is most often the mouse and its buttons.
- The user moves the mouse pointer to the relevant element (pick) and the action is signaled (click).
- Pointing allows rapid selection and feedback. The hand and mind seem to work smoothly and efficiently together.
- The secondary mechanism for performing these selection actions is the keyboard most systems permit pick-and-click to be performed using the keyboard as well.
- Visualization: Visualization is a cognitive process that allows people to understand.
- Information that is difficult to perceive, because it is either too voluminous or too abstract Presenting specialized graphic portrayals facilitates visualization.
- The best visualization method for an activity depends on what People are trying to learn from the data.
- The goal is not necessarily to reproduce a really graphical image, but to produce one that conveys the most relevant information.
- Effective visualizations can facilitate mental insights, increase productivity, and for faster and more accurate use of data.
- Object Orientation: A graphical system consists of objects and actions. Objects are what people see on screen. They are manipulated as a single unit.
- Objects can be composed of sub objects. For example, an object may be a document. The ~~document's sub objects~~ may be a para-graph, sentence, word, and letter.
- A collection is the simplest relationship-the objects sharing a common aspect.
- A collection might be the result of a query or a multiple selection of objects. Operations can be applied to a collection of objects.
- A constraint is a stronger object relationship. Changing an object in a set affects some other object in the set.
- A document being organized into pages is an example of a constraint.
- A composite exists when the relationship between objects becomes so significant that the aggregation itself can be identified as an object. Examples include a range of cells organized into a spreadsheet, or a collection of words organized46 into a paragraph.
- A container is an object in which other objects exist. Examples include text in a doc-ument or documents in a folder.
- A container often influences the behavior of its con-tent. It may add or suppress certain properties or operations of objects placed within it, control access to its content, or control access to kinds of objects it will accept.

- These relationships help define an object's type. Similar traits and behaviors exist in objects of the same object type.
- Another important object characteristic is persistence. Persistence is the maintenance of a state once it is established.
- An object's state (for example, window size, cursor location, scroll position, and so on) should always be automatically preserved when the user changes it.
- Use of Recognition Memory : Continuous visibility of objects and actions encourages use of a person's more powerful recognition memory.
- The "out of sight, out of mind" problem is eliminated
- Object Orientation: A graphical system consists of objects and actions. Objects are what people see on screen. They are manipulated as a single unit.
- Objects can be composed of sub objects. For example, an object may be a document. The document's sub objects may be a paragraph, sentence, word, and letter.
- A collection is the simplest relationship-the objects sharing a common aspect.
- A collection might be the result of a query or a multiple selection of objects. Operations can be applied to a collection of objects.
- A constraint is a stronger object relationship. Changing an object in a set affects some other object in the set.
- □ A document being organized into pages is an example of a constraint.
- A composite exists when the relationship between objects becomes so significant that the aggregation itself can be identified as an object. Examples include a range of cells organized into a spreadsheet, or a collection of words organized into a paragraph.
- A container is an object in which other objects exist. Examples include text in a document or documents in a folder.
- A container often influences the behavior of its content. It may add or suppress certain properties or operations of objects placed within it, control access to its content, or control access to kinds of objects it will accept.
- These relationships help define an object's type. Similar traits and behaviors exist in objects of the same object type.
- Another important object characteristic is persistence. Persistence is the maintenance of a state once it is established.
- An object's state (for example, window size, cursor location, scroll position, and so on) should always be automatically preserved when the user changes it.
- Use of Recognition Memory: Continuous visibility of objects and actions encourages use of a person's more powerful recognition memory.
- The "out of sight, out of mind" problem is eliminated

■ Concurrent Performance of Functions:

- Graphic systems may do two or more things at one time. Multiple programs may run simultaneously. When a system is not busy on a primary task, it may process back-ground tasks (cooperative multitasking).
- When applications are running as truly separate tasks, the system may divide the processing power into time slices and allocate portions to each application.
- Data may also be transferred between programs. It may be temporarily stored on a "clipboard" for later transfer or be automatically swapped between programs.

■ **Concurrent Performance of Functions:**

- Graphic systems may do two or more things at one time. Multiple programs may run simultaneously. When a system is not busy on a primary task, it may process back-ground tasks (cooperative multitasking).
- When applications are running as truly separate tasks, the system may divide the processing power into time slices and allocate portions to each application.
- Data may also be transferred between programs. It may be temporarily stored on a "clipboard" for later transfer or be automatically swapped between programs.

The Graphical User Interface:

- A user interface is a collection of techniques and mechanisms to interact with something.
- In a graphical interface the primary interaction mechanism is a pointing device of some kind.
- This device is the electronic equivalent to the human hand. What the user interacts with is a collection of elements referred to as objects.
- They can be seen, heard, touched, or otherwise perceived.
- Objects are always visible to the user and are used to perform tasks. They are interacted with as entities independent of all other objects.
- People perform operations, called actions, on objects. The operations include accessing and modifying objects by pointing, selecting, and manipulating.
- All objects have standard resulting behaviors.

The Web User Interface:

- The expansion of the World Wide Web since the early 1990s has been truly amazing.
- Once simply a communication medium for scientists and researchers, its many and pervasive tentacles have spread deeply into businesses, organizations, and homes around the world.
- Unlike earlier text-based and GUI systems that were developed and nurtured in an organization's Data Processing and Information Systems groups, the Web's roots were sown in a market-driven society thirsting for convenience and information.

- Web interface design is essentially the design of navigation and the presentation of information. It is about content, not data.
- Proper interface design is largely a matter of properly balancing the structure and relationships of menus, content, and other linked documents or graphics.
- The design goal is to build a hierarchy of menus and pages that feels natural, is well structured, is easy to use, and is truthful.
- The Web is a navigation environment where people move between pages of information, not an application environment. It is also a graphically rich environment.
- Web interface design is difficult for a number of reasons. First, its underlying design language, HTML, was never intended for creating screens to be used by the general population.
- Its scope of users was expected to be technical. HTML was limited in objects and interaction styles and did not provide a means for presenting information in the most effective way for people.
- Next, browser navigation retreated to the pre-GUI era. This era was characterized by a "command" field whose contents had to be learned, and a navigational organization and structure that lay hidden beneath a mostly dark and blank screen.
- GUIs eliminated the absolute necessity for a command field, providing menus related to the task and the current contextual situation.
- Browser navigation is mostly confined to a "Back" and "Forward" concept, but "back-to-where" and "forward-to-where" is often unremembered or unknown.
- Web interface design is also more difficult because the main issues concern information architecture and task flow, neither of which is easy to standardize.
- It is more difficult because of the availability of the various types of multimedia, and the desire of many designers to use something simply because it is available.
- It is more difficult because users are ill defined, and the user's tools so variable in nature.
- The ultimate goal of a Web that feels natural, is well structured, and is easy to use will reach fruition.

■ **The Popularity of the Web:**

- While the introduction of the graphical user interface 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.
- Aspects such as typography and colors can be changed, graphics turned off, and decisions made whether or not to transmit certain data over non secure channels or whether to accept or refuse cookies.
- 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, 100,000,
 - in 1990, 300,000;

- in 1992 hosts exceeded one million.
- Commercialization of the Internet saw even greater expansion of the growth rate. In 1993, Internet traffic was expanding at a 341,634 percent annual growth rate. In 1996, there were nearly 10 million hosts online and 40 million connected people (PBS Timeline).
- User control has had some decided disadvantages for some Web site owners as well.
- Users have become much more discerning about good design.
- Slow download times, confusing navigation, confusing page organization, disturbing animation, or other un-desirable site features often results in user abandonment of the site for others with a more agreeable interface.
- People are quick to vote with their mouse, and these warnings should not go unheeded.

GUI versus Web Page Design:

- GUI and Web interface design do have similarities. Both are software designs, they are used by people, they are interactive, they are heavily visual experiences presented through screens, and they are composed of many similar components.

Significant differences do exist.

PRINCIPLES OF USER INTERFACE DESIGN:

- An interface must really be just an extension of a person. This means that the system and its software must reflect a person's capabilities and respond to his or her specific needs.
- It should be useful, accomplishing some business objectives faster and more efficiently than the previously used method or tool did.
- It must also be easy to learn, for people want to do, not learn to do.
- Finally, the system must be easy and fun to use, evoking a sense of pleasure and accomplishment not tedium and frustration.
- 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.
-
- While the damage the user in-flicts on the computer tends to be physical (a frustrated pounding of the keyboard), the damage caused by the computer is more psychological.
- Throughout the history of the human-computer interface, various researchers and writers have attempted to define a set of general principles of interface design.
- What follows is a compilation of these principles. They reflect not only what we know today, but also what we think we know today.
- Many are based on research, others on the collective thinking of behaviorists working with user interfaces.
- These principles will continue to evolve, expand, and be refined as our experience with Gills and the Web increases
- **Principles for the Xerox STAR:**
 - The design of the Xerox STAR was guided by a set of principles that evolved over its lengthy development process. These principles established the foundation for graphical interfaces.
 - Displaying objects that are selectable and manipulable must be created.
 - A design challenge is to invent a set of displayable objects that are represented meaningfully and appropriately for the intended application.
 - It must be clear that these objects can be selected, and how to select them must be self-evident.
 - When they are selected should also be obvious, because it should be clear that the selected object will be the focus of the next action. Standalone icons easily fulfilled this requirement.
 - The handles for windows were placed in the borders.
 - Visual order and viewer focus: Attention must be drawn, at the proper time, to the important and relevant elements of the display.

- Effective visual contrast between various components of the screen is used to achieve this goal.
- Animation is also used to draw attention, as is sound. Feedback must also be provided to the user.
- Since the pointer is usually the focus of viewer attention, it is a useful mechanism for providing this feedback (by changing shapes).
- Revealed structure: The distance between one's intention and the effect must be minimized.
- Most often, the distance between intention and effect is lengthened as system power increases.
- The relationship between intention and effect must be, tightened and made as apparent as possible to the user.
- The underlying structure is often revealed during the selection process.
- Consistency: Consistency aids learning. Consistency is provided in such areas as element location, grammar, font shapes, styles, and sizes, selection indicators, and contrast and emphasis techniques
- Appropriate effect or emotional impact: The interface must provide the appropriate emotional effect for the product and its market.
- Is it a corporate, professional, and secure business system? Should it reflect the fantasy, wizardry, and bad puns of computer games?
- A match with the medium: The interface must also reflect the capabilities of the device on which it will be displayed.
- Quality of screen images will be greatly affected by a device's resolution and color-generation capabilities.

General Principles:

- The design goals in creating a user interface are described below.
- They are fundamental to the design and implementation of all effective interfaces, GUI and Web.
- These principles are general characteristics of the interface, and they apply to all aspects.
- The compilation is presented alphabetically, and the ordering is not intended to imply degree of importance.

1. Aesthetically Pleasing:

- Provide visual appeal by following these presentation and graphic design principles:
- Provide meaningful contrast between screen elements.
- Create groupings.
- Align screen elements and groups.
- Provide three-dimensional representation.
- Use color and graphics effectively and simply.

2. Clarity:

- The interface should be visually, conceptually, and linguistically clear, including
- Visual elements
- Functions
- Metaphors
- Words and Text

3.Compatibility:

- Provide compatibility with the following:
- The user
- The task and job
- The Product
- Adopt the User's Perspective

4.Configurability

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

5.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.

6.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.

7.Control:

- The user must control the interaction.

- Actions should result from explicit user requests.
- Actions should be performed quickly.
- Actions should be capable of interruption or termination.
- The user should never be interrupted for errors
- The context maintained must be from the perspective of the user.
- The means to achieve goals should be flexible and compatible with the user's skills, experiences, habits, and 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

8.Directness:

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

9.Flexibility:

- 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.

10.Efficiency:

- Minimize eye and hand movements, and other control actions.
- Transitions between various system controls should flow easily and freely.
- Navigation paths should be as short as possible.
- Eye movement through a screen should be obvious and sequential.
- Anticipate the user's wants and needs whenever possible.

11.Familiarity:

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

12.Forgiveness:

- 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.

13. Predictability:

- 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.

14. Recovery:

- 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.
 - Hardware, software, or communication problems

15. Responsiveness:

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

16. Transparency:

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

17. Simplicity:

- 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 and 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.

HUMAN COMPUTER INTERACTION

UNIT-II

Design process : Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business functions.

Screen Designing : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

TEXT BOOK :

1. The essential guide to user interface design, Wilbert O .Galitz, Wiley Dream Tech.

Design process

Obstacles and pitfalls in development path

- No body ever gets it right for the first time
- Development is chock full of surprises.
- Good design requires living in a sea of changes.
- Designers need good tools.
- Performance design goals
- People may make mistakes while using a good system also

Common pitfalls

- No early analysis and understanding the users needs and expectations.
- A focus on using design features or components .
- No usability testing.
- No common design team vision.
- Poor communication

Common usability problems

- Ambiguous menus and icons.
- Languages that permit only single direction movement through a system.
- Input and direct manipulation limits.
- Complex linkage.
- Inadequate feedback.
- Lack of system anticipation.
- Inadequate error messages.

Irritating characters

- Visual clutter
- Impaired information readability
- Incomprehensible components
- Annoying distractions.
- Confusing navigation.
- inefficient operations
- inefficient page scrolling.
- Information overload

Design team

- Development

- Human factors
- Visual Design
- Usability assessment
- Documentation
- Training

Human interaction with computers

- Understanding How People Interact with Computers :
- Characteristics of computer systems, past and present, that have caused, and are causing, people problems. We will then look at the effect these problems have -
 - Why people have trouble with computers
 - Responses to poor design
 - People and their tasks

Why People Have Trouble with Computers

- Extensive technical knowledge but little behavioral training.
- with its extensive graphical capabilities.
- Poorly designed interfaces.
- What makes a system difficult to use in the eyes of its user?
- Use of jargon
- Non-obvious design
- Fine distinctions
- Disparity in problem-solving strategies an "error-preventing" strategy
- Design inconsistency

Psychological

- Typical psychological responses to poor design are:
- **Confusion:** Detail overwhelms the perceived structure. Meaningful patterns are difficult to ascertain, and the conceptual model or underlying framework cannot be understood or established.
- **Annoyance:** Roadblocks that prevent a task being completed, or a need from being satisfied, promptly and efficiently lead to annoyance.
- Inconsistencies in design, slow computer reaction times, difficulties in quickly finding information, out-dated information, and visual screen distractions are a few of the many things that may annoy users.

- **Frustration:** An overabundance of annoyances, an inability to easily convey one's intentions to the computer, or an inability to finish a task or satisfy a need can cause frustration.
- Frustration is heightened if an unexpected computer response cannot be undone or if what really took place cannot be determined: Inflexible and un-forgiving systems are a major source of frustration.
- **Panic or stress:** Unexpectedly long delays during times of severe or unusual pressure may introduce panic or stress. Some typical causes are unavailable systems or long response times when the user is operating under a deadline or dealing with an irate customer.
- **Boredom:**
 - Boredom results from improper computer pacing (slow response times or long download times) or overly simplistic jobs.
 - These psychological responses diminish user effectiveness because they are severe blocks to concentration.
 - Thoughts irrelevant to the task at hand are forced to the user's attention, and necessary concentration is impossible.
 - The result, in addition to higher error rates, is poor performance, anxiety, and dissatisfaction
- **Physical**
- Psychological responses frequently lead to, or are accompanied by, the following physical reactions.
- **Abandonment of the system:** The system is rejected and other information sources are relied upon.
- These sources must, of course, be available and the user must have the discretion to perform the rejection.
- In business systems this is a common reaction of managerial and professional personnel. With the Web, almost all users can exercise this option.
- **Partial use of the system:** Only a portion of the system's capabilities are used, usually those operations that are easiest to perform or that provide the most benefits. Historically, this has been the most common user reaction to most computer systems. Many aspects of many systems often go unused.
- **Indirect use of the system:** An intermediary is placed between the would-be user and the computer.
- Again, since this requires high status and discretion, it is another typical response of managers or others with authority.

- **Modification of the task:** The task is changed to match the capabilities of the system.
 - This is a prevalent reaction when the tools are rigid and the problem is unstructured, as in scientific problem solving.
- **Compensatory activity:** Additional actions are performed to compensate for system inadequacies.
 - A common example is the manual reformatting of information to match the structure required by the computer.
 - This is a reaction common to workers whose discretion is *limited, such as clerical personnel*.
- **Misuse of the system:** The rules are bent to shortcut operational difficulties. This requires significant knowledge of the system and may affect system integrity.
 - Direct programming: The system is reprogrammed by its user to meet specific needs. This is a typical response of the sophisticated worker.
 - These physical responses also greatly diminish user efficiency and effectiveness.
 - They force the user to rely upon other information sources, to fail to use a system's complete capabilities, or to perform time-consuming "work-around" actions.

Important Human Characteristics in Design:

- Importance in design are perception, memory, visual acuity, foveal and peripheral vision, sensory storage, information processing, learning, skill, and individual differences.
 - Perception
 - Proximity
 - Similarity
 - Matching patterns
 - Succinctness
 - Closure
 - Unity
 - Continuity
 - Balance
 - Expectancies
 - Context
- **Memory:** Memory is not the most stable of human attributes, as anyone who has forgotten why they walked into a room, or forgotten a very important birthday, can attest.
 - *Short-term*, or working, memory.
 - *Long-term* memory

- Mighty memory
- Sensory Storage
- **Mental Models:** As a result of our experiences and culture, we develop mental models of things and people we interact with.
- A mental model is simply an internal representation of a person's current understanding of something. Usually a person cannot describe this mental model and most often is unaware it even exists.
- Mental models are gradually developed in order to understand something, explain things, make decisions, do something, or interact with another person.
- Mental models also enable a person to predict the actions necessary to do things if the action has been forgotten or has not yet been encountered.
- **Movement Control :** Once data has been perceived and an appropriate action decided upon, a response must be made; in many cases the response is a movement. In computer systems, movements include such activities as pressing keyboard keys, moving the screen pointer by pushing a mouse or rotating a trackball, or clicking a mouse button. The implications in screen design are:
 - Provide large objects for important functions.
 - Take advantage of the "pinning" actions of the sides, top, bottom, and corners of the screen.
- **Learning:** Learning, as has been said, is the process of encoding in long-term memory information that is contained in short-term memory.
- It is a complex process requiring some effort on our part. Our ability to learn is important—it clearly differentiates people from machines.
- Given enough time people can improve the performance in almost any task. Too often, however, designers use our learning ability as an excuse to justify complex design.
- A design developed to minimize human learning time can greatly accelerate human performance.
- People prefer to stick with what they know, and they prefer to jump in and get started. Unproductive time spent learning is something frequently avoided.
- **Skill:** The goal of human performance is to perform skillfully. To do so requires linking inputs and responses into a sequence of action.
- The essence of skill is performance of actions or movements in the correct time sequence with adequate precision. It is characterized by consistency and economy of effort.

- Economy of effort is achieved by establishing a work pace that represents optimum efficiency.
- It is accomplished by increasing mastery of the system through such things as progressive learning of short-cuts, increased speed, and easier access to information or data.
- Skills are hierarchical in nature, and many basic skills may be integrated to form increasingly complex ones. Lower-order skills tend to become routine and may drop out of consciousness.
- System and screen design must permit development of increasingly skillful performance.
- **Individual Differences :** In reality, there is no average user. A complicating but very advantageous human characteristic is that we all differ in looks, feelings, motor abilities, intellectual abilities, learning abilities and speed, and so on.
- In a keyboard data entry task, for example, the best typists will probably be twice as fast as the poorest and make 10 times fewer errors.
- Individual differences complicate design because the design must permit people with widely varying characteristics to satisfactorily and comfortably learn the task or job, or use the Web site.
- In the past this has usually resulted in bringing designs down to the level of lowest abilities or selecting people with the minimum skills necessary to perform a job.
- But technology now offers the possibility of tailoring jobs to the specific needs of people with varying and changing learning or skill levels. Multiple versions of a system can easily be created.
- Design must provide for the needs of all potential users.

Human Considerations in Design

The User's Knowledge and Experience:

- The knowledge possessed by a person, and the experiences undergone, shape the design of the interface in many ways. The following kinds of knowledge and experiences should be identified.
- **Computer Literacy** - Highly technical or experienced, moderate computer experience, or none
- **System Experience** - High, moderate, or low knowledge of a particular system and its methods of interaction
- **Application Experience** - High, moderate, or low knowledge of similar systems
- **Task Experience** - Other Level of knowledge of job and job tasks

- **Systems Use** - Frequent or infrequent use of other systems in doing job
- **Education** - High school, college, or advanced degree
- **Reading Level** - Less than 5th grade, 5th-12th, more than 12th grade
- **Typing Skill** - Expert (135 WPM), skilled (90 WPM), good (55 WPM), average(40 WPM), or "hunt and peck" (10 WPM).
- **Native Language or Culture**- English, another, or several

JOB/TASK/NEED

- **Type of System Use** -Mandatory or discretionary use of the system.
- **Frequency of Use** -Continual, frequent, occasional, or once-in-a- lifetime use of system
- **Task or Need importance** - High, moderate, or low importance of the task being performed
- **Task Structure** - Repetitiveness or predictability of tasks being automated, high, moderate, or low
- **Social Interactions** - Verbal communication with another person required or not required
- **Primary Training** - Extensive or formal training, self-training through manuals, or no training
- **Turnover Rate** - High, moderate, or low turnover rate for jobholders
- **Job Category**- Executive, manager, professional, secretary, clerk
- **Lifestyle** - For Web e-commerce systems, includes hobbies, recreational pursuits, and economic status

PSYCHOLOGICAL CHARACTERISTICS:

- **Attitude** - Positive, neutral, or negative feeling toward job or system
- **Motivation** - Low, moderate, or high due to interest or fear
- **Patience** - Patience or impatience expected in accomplishing goal
- **Expectations** - Kinds and reasonableness

- | | | |
|-------------------|---|--|
| ■ Stress Level | - | High, some, or no stress generally resulting from task performance |
| ■ Cognitive Style | - | Verbal or spatial, analytic or intuitive, concrete or abstract. |
| ■ Age | | Young middle aged or elderly |
| ■ Gender | | Male or Female |
| ■ Handness | | Left, right or ambidextrous |
| ■ Disabilities | | Blind, defective vision, deafness, motor handicap |

Human Interaction Speeds

- The speed at which people can perform using various communication methods has been studied by a number of researchers.
- **Reading:** The average adult, reading English prose in the United States, has a reading speed in the order of 250-300 words per minute.
- Proof reading text on paper has been found to occur at about 200 words
- per minute, on a computer monitor, about 180 words per minute.
- One technique that has dramatically increased reading speeds is called Rapid Serial Visual Presentation, or RSVP. In this technique single words are presented one at a time in the center of a screen.
- New words continually replace old words at a rate set by the reader. For a sample of people whose paper document reading speed was 342 words per minute. (With a speed range of 143 to 540 words per minute.)
- Single words were presented on a screen in sets at a speed sequentially varying ranging from 600 to 1,600 words per minute. After each set a comprehension test was administered
- Prose text - 250-300 words per minute.

- Proof reading text on paper - 200 words per minute.

Proofreading text on a monitor - 180 words per minute.

- **Listening**

Speaking to a computer: 150-160 words per minute.

After recognition corrections: 105 words per minute.

- **Keying**

Typewriter

- Fast typist :150 words per minute and higher Average typist : 60-70 words per minute

Computer

- Transcription 33 words per minute
- Composition: 19 words per minute

Two finger typists

- Memorized text:. 37 words per minute

- Copying text: 27 words per minute

Hand printing

- Memorized text: 31 words per minute.
- Copying text: 22 words per minute.

Understand the Business Function:

- Business definition and requirements analysis
 - Direct methods
 - Indirect methods
 - Requirements collection guidelines
- Determining basic business functions
 - Developing conceptual modes
 - Understanding mental models
 - Users new mental model
- Design standards or style guides
 - Value of standards and guidelines
 - Document design
 - Design support and implementation
- System training and documentation
 - Training
 - Documentation

DIRECT METHODS

- Individual Face-to-Face Interview
- Telephone Interview or Survey
- Traditional Focus Group
- Facilitated Team Workshop

- Observational Field Study
- User-Interface Prototyping
- Usability Laboratory Testing
- Card Sorting for Web Sites
- A technique to establish groupings of information for Web sites

INDIRECT METHODS

- MIS Intermediary
- Paper Surveyor Questionnaire
- Electronic Surveyor Questionnaire
- Electronic Focus Group
- Marketing and Sales
- Support Line
- E-Mail or Bulletin Board
- User Group
- Competitor Analyses
- Trade Show
- Other Media Analysis
- System Testing

Determining Basic Business Functions

- Major system functions are listed and described, including critical system inputs and outputs.
- A flow-chart of major functions is developed. The process the developer will use is summarized as follows:
- Gain a complete understanding of the user's mental model based upon:
 - The user's needs and the user's profile.
 - A user task analysis.
 - Develop a conceptual model of the system based upon the user's mental model. This includes:
 - Defining objects.
 - Developing metaphors.

Understanding the User's Mental Model

- The next phase in interface design is to thoroughly describe the expected system user or users and their current tasks.

- The former will be derived from the kinds of information collected in Step 1 "Understand the User or Client," and the requirements analysis techniques described above.
- A goal of task analysis, and a goal of understanding the user, is to gain a picture of the user's mental model.
- A mental model is an internal representation of a person's current conceptualization and understanding of something.
- Mental models are gradually developed in order to understand, explain, and do something.
- Mental models enable a person to predict the actions necessary to do things if the actions have been forgotten or have not yet been encountered

Performing a Task Analysis

- User activities are precisely.
- Task analysis involves breaking down the user's activities to the individual task level.
- Knowing why establishes the major work goals;
- complete description of all user tasks and interactions.
- Work activities are studied using the techniques just reviewed;
- direct observation, interviews, questionnaires, or obtaining measurements of actual current system usage.
- listing of the user's current tasks.
- Another result is a list of objects the users see as important to what they do

Developing Conceptual Models

- The output of the task analysis is the creation, by the designer, of a conceptual model for the user interface.
- A conceptual model is the general conceptual framework through which the system's functions are presented.
- Such a model describes how the interface will present objects, the relationships between objects, the properties of objects, and the actions that will be performed.
- A conceptual model is based on the user's mental model. Since the term mental model refers to a person's current level of knowledge about something, people will always have them

Developing Conceptual Models

- Since mental models are influenced by a person's experiences, and people have different experiences, no two user mental models are likely to be exactly the same.
- Each person looks at the interface from a slightly different perspective. The goal of the designer is to facilitate for the user the development of useful *mental model of the system*.

- This is accomplished by presenting to the user a *meaningful conceptual model of the system*. When the user then encounters the system, his or her *existing mental model* will, hopefully, mesh well with the system's conceptual model.
- As a person works with a system, he or she then develops a *mental model of the system*.
- The system mental model the user derives is based upon system's behavior, including factors such as the system inputs, actions, outputs (including screens and messages), and its feedback and guidance characteristics, all of which are components of the conceptual model.
- Documentation and training also play a formative role. Mental models will be developed regardless of the particular design of a system, and then they will be modified with experience.
- What must be avoided in design is creating for the user a conceptual model that leads to the creation of a false mental model of the system, or that inhibits the user from creating a meaningful or efficient mental model.

Guidelines for Designing Conceptual Models

- Reflect the user's mental model, not the designer's.
- Draw physical analogies or present metaphors.
- Comply with expectancies, habits, routines, and stereotypes.
- Provide action-response compatibility.
- Make invisible parts and process of a system visible.
- Provide proper and correct feedback.
- Avoid anything unnecessary or irrelevant.
- Provide design consistency.
- Provide documentation and a help system that will reinforce the conceptual model.
- Promote the development of both novice and expert mental models.

Defining Objects

- Determine all objects that have to be manipulated to get work done. Describe:
 - The objects used in tasks.
 - Object behavior and characteristics that differentiate each kind of object.
 - The relationship of objects to each other and the people using them.
 - The actions performed.
 - The objects to which actions apply.
- State information or attributes that each object in the task must preserve, display, or allow to be edited.
- Identify the objects and actions that appear most often in the workflow.

- Make the several most important objects very obvious and easy to manipulate

Developing Metaphors

- Choose the analogy that works best for each object and its actions.
- Use real-world metaphors.
- Use simple metaphors.
- Use common metaphors.
- Multiple metaphors may coexist.
- Use major metaphors, even if you can't exactly replicate them visually.
- Test the selected metaphors.

Screen designing

How to distract the screen user

- Unclear captions
- Improper type and graphic emphasis
- Misleading headings
- Irrelevant and unnecessary headings
- Inefficient results
- Clustered and cramped layout
- Poor quality of presentation
 - Legibility
 - Appearance
 - arrangeemnt
- Visual inconsistency
- Lack of design features
- Over use of 3D presentations
- Overuse of too many bright colors
- Bad typography

Web screens also present to the user Variety of distractions:

- Numerous audio and visual interruptions
- Extensive visual clutter
- Poor information readability
- In comprehensible screen components
- Confusing and inefficient navigation
- Inefficient operations
- Excessive or inefficient page scrolling
- Information overload
- Design in consistency
- Outdated information

What screen users want:

- An orderly clean clutter free appearance
- An indication of what is being shown and what should be done with it.
- Expected information located where it should be.
- A clear indication of what relates to what.
- Plain and simple English.
- A simple way of finding out what is in a system and how to get it out.
- A clear indication of when an action can make a permanent change in data

What screen users do:

Identifies a task to be performed or need to be fulfilled:

The task may be very structured, including activities such as: enter this data from this form into the system, answer a specific question regarding the status of an order, or collect the necessary information from a customer to make a reservation. Finally, the need may be very general or even vague. **Decides how the task will be completed or need fulfilled:**

For a structured or semi-structured task a set of transaction screens will be available. The proper transaction is identified and the relevant screen series retrieved. To satisfy a general or vague need will require browsing or searching through screens that might possibly have relevance.

Manipulates the computers controls:

To perform the task or satisfy the need, the keyboard, mouse, and other similar devices are used to select choices from lists, choose commands to be performed, key data into text boxes, and so forth

Gathers necessary data:

Using structured and semi-structured transaction screens information is collected from its source: a form, a coworker, or a customer. This information is identified on the screen, or placed on the screen, through control manipulation.

Forms judgments resulting in decisions relevant to task:

Structured transactions will require minimal decision-making. Has all the data been collected and is the data valid? Has the transaction been successfully accepted by the system? If not accepted, why not? Semi-structured transactions, in addition, may require decisions such as: Which set of screens, from all available, should I use to complete this process? How much information is needed to complete the sale of this particular product, make a reservation in this hotel, or complete the enrollment process for a specific program?

Design goals:

- Reduce visual work

- Reduce intellectual work

- Reduce memory work

- Reduce mentor work

- Eliminate burdens or instructions

The result will always be improved user productivity and increased satisfaction.

Screen meaning and Purpose:

- Each screen element. . .

 - Every control

 - All text

 - Screen organization

 - All emphasis

 - Each color

 - Every graphic

 - All screen animation

 - All forms of feedback

Must

Have meaning to screen users

Serve a purpose in performing tasks

All elements of a screen must have meaning to users and serve a purpose in performing tasks or fulfilling needs. If an element does not have meaning, do not include it on the screen because it is noise.

139

Organizing screen elements clearly and Meaningfully:

Visual clarity is achieved when the display elements are organized and presented in meaningful and understandable ways.

A clear and clean organization makes it easier to recognize screen's essential elements and to ignore its secondary information when appropriate.

Clarity is influenced by a multitude of factors: consistency in design, a visually pleasing composition, a logical and sequential ordering, the presentation of the proper amount of information, groupings, and alignment of screen items.

Organizing screen elements clearly and Meaningfully:

Consistency

Provide real world consistency. Reflect a person's experiences, work conventions, and cultural conventions

Provide internal consistency. Observe the same conventions and rules for all aspects of an interface screen, and all applications or web site screens, including:
operational and navigational procedures

visual identity or theme

Component

Follow the same conventions

Deviate only when there is clear benefit to user

Ordering of Screen Data and Content

- ▶ Divide information into units that are logical, meaningful and sensible.
- ▶ Organize by interrelationships between data or information.
- ▶ Provide an ordering of screen units of elements depending on priority.
- ▶ Possible ordering schemes include
 - Conventional
 - Sequence of use
 - Frequency of use
 - Function
 - Importance
 - General to specific
- ▶ Form groups that cover all possibilities.
- ▶ Ensure that information is visible.
- ▶ Ensure that only information relative to task is presented on screen.
- ▶ Organizational scheme is to minimize number of information variables

Upper-Left Starting Point provide an obvious starting point in the screen's upper left corner.

- ▶ Eyeball fixation studies indicate that in looking at displays of information, usually one's eyes move first to the upper-left center of the display, and then quickly move through the display in a clockwise direction.
- ▶ Streveler and Wasserman (1984) found that visual targets located in the upper-left quadrant of a screen were found fastest and those located in the lower-right quadrant took longest to find.
- ▶ Provide an obvious starting point in the upper-left corner of the screen. This is near the location where visual scanning begins and will permit a left-to-right, top-to-bottom reading of information or text as is common in Western cultures.

Screen Navigation and Flow

- ▶ Provide an ordering of screen information and elements that:
 - is rhythmic guiding a person's eye through display
 - encourages natural movement sequences.
 - minimizes pointer and eye movement distances.
- ▶ Locate the most important and most frequently used elements or controls at top left.
- ▶ Maintain top to bottom , left to right flow.
- ▶ Assist in navigation through a screen by
 - Aligning elements
 - Grouping elements
 - Use of line borders
- ▶ Through focus and emphasis, sequentially , direct attention to items that are
 - 1.critical 2.Important 3.Secondary 4.Peripheral
- ▶ Tab through window in logical order of displayed information.
- ▶ locate command button at the end of the tabbing order sequence,
- ▶ when groups of related information must be broken and displayed on separate screens, provide breaks at logical or natural points in the information flow.
- ▶ In establishing eye movement through a screen, also consider that the eye trends to move sequentially , for example –
 - From dark areas to light areas
 - From big objects to little objects
 - From unusual shapes to common shapes.
 - From highly saturated colors to unsaturated colors.
- ▶ These techniques can be initially used o focus a person's attention to one area of the screen and then direct it else where.
- ▶ Maintain top to bottom, left to right through the screen. This top to bottom orientation is recommended for information entry for the following reasons –
 - Eye movements between items will be shorter.
 - Control movements between items will be shorter.
 - Groupings are more obvious perceptually.
 - When one's eyes moves away from the screen and then back, it returns to about same place it left, even if it is seeking next item in sequence

- ▶
- ▶ Most product style guides recommend a left to right orientation.
- ▶ Our earliest display screens reflected this left to right entry orientation.
- ▶ Top to bottom orientation is also recommended for presenting displays of read only information that must be scanned.

Visually pleasing composition

- ▶ **Provide visually pleasing composition with the following qualities –**
 - Balance
 - Symmetry
 - Regularity
 - Predictability
 - Sequentiality
 - Economy
 - Unity
 - proportion
 - Simplicity
 - Groupings.

Information retrieval on web

- ▶ The web has an almost unlimited supply of information—
- ▶ The magnitude and structure of the web seems to be creating a user interaction pattern with these characteristics:
 - ▶ The most sought after web commodity is content.
 - ▶ Behavior is often goal driven.
 - ▶ Reading is no longer a linear activity.
 - ▶ Impatience.
 - ▶ Frequent switching of purpose.
- ▶ Web users access site for different reasons: a focused search for a piece of information or an answer less focused for browsing or surf.

Initial focus on attention

- ▶ Page perusal
- ▶ Scanning guidelines
- ▶ Browsing
- ▶ Browsing guidelines
- ▶ Searching
- ▶ Problems with search facilities
- ▶ Search facility guidelines
- ▶ Express the search
- ▶ Progressive search refinement
- ▶ Launch the search
- ▶ Present meaningful results

Scanning guidelines

- ▶ Organization
 - Minimize eye movement
 - Provide groupings of information
 - Organize content in a logical and obvious way.
- ▶ Writing
 - Provide meaningful headings and subheadings.
 - Provide meaningful titles
 - Concisely write the text.
 - Use bullets/ numbers
 - Array information in tables
- ▶ Presentation
 - Key information in words or phrases

Browsing guidelines

- ▶ Facilitate scanning
- ▶ Provide multiple layers of structure
- ▶ Make navigation easy
- ▶ Respect users desire to leave
- ▶ Upon returning help users reorient themselves.
- ▶ Users can browse deeply or simply move on.
- ▶ Provide guidance to help reorientation
- ▶ Understand terms to minimize the need for users to switch context.

Problems with searching

- ▶ Not understanding the user.
- ▶ Difficulties in formulating the search.
- ▶ Difficulties in presenting meaningful results.
- ▶ Identify the level of expertise of user.
- ▶ Know your Search user
- ▶ Plan for user's switching purposes during search process.
- ▶ Plan for flexibility in the search process.
- ▶ Anticipate
 - nature of every possible query
 - Kind of information desired
 - How much information will result the search.

Statistical graphics

- ▶ A statistical graphic is data presented in a graphical format.
- ▶ A well designed statistical graphic also referred to as chart or graph.
- ▶ Use of statistical graphics
 - reserve for material that is rich, complex or difficult.

▶ Data Presentation

- ▶ emphasize the data
- ▶ Minimize non data elements
- ▶ Minimize redundant data
- ▶ Fill the graph's available area with data.
- ▶ Show data variation
- ▶ Provide proper context for data interpretation

► Scales and Scaling

place ticks to marks scales on the outside edge of each axis.

employ a linear scale.

mark scales at standard or customary intervals

Start a numeric scale at zero.

display only a single scale on axis.

provide aids for scale interpretation.

clearly label each axis.

Provide scaling consistency

consider duplicate axis for large scale data.

Proportion

Lines

Labeling

Title

Interpretation of numbers

► Types of statistical graphs

curve and line graphs



Single graph

Four or five maximum

Label identification

Legend

Tightly packed curves

Important or critical data

Comparing actual and projected data

Data differences

Surface charts

Ordering

Coding schemes

Labels



Scatter plots

two dimensions

Consistent intervals

multiple data sets

Significant points



Bar graphs

consistent orientation

Meaningful organization

Bar spacing

Differentiation

Important or critical data

Related bar ordering

[Reference index](#)

▶ [labeling](#)

▶ Segmented or stacked bars.

▶ Data category ordering

▶ Large segments

▶ Coding schemes

▶ labeling

▶ [Flow charts](#)

▶ Order of steps

▶ Orientation

▶ Coding conventions

▶ Arrows

▶ Highlighting

▶ One decision at each step

▶ Consistently order and word all choices

▶ Pie chart

Technological consideration -interface design

■ [Graphical systems](#)

- ▶ Screen design must be compatible with the capabilities of the system –
 - system power
 - Screen size
 - Screen resolution
 - Display colors
 - Other display features
- ▶ Screen design must be compatible with the capabilities of the
 - ▢ Platform compatibility
 - ▢ Development and implementation
 - ▢ Platform style guide

■ [browser](#)

- compatibility
- monitor size and resolution
- fonts
- Color
- Bandwidth
- Version

- ▶ other considerations
 - Downloading
 - Currency
 - Page printing
 - Maintainability

Web Systems

- ▶ Understand the current level of Web technology.
- ▶ Design for system configuration used by most users.
- ▶ Refrain from haphazard use of leading-edge technology

Browsers

- ▶ ■ Compatibility:

- Make the Web site accessible to all users' browsers.
- Use browser defaults as much as possible.

- ■ Monitor size and resolution:

- Design within the boundaries of an image-safe area for all browsers.
- Present images at a resolution appropriate for all users' monitors.

- ▶ ■ Fonts:

- Use fonts that can be displayed on a variety of browsers.

- Colors:

- Use colors that succeed on a variety of browsers and platforms.

- A palette of 216 colors. ■

Bandwidth:

- Design for the most commonly used bandwidth.

- A 56-kbps modem is most common for home users. ■ Versions

- Create multiple versions that support multiple browsers.

- Always provide a text-only version.

- Make use of browser sniffers

The User Technology Profile Circa 2001

- ▶ While a great variety does exist in the technological tools people use to interact with the Internet, the dominance of certain platforms and monitor characteristics is quite evident.

- ▶ Bailey (2001), in summarizing recently reported data (thecounter.com, 2001) says that the following operating systems, browsers, screen resolutions, and color depth search account for more than 90 abilities.





OPERATING SYSTEMS

- Windows 95 10%
- Windows 98 72%
- Windows 2000 6%
- Windows NT 5%
- » -----

- 93%

The User Technology Profile Circa 2001



BROWSERS

- Internet Explorer 4 9%
- Internet Explorer 5 77%
- Netscape 4 9%
- 95%



SCREEN RESOLUTION IN PIXELS

- 640×480 5%
- 800×600 53%
- 1024×768 31%
- 1280×1024 3%
- — 98%



COLOR IN BITS

- 8 5%
- 16 55%
- 24 and 32 38%
- 92%

HUMAN COMPUTER INTERACTION

UNIT-III

System Menus – Structures of Menus, Functions of Menus, Content of Menus, Kinds of Graphical menus.

Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls.

TEXT BOOK :

1. The essential guide to user interface design, Wilbert O Galitz, Wiley Dream Tech.

Develop System Menus and Navigation Schemes

Structures of Menus:

1. Single Menus

- No other menus will follow necessitating additional user choices

2. Event-Trapping Menus

- Provide ever-present background of control over the system's state and parameters while the user is working on a foreground task
- Serve three functions
 - Immediately change some parameter in the current environment (bold text)
 - Take user out of current environment to perform function (spell check)
 - Exit and allow user to go to new environment (exit)

Functions of Menus

- Navigation to a New Menu
- Execute an Action or Procedure
- Displaying Information
- Data or Parameter Input

Content of Menus

- Menu Context
- Provides information to keep the user oriented
- Menu Title

- Provides the context for the current set of choices

Choice Descriptions:

- Descriptions can range from a mnemonic, numeric or alphabetized listing
- Completion Instructions
 - Tell users how to indicate their choices

Formatting of Menus

1.Consistency

- Provide consistency in menu Organization, presentation, and choice ordering

2.Display

- Frequent references
- Permanently display the menu in an area of the screen that will not obscure other screen data
- Occasional references

3. Presentation

- Should be obvious with a unique and consistent structure

4.Organization

- Provide a main menu
- Display
- All relevant alternatives (gray-out inactive choices)
- Minimize number of menu levels
- Number of menu choices presented on a screen
 - 4-8 choices without logical grouping of elements
 - 18-24 choices with logical groupings of elements with no more than 10 items within a group
- Never require menus to be scrolled

5.Complexity

- Provide both simple and complex menus

6.Item Arrangement

- Orient for top-to-bottom reading
- Left justify descriptions
- Organize for left to right reading

7.Ordering

- Numeric order
- Sequence/Frequency of occurrence
- Importance
- Semantic similarity

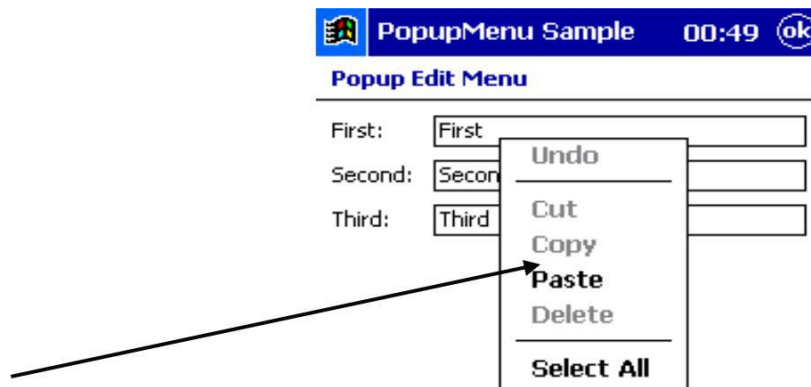
8.Groupings

- Create grouping of items that are logical, unique, meaningful and mutually exclusive

- Present no more than six or seven groupings on screen
- Separate grouping created through either
 - Wider spacing, or a thin ruled line
 - Provide immediate access to critical or frequently chosen items

9. Line Separator

- ▶ Separate vertically arrayed grouping with subtle solid lines
- ▶ Separate vertically arrayed subgroupings with subtle dotted or dashed lines
- ▶ For independent groupings
- Extend the line to the left and right menu borders



Line Separator



Line Separator

Phrasing the Menu

- ▶ Menu Titles: Should be Short, Simple, Distinctive title
 - ▶ Menu Choice Description:
 - Can be single, compound or multiple words
 - Use task-oriented not data-oriented wording
 - Must never use the same wording as its menu title
 - Identical choices on different menus should be worded identically
 - ▶ Keyboard Accelerators
 - Ctrl+B or (Ctrl+B)
 - ▶ Keyboard Equivalents
 - Normal, Bold, Italic
- ### Phrasing the Menu

- ▶ Intent Indicators
 - To a cascade indicator: place a triangle or right-pointing solid arrow following the choice
 - To a window indicator: place ellipsis (...) immediately follow the choice

Map Options

Predefined Maps . . .

World View

Recenter

Map Source

Map Intensity. . .

Map Manager. . .

Submenu

Digital

WDBI

DTED

Window indicator

Cascade indicator

Selecting Menu Choices

- ▶ Initial Cursor Positioning
- ▶ Choice Selection

- Pointers
- Keyboards
- Selection/Execution
- Combining techniques

- ▶ Defaults

- Provide a default whenever possible (as Bold Text)

- ▶ Unavailable Choices

- Should be dimmed or “grayed out”

Mark Toggles or Setting

- ▶ Purpose

- Use to designate that an item or feature is active over a relatively long period of time
- Use to provider a reminder that an item or feature is active or inactive
- Position the indicator to the left of the option
- For situations where several nonexclusive choices may be selected, consider including one alternative that deselects all items an reverts the state to the normal condition

Bold

Bold

Ctrl+B

Italic

*I*talic

Ctrl+I

Toggled Menu Items

- ▶ Purpose

- Use to designate two opposite commands that are accessed frequently
- Use when the menu item displayed will clearly indicate that the opposite condition currently exists
- Provide a meaningful, fully spelled-out description of action
- Begin with a clear verb
- Use mixed-case letter

View

Hide Grid

View

Show Grid

Kinds of Graphical enus

- ▶ Menu Bar
- ▶ Pull-Down Bar
- ▶ Cascading Menu Bar
- ▶ Pop-Up Menu
- ▶ Iconic Menu

Menu Bar

- ▶ Advantage

- Always visible
- Easy to browse
- Do not obscure the screen working area
- Allow for use of keyboard equivalents

- ▶ Disadvantage

- Consume a full row of screen space
- Require looking away from the main working area to find
- Require moving pointer from the main working area to select
- Horizontal orientation is less efficient for scanning

Menu Bar

- ▶ All primary windows must have a menu bar
- ▶ All menu bars must have an associated pull-down menu containing at least two choices
- ▶ Do not allow the user to turn off the display of the menu bar
- ▶ Locate at the top of the screen, just below the screen title
- ▶ Use single-word choices whenever possible

Menu Bar

- ▶ Order choice left-to-right with

- Most frequent choices to left/ Related information grouped together

- ▶ Help, when included should be located at the right side

- Layout: xFilexxxEditxxxOptions

Helpx

- ▶ Separate the bar from the remainder of the screen by

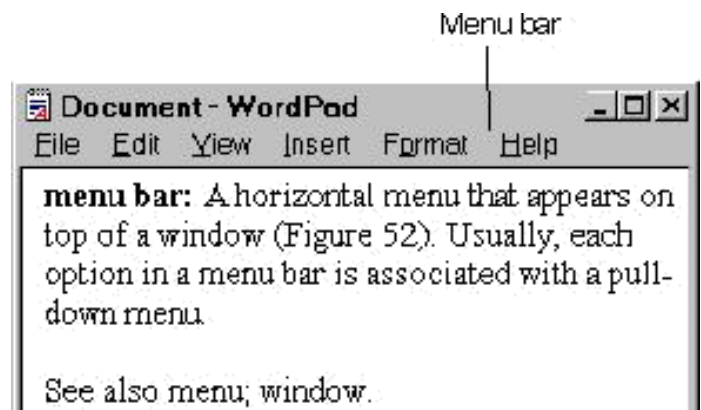
- A different background or Solid lines above and below

- ▶ Use reverse color selection cursor to surround the choice

Pull-Down Menu

- ▶ Proper Usage

- A small number of items
- Items best represented textually



–Items whose content rarely changes

► Advantages

–No window space is consumed when they r not used

–Allow for display of both keyboard equivalents and accelerators

–Vertical orientation permits more choices to be displayed

► Disadvantage

–Require searching and selecting

–Require moving the pointer out of working area to select

–May obscure the screen working area

Pull-Down Menu

► Gray-out or dim items that can not be chosen

► Position the pull-down directly below the selected menu bar choice

► Restrict to no more than 5-10 choices

► Place frequent or critical items at the top

► Multicolumn menus are not desirable

► Align the first character of the pull-down descriptions under the second character of the applicable menu bar choice

Pull-Down Menu

► If a menu item establishes or changes the attributes of data or properties of the interface, mark the pull down choice or choices whose state is current or active “On”

► Grouping:

► Mark Toggles or Setting

► Cascade and Leading to other windows indicator

► Keyboard Equivalents and Accelerators



Cascading Menus

► Advantage:

– Top-level menus are simplified because some choices are hidden

– More first-letter mnemonics are available because menus possess fewer alternatives

– High-level command browsing is easier because subtopics are hidden

► Disadvantage

–Access to submenu items requires more steps

- Access to submenu items require a change in pointer movement

Cascading Menus

- ▶ Place an arrow or right-pointing triangle to the right of each menu
- ▶ Leave the choice leading to the cascading menu highlighted
- ▶ Do not exceed three menu levels (two cascades)

Pop Up Menu

- ▶ Choices may be also presents alternatives or choices within the context of the task
- ▶ Pop-up menus may be requested when the mouse pointer is positioned over a designated or hot area of screen (a window border) or over a designed icon
- ▶ Advantage

- They do not use window space when not displayed

- They appear in the working area

- ▶ Disadvantage

- They existence must be learned and remembered
- May obscure the screen working area
- Require a special action to see the menu (Mouse click)

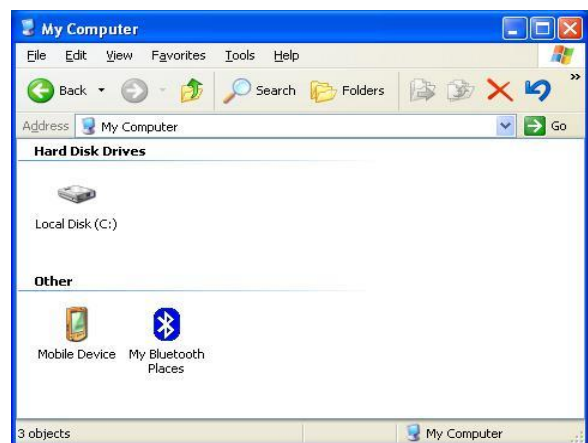
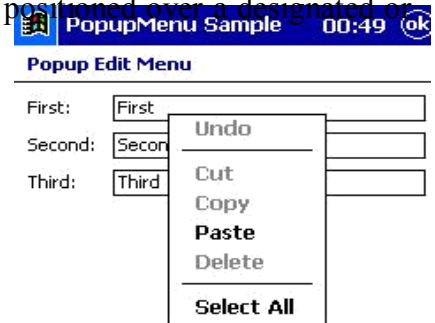
Iconic Menu

- ▶ Use to remind user of the functions, commands, application choices

- ▶ Create icons that

- Help enhance recognition and hasten option selection

- Meaningful and clearly represent choices



UNIT-IV

CONTROLS: Characteristics of device based controls, Selecting the proper device based controls, Operable controls, Text Entry/Read-only controls, Selection controls, Combination Entry/selection controls, Selecting the proper controls.

Select the Proper Device-Based Controls

Introduction:

Def.: Device-based controls, often called **input devices**, are the **mechanisms** through which **people communicate** their **desires** to the system.

Identify the **characteristics** and capabilities of device-based controls:

1. Trackball
2. Joystick
3. Graphic tablet
4. Light pen
5. Touch screen
6. Voice
7. Mouse
8. Keyboard

■ Several specific tasks are performed using graphical systems.

- To point at an object on the screen.
- To select the object or identify it as the focus of attention.
- To drag an object across the screen.
- To draw something free form on the screen.
- To track or follow a moving object.
- To orient or position an object.
- To enter or manipulate data or information.

■ Various devices vary in how well they can perform the actions.

1.Trackball

Def.:A *trackball* is a computer cursor control device used in many notebook and laptop computers.



► Description

- A ball that rotates freely in all directions in its socket

► Advantages

- Direct relationship between hand and pointer movement in terms of direction and speed
- Does not obscure vision of screen

- ▶ Does not require additional desk space (if mounted on keyboard)

▶ **Disadvantages**

- ▶ Movement indirect, in plane different from screen
- ▶ Requires hand to be removed from keyboard keys
- ▶ Requires different hand movements
- ▶ May be difficult to control
- ▶ May be fatiguing to use over extended time

2.Joystick

Def.:A *joystick* is an input device consisting of a stick that pivots on a base and reports its angle or direction to the device it is controlling.



▶ **Description**

A stick or bat-shaped device anchored at the bottom.

▶ **Advantages**

- ▶ Direct relationship between hand and pointer movement in terms of direction and speed
- ▶ Does not obscure vision of screen
- ▶ Does not require additional desk space (if mounted on keyboard)

▶ **Disadvantages:**

- ▶ Movement indirect, in plane different from screen
- ▶ Requires hand to be removed from keyboard keys
- ▶ Requires different hand movements
- ▶ May be difficult to control
- ▶ May be fatiguing to use over extended time
- ▶ May be slow and inaccurate

2.Graphic (*Touch*) Tablet

Def.: A **graphics tablet** (also known as a **digitizer**, **drawing tablet**, **digital drawing tablet**, **pen tablet**, or **digital art board**) is a computer input device that enables a user to hand-draw images, animations and graphics, with a special pen-like stylus, similar to the way a person draws images with a pencil and paper.



► Description

- Pressure-, heat-, light-, or light-blockage-sensitive horizontal surfaces that lie on the desktop or keyboard
- May be operated with fingers, light pen, or objects like pencil

► Advantages

- Direct relationship between hand and pointer movement in terms of direction and speed
- Does not obscure vision of screen
- More comfortable horizontal operating plane

► Disadvantage

- Movement is indirect, in a plane different from screen
- Requires hand to be removed from keyboard
- Requires different hand movements to use
- Finger may be too large from accuracy with small objects

3. Touch Screen

Def.: A *touch screen* is a computer screen that can be used by touching it with a finger or a stylus pen, instead of using a mouse and keyboard.



► Description:

- A special surface on the screen sensitive to finger or stylus touch.

► Advantages:

- Direct relationship between hand and pointer movement in terms of direction and speed
- Movement is direct, in the same plane as screen
- Requires no additional desk space

► Disadvantages:

- Finger may obscure part of screen
- Finger may be too large for accuracy with small objects
- Requires moving the hand far from the keyboard to use
- Very fatiguing to use for extended period of time

▶ May Damage the screen

4. Light Pen



► Description:

- A special surface on a screen sensitive to the touch of a special stylus or pen.

► Advantages:

- Direct relationship between hand and pointer movement in terms of direction, distance, and speed
- Movement is direct, in the same plane as screen
- Requires minimal additional desk space
- Stands up well in high-use environments
- More accurate than finger touching

► Disadvantages:

- Hand may obscure part of screen
- Requires picking it to use
- Requires moving the hand far from the keyboard to use
- Very fatiguing to use for extended period of time

5. Voice

► Description:



- Automatic speech recognition by the computer.

► Advantages:

- Simple and direct
- Useful for people who cannot use a keyboard
- Useful when the user's hands are occupied

► Disadvantages:

- High error rates due to difficulties in Recognizing boundaries between spoken words
 - Blurred word boundaries due to normal speech patterns
- Slower throughput than with typing
- Difficult to use in noisy environment
- Impractical to use in quiet environment



6. Mouse

► Description:

► A rectangular or dome-shaped, movable, desktop control containing from one to three buttons used to manipulate objects and information on the screen.

► Movement of screen pointer mimics the mouse movement.

► Advantages:

► Direct relationship between hand and pointer movement in terms of direction, distance, and speed.

► Permit a comfortable hand resting position

► Selection mechanisms are included on mouse

► Does not obscure vision of the screen

► Disadvantages:

► Movement is indirect, in a plane different from screen

► Requires hand to be removed from keyboard

► Requires additional desk space

► May require long movement distances

► Requires a degree of eye-hand co ordination

Mouse Usage Guidelines

Provide a “hot zone” around small or thin objects that might require extremely fine mouse positioning.

► Never use double-clicks or double-drags as the only means of carrying out essential operations

► Do not use mouse plus keystroke combinations

► Do not require a person to point at a moving target

8. Keyboard:



► Description:

► Standard typewriter keyboard and cursor movement keys.

► Advantages:

► Familiar

► Accurate

► Does not take up additional desk space

► Very useful for

Entering text and alphanumeric data

Inserting in text and alphanumeric data

Keyed shortcuts accelerators

Keyboard mnemonics equivalents

► **Disadvantages:**

- Slow for non-touch-typists
- Slower than other devices in pointing
- Requires discrete actions to operate
- No direct relationship between finger or hand movement

Keyboard Guidelines:

► **Provide keyboard accelerators**

- Assign single keys for frequently performed, small-scale tasks
- Use standard platform accelerators
- Assign Shift-key combinations for actions that extend or are complementary to the actions of key or key combination used without the Shift-key
- Assign Ctrl-key combinations for:

Infrequent actions

Tasks that represent larger-scale versions of the task assigned to the unmodified key

► **Provide keyboard equivalents**

- Use standard platform equivalents
- Use the first letter of the item description
- Provide window navigation through use of keyboard keys

Selecting the Proper Device-Based Control

▶ Provide keyboard accelerators

- ▶ Assign single keys for frequently performed, small-scale tasks
- ▶ Use standard platform accelerators
 - Assign Shift-key combinations for actions that extend or are complementary to the actions of key or key combination used without the Shift-key
- ▶ Assign Ctrl-key combinations for
 - Infrequent actions
 - Tasks that represent larger-scale versions of the task assigned to the unmodified key

▶ Provide keyboard equivalents

- ▶ Use standard platform equivalents
- ▶ Use the first letter of the item description
- ▶ Provide window navigation through use of keyboard keys

▶ Provide keyboards for tasks involving

- ▶ Heavy text entry and manipulation
- ▶ Movement through structured arrays consisting of few discrete objects

▶ Provide an alternative pointing device for graphical or drawing tasks

- ▶ Mouse: pointing, selecting, drawing, and dragging
- ▶ Joystick: selecting and tracking
- ▶ Trackball: pointing, selecting and tracking
- ▶ Touch screen pointing and selecting
- ▶ Graphic tablet pointing selecting, drawing, and dragging

▶ Provide touch screens under the following conditions

- ▶ The opportunity for training is minimal
- ▶ Targets are large, discrete and spread out
- ▶ Frequency of use is low
- ▶ Desk space is at a premium
- ▶ Little or no text input requirement exists

▶ Consider user characteristics and preferences

- ▶ Provide keyboards for touch typists

▶ Minimize eye and hand movements between devices

Pointer Guidelines:

▶ The pointer

- ▶ Should be visible at all times
- ▶ Should contrast well its background
- ▶ Should maintain its size across all screen locations and during movement

▶ Shape of pointer

- ▶ Should clearly indicate its purpose and meaning
- ▶ Should be constructed of already defined shapes
- ▶ Should not be used for any other purpose other than its already defined meaning

▶ Use only as many shapes as necessary to inform the user about current location and status

▶ Animation should not distract

Choose the Proper Screen Based Controls

Def.: **Screen Based controls**, often simply called **controls** and sometimes called **widgets**. By definition, they are **graphic objects** that represent the **properties or operations** of other **objects**.

A control may:

- ▶ Permit the entry or selection of a particular value.
- ▶ Permit the changing or editing of a particular value.
- ▶ Display only a particular piece of text, value, or graphic.
- ▶ Cause a command to be performed.
- ▶ Possess a contextual pop-up window.

Identify the characteristics and capabilities of the various screen-based controls, including:

- ▶ Buttons.
- ▶ Text entry/read-only controls.
- ▶ Selection controls.
- ▶ Combination entry/selection controls.
- ▶ Specialized operable controls.
- ▶ Custom controls
- ▶ Presentation controls.
- ▶ Web controls.
- ▶ Select the proper controls for the user and tasks.

Three extremely important principles regarding controls should be noted:

- ▶ A control must:
 - ▶ Look the way it works.
 - ▶ Work the way it looks.
 - ▶ A control must be used exactly as its design intended.
 - ▶ A control must be presented in a standard manner.

Microsoft Windows Formed Simple Rules for a Control:

- ▶ Raised elements can be pressed.
- ▶ Recessed elements cannot be pressed.
- ▶ Elements on a flat white background can be opened, edited, or moved

Operable Controls:

- ▶ Operable controls are those that permit the entry, selection, changing, or editing of a particular value, or cause a command to be performed.
- ▶ Types include: (1)Buttons(2)Text entry/read-only (3)Selection (4)Combination entry/selection (5)Specialized controls

1.Buttons:

▶Description:

- ▶ A square or rectangular-shaped control with a label inside that indicates action to be accomplished.
- ▶ The label may consist of text, graphics, or both.

▶ Purpose:

- ▶ To start actions.
- ▶ To change properties.
- ▶ To display a pop-up menu.

▶ Advantages:

- ▶ Always visible, reminding one of the choices available.
- ▶ Convenient.
- ▶ Can be logically organized in the work area.
- ▶ Can provide meaningful descriptions of the actions that will be performed.
- ▶ Larger size generally provides faster selection target.
- ▶ Can possess 3-D appearance:
- ▶ Adds an aesthetically pleasing style to the screen.
- ▶ Provides visual feedback through button movement when activated.
- ▶ May permit use of keyboard equivalents and accelerators.

- ▶ Faster than using a two-step menu bar/pull-down sequence.

■ **Disadvantages:**

- ▶ Consumes screen space.
- ▶ Size limits the number that may be displayed.
- ▶ Requires looking away from main working area to activate.

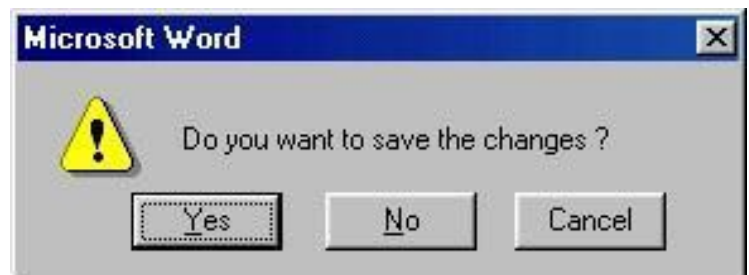
- ▶ Requires moving the pointer to select.

■ **Proper usage:**

- ▶ Use for frequently used actions that are specific to a window.
- ▶ To cause something to happen immediately.
- ▶ To display another window.
- ▶ To display a menu of options.
- ▶ To set a mode or property value.

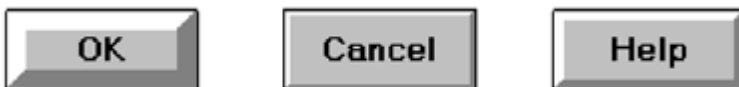
- ▶ Command Buttons

- ▶ Toolbars



Command Buttons (Usage and Label):

- ▶ Use to provide fast access to frequently used or critical commands (for windows with a menu bar)
- ▶ Use to provide access to all necessary commands (for windows without a menu bar)
- ▶ Use single-word labels whenever possible (Use two –three words for clarity, if necessary)
- ▶ Use mixed-case letters with the first letter of each significant label word capitalized



Command Buttons

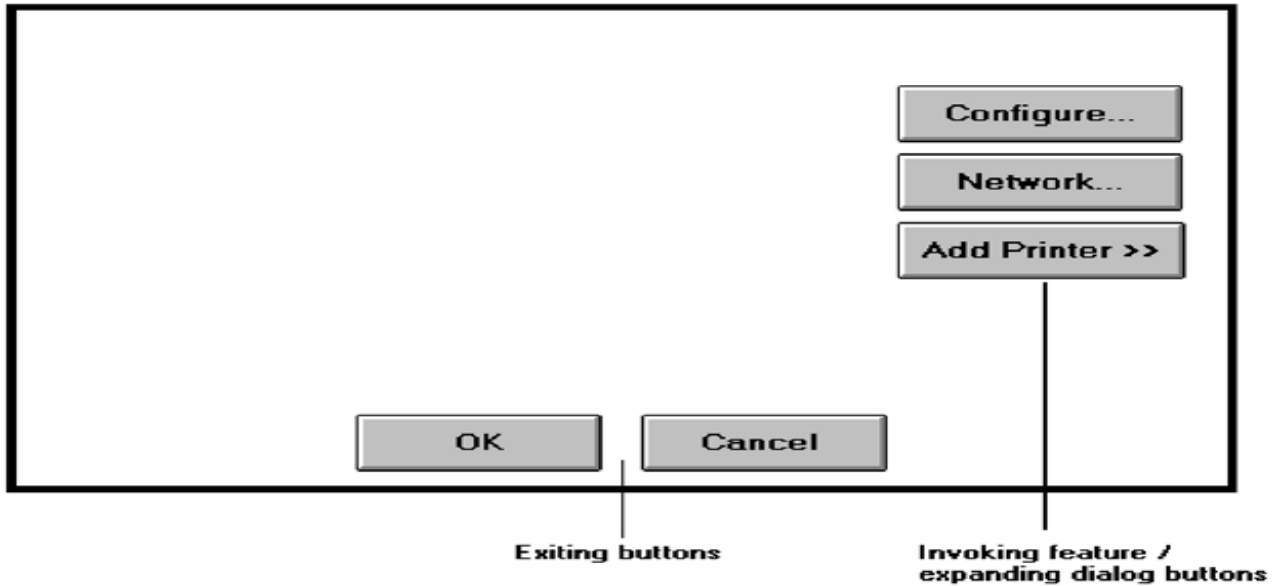
Command Buttons (Label and Size):

- ▶ Do not number labels
- ▶ Center the label within the button borders
- ▶ Provide consistency in button labeling across all screens
- ▶ Restrict the number of buttons on a window to six or fewer
- ▶ Provide as large as button as feasible and maintain consistent button heights and widths

Command Buttons (Location and Layout):

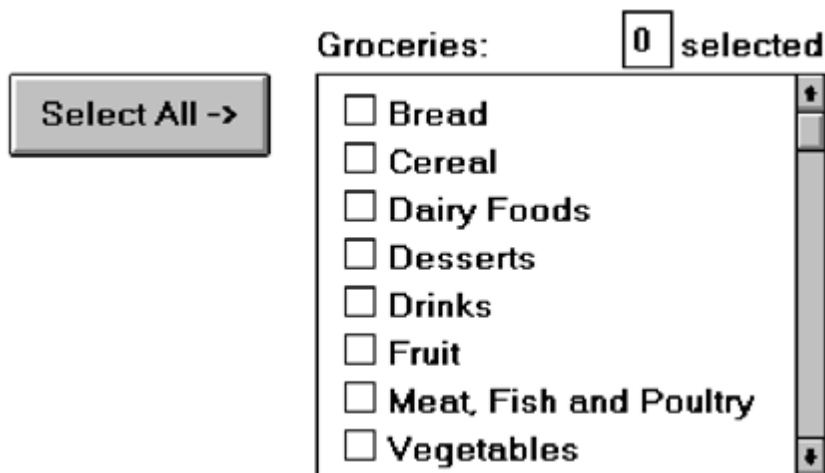
- ▶ Buttons exiting a dialog, and usually closing the window, should be positioned horizontally and centered across the lower part of the window
- ▶ For a button invokes a dialog or expands the dialog, position it centered and aligned vertically along the right side of the window
- ▶ Do not provide alignment with other screen controls. Maintain alignment and spacing only within the buttons themselves
- ▶ Position the buttons within windows before locate the other window controls

Command Buttons (Location and Layout)



Command Buttons (Location and Layout)

- ▶ If a button has a *contingent* relationship to another control, position it adjacent to the related control
- ▶ Buttons found on more than one window should be consistently positioned


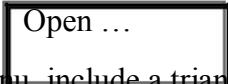
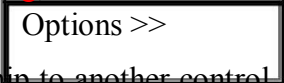


Button with contingent relationship to a control.

Command Buttons (Organization)

- ▶ Most *frequent actions* to the left or top
- ▶ Keep *related buttons* grouped together
- ▶ *Exception*: Buttons containing excessively long labels may be wider
- ▶ Windows Recommends
 - ▶ An affirmative action the left or above
 - ▶ The default first
 - ▶ OK and Cancel next to each other
 - ▶ Help last

Command Buttons(Intent Indicators)

- ▶ No intent indicator is necessary, when a button causes an action to be immediately performed 
- ▶ When a button leads to a cascading dialog, include an ellipsis (...) 
- ▶ When a button leads to a menu, include a triangle pointing in the direction the menu will appear after the label
- ▶ When a button leads to an **expanding dialog**, include a double arrow (>>) 
- ▶ When a button has a contingent relationship to another control, include a single arrow (<) pointing at the control



Command Buttons (Expansion and Defaults)

- ▶ Gray buttons after Expansion or when not applicable
- ▶ When a window is first displayed, provide a default action, if practical
- ▶ A default should be the most likely action:
 - ▶ A confirmation
 - ▶ An application of the activity being performed
 - ▶ A positive action such as OK
 - ▶ If a destructive action is performed (such as a deletion) the default should be Cancel
- ▶ Indicate the default action by displaying the buttons with a bold or double border

Command Buttons (Keyboard Equivalents, Accelerators)

- ▶ The mnemonic should be the first character of the button's label
- ▶ If duplication exists in first characters, use another character in the label
- ▶ Designate the mnemonic character by underlining it
- ▶ Assign a keyboard accelerator to each button to facilitate keyboard selection

Command Buttons (Scrolling and Button Activation)

- ▶ Use buttons to move between multi-page forms, not scroll bars Label buttons Next and Previous.
- ▶ Highlight the button in some visually distinctive manner when the point is resting on it and the button is available for selection

Toolbars:

Toolbars are compilations of commands, actions, or functions, usually graphical in structure but sometimes textual, grouped together for speedy access. Microsoft Windows defines a toolbar as a panel that contains a *set* of controls. Toolbars may also be called *button bars*, *control bars*, or *access bars*.



(Usage, Structure and size)

- ▶ Provide easy and fast access to most frequently used commands or options across multiple screens
- ▶ Provide buttons of equal size
- ▶ Create a meaningful and unique icon
- ▶ Center the image within the button
- ▶ Create a meaningful label
- ▶ Provide the smaller size as the default size with a user option to change it

Toolbars (Organization and Location)

- ▶ Place the most frequently used actions to the left or the top
 - ▶ Keep related buttons grouped together
 - ▶ Separate potentially destructive buttons from frequently chosen selections
 - ▶ Permit user to reconfigure the button organization
-
- ▶ Position main features and functions bar horizontally across top of window just below menu bar
 - ▶ Position subtask and sub features bars along sides of window
 - ▶ Permit the location of the bar to be changed by the user

Toolbars (Active items, Button Activation and Customization)

- ▶ Make only currently available toolbar items available
- ▶ Temporarily not available items by displaying grayed out
- ▶ Highlight the button in some visually distinctive manner when the pointer is resting on it

▶ Call attention to the button in another visually distinctive manner when it **has been activated or pressed**

- ▶ Permit toolbars to be turned off by user
- ▶ Allow the customizing of toolbars

Keyboard Equivalents and Accelerators

- ▶ **Equivalents:**
 - ▶ Assign keyboard equivalents to facilitate keyboard selection.
 - ▶ Maintain the same mnemonic on all identical buttons on all screens.
- ▶ **Accelerators:**
 - ▶ Assign a keyboard accelerator to facilitate keyboard selection.
 - ▶ Provide keyboard equivalents and accelerators to facilitate keyboard selection.

Maintain the same mnemonic on all identical buttons on all screens. One caution, if a particular mnemonic is being used somewhere else in the window, it may not be available for use on the toolbar.



Button Activation

- ▶ **Pointing:**
 - ▶ Highlight the button in some visually distinctive manner when the pointer is resting on it and the button is available for selection.
- ▶ **Activation:**
 - ▶ Call attention to the button in another visually distinctive manner when it has been activated or pressed.

Text Entry/Read-Only Controls (Captions)

For entry boxes

- ▶ Place a colon (:) immediately following the caption
- ▶ For single fields, caption can be located in front of upper-left corner of the box
- ▶ For multiple fields, position the caption upper left of the box
- ▶ For read-only boxes
 - ▶ If the data field is long or about the same length, center the caption above the displayed text box
 - ▶ If the data is alphanumeric, short, or quite variable in length, left-justify the caption above the displayed
 - ▶ If the data field is numeric and variable in length, right-justify the caption above the displayed

Text Entry/Read-Only Controls (Fields)

- ▶ To visually indicate that it is an enterable field, present the box in a recessed manner
- ▶ Present read-only text boxes on the window background
- ▶ Break up long text boxes through incorporation of slashes(/), dashes (-), spaces, or common delimiters
- ▶ Call attention to text box data through a highlighting technique
- ▶ Gray-out temporarily unavailable text boxes

Selection Controls

A **selection** control presents on the screen all the possible alternatives, conditions, or choices that may exist for an entity, property, or value. The relevant item or items are selected from those displayed.

- ▶ Radio Buttons
- ▶ Check Boxes
- ▶ Palettes
- ▶ List Boxes
- ▶ List View Controls
- ▶ Drop-down/Pop-up List Boxes

Radio Buttons:

Description:

- ▶ A two-part control consisting of the following:
 - ▶ Small circles, diamonds, or rectangles.
 - ▶ Choice descriptions.
- ▶ When a choice is selected:
 - ▶ The option is highlighted.
 - ▶ Any existing choice is automatically unhighlighted and deselected.

- ☐ Monthly
- ☒ Quarterly
- ☐ Semi-annually
- ☐ Annually

Monthly
Quarterly
Semi-annually
Annually

Alignment	
<input checked="" type="radio"/> <u>L</u> eft	
<input type="radio"/> <u>C</u> enter	
<input type="radio"/> <u>R</u> ight	
<input type="radio"/> <u>D</u> ecimal	
<input type="radio"/> <u>B</u> ar	

Purpose:

- ▶ To set one item from a small set of mutually exclusive options (2 to 8).

Advantages:

- ▶ Easy-to-access choices.
- ▶ Easy-to-compare choices.
- ▶ Preferred by users.

Disadvantages:

- ▶ Consume screen space.
- ▶ Limited number of choices.

Proper usage:

- ▶ For setting attributes, properties, or values.
- ▶ For mutually exclusive choices (that is, only one can be selected).
- ▶ Where adequate screen space is available.
- ▶ Most useful for data and choices that are:
 - ▶ Discrete.
 - ▶ Small and fixed in number.
 - ▶ Not easily remembered.
 - ▶ In need of a textual description to meaningfully describe the alternatives.

- ▶ **Most easily understood when the alternatives can be seen together and compared to one another.**
- ▶ **Never changed in content.**
- ▶ **Do not use:**
- ▶ **For commands.**
- ▶ **Singly to indicate the presence or absence of a state.**

Radio Buttons (Defaults and Structure)

- ▶ If there is a default selection, designate it as the default and display its button filled in. Else, display all the buttons without setting a dot.
- ▶ When a multiple selection includes choices, display the buttons in another unique manner, such as gray shadow
- ▶ Left-align the buttons and choice descriptions
- ▶ A columnar orientation is the preferred unless vertical space on the screen is limited
- ▶ Enclose the buttons in a border to visually strengthen the relationship

Radio Buttons (Organization, Related Control)

- ▶ Arrange selection in expected order or follow other patterns (frequency of occurrence, sequence of use, or importance)
- ▶ Position any control related to a radio button immediately to the right of the choice description. End the label with an arrow

Radio Buttons (Captions)

- ▶ Display full spelled out in mixed-case letters, capitalizing the first letter of all significant words
- ▶ Columnar orientation
 - ▶ With a control border, position the caption:
 - Upper-left-justified within the border
 - Alternatively, to the left of the topmost choice description with (:))
 - ▶ Without a control border position the caption:
 - Left-justified above the choice description with (:))
 - Alternatively, the caption may be located to the left of the topmost choice description with (:))
- ▶ Horizontal orientation
 - ▶ Position the caption to the left of the choice
 - ▶ Alternatively, with a control border, left-justified within the border

Radio Buttons (Keyboard Equivalents and Selection and Indication)

- ▶ Assign a keyboard mnemonic to each choice description by underlining the applicable letter in the choice description
- ▶ Highlight the selection choice in some visually distinctive way when the cursor's resting on it
- ▶ When a choice is selected, distinguish it visually from the unselected choices
- ▶ If there is a default choice, display the selected choice as set in the control

Check Boxes

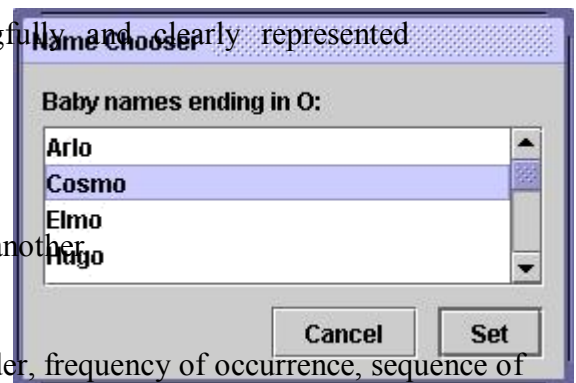
- ▶ Each option acts as a switch and can be either “on” or “off”
 - ▶ When an option is selected, a mark (X) appears within the square box, or the box is highlighted in some other manner
 - ▶ Otherwise the square is unselected or empty (off)
- ▶ Each box can be
 - ▶ Switched on or off independently
 - ▶ Used alone or grouped in sets

!!Other properties are similar to the radio button’s properties!!



Palettes:

- ▶ A control consisting of a series of graphical alternatives. The choices themselves are descriptive, being composed of colors, patterns, or images
- ▶ To set one of a series of mutually exclusive options presented graphically or pictorially
- ▶ Usually consume less screen space than textual equivalents
- ▶ Do not use
 - ▶ Where the alternatives cannot be meaningfully and clearly represented pictorially
 - ▶ Where words are clearer than images
 - ▶ Where the choices are going to change
- ▶ Create boxes of equal size
- ▶ Position the boxes adjacent to, or butted up against another
- ▶ A columnar orientation is the preferred manner
- ▶ Top to bottom, Left to right ordering by expected order, frequency of occurrence, sequence of use or alphabetically
- ▶ Display it less brightly than the other choices, if a choice is not available
- ▶ Highlight the choice in some visually distinctive way when the pointer is resting
- ▶ When a choice is selected, distinguish it visually from the unselected choices



List Boxes:

- ▶ A permanently displayed box-shaped control containing a list of attributes or objects from which
 - A single selection is made (mutually exclusive), or
 - Multiple selections are made (non-mutually exclusive)
- ▶ Unlimited number of choices
- ▶ If the list content change, items will be hard to find
- ▶ Good for data that are
 - ▶ Best represented textually
 - ▶ Not frequently selected
 - ▶ Large in number
 - ▶ Fixed in list length

- ▶ Clearly and meaningfully describe the choices available
- ▶ Present in mixed case
- ▶ Left-align into columns
- ▶ Require no more than 40 page-downs to search a list
- ▶ If more are required, provide a method for using criteria
- ▶ Must be long enough to display 6-8 choices
- ▶ If it is the major control within a window, the box may be larger
- ▶ When box can't be made wide enough to display longest entry
- ▶ Break the long entries with an ellipsis (...)
- ▶ Provide horizontally scrolling

- ▶ Order in a logical and meaningful way to permit easy browsing (allow user to change the sort order will be great)
- ▶ If a particular choices is not available in the current context, omit , gray or dim it
- ▶ Enclose the choices in a box with a solid border
- ▶ Use mixed-case
- ▶ Preferred position of the control caption is above upper-left
- ▶ When a list box is disabled, display its caption as gray out
- ▶ Highlight the selection choice when the pointer is resting on

Single-Selection List Boxes

- ▶ If presented with an associated text box control
 - ▶ Position the list box below and as close as possible to the text box
 - ▶ The list box caption should be worded similarly to the text box caption
 - ▶ If the related text box and the list box are very close, the caption may be omitted from the list box
- ▶ When the list box is first displayed
 - ▶ Present the currently active choice highlighted or marked with a circle or diamond to the left of the entry
 - ▶ If a choice has not been previously selected, provide a default choice and display it in the same manner that is used in selecting it

Multiple-Selection List Boxes

- ▶ Mark the selected choice with an X or check mark to the left of the entry
- ▶ Consider providing a summary list box
 - ▶ Position it to the right of the list box
 - ▶ Use the same color for the summary list box
- ▶ Consider providing a display-only text control indicating how many choices have been selected
 - ▶ Position it justified upper-right above the list box
- ▶ Provide command buttons for Select All and Deselect All
- ▶ When the list box is first displayed
 - ▶ Display the currently active choices
 - ▶ Mark with an X or check mark to the left of the entry

Drop-Down/Pop-up List Boxes

- ▶ Unlimited number of choices
- ▶ When displayed, all choices may not always be visible, requiring scrolling
- ▶ Use drop-down/pop-up when
 - ▶ Screen space or layout consideration make radio buttons or single-selection list boxes impractical
 - ▶ Do not use a drop-down list if it is important that all options be seen together
- ▶ Provide a visual cue that a box is hidden by including a downward pointing arrow, or other meaningful image
- ▶ !Other properties are the same as List boxes!

Combination Entry/Selection Controls and Other Operable Controls:

Def. A control to possess the characteristics of both a text field and a selection field. Information may either be keyed into the field or selected and placed within it.

1. Spin Boxes
2. Combo Boxes
3. Drop-down/Pop-up Combo Boxes
4. Slider

1. Spin Boxes:

- ▶ A single line field followed by two small, vertically arranged buttons (pointing up and pointing down arrow)
- ▶ Selection/entry is made by:
 - ▶ Using the mouse to point at one of directional buttons
 - ▶ Keying a value directly into field itself



Advantages:

- ▶ Consumes little screen spaces
- ▶ Flexible, permitting selection or typed entry

Disadvantages:

- ▶ Difficult to compare choices.
- ▶ Can be awkward to operate.
- ▶ Useful only for certain kinds of data

Proper usage for:

- ▶ For setting attributes, properties, or values.
- ▶ For mutually exclusive choices
- ▶ Where screen space is limited
- ▶ Small in number
- ▶ Infrequently changed, selected
- ▶ To reduce the size of potentially long lists, break the listing into subcomponents (break a date into dd mm yy)
- ▶ When first displayed, present a default choice in the box
- ▶ The spin box should be wide enough to display the longest entry or choice
- ▶ Caption is mixed-case letters
- ▶ Position the caption to the left of the box
 - ▶ Alternatively, left-justified above the box
- ▶ For numeric values
 - ▶ Show a larger value using the up arrow

Combo Boxes:

Def. A single rectangular text box entry field, beneath which is a larger rectangular list box (resembling a drop-down list box)

- ▶ The text box permits a choice to be keyed within it
- ▶ As text is typed into the text box, the list scrolls to the nearest match
- ▶ Also, when an item in the list box is selected, that item is placed within the text box

Purpose:

- ▶ To allow either typed entry in a text box or selection from a list of options in a permanently displayed list box attached to the text box.

Advantages:

- ▶ Unlimited number of entries and choices.
- ▶ Reminds users of available options.
- ▶ Flexible, permitting selection or typed entry.

Disadvantages:

- ▶ Consumes some screen space.
- ▶ All list box choices not always visible, requiring scrolling.

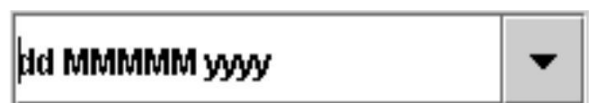
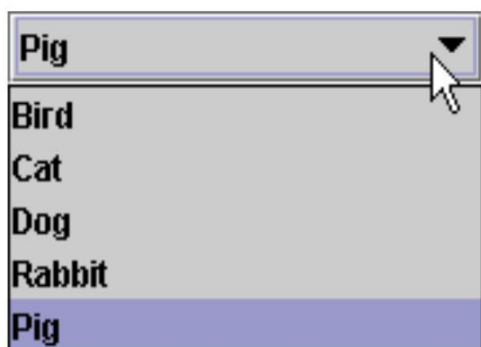
Users may have difficulty recalling sufficient information to type entry, making text box unusable.

- ▶ The list may be ordered in an unpredictable way, making it hard to find items.

■ Proper usage:

- ▶ For entering or selecting objects or values or setting attributes.
- ▶ For information that is mutually exclusive (only one can be entered or selected).
- ▶ When users may find it practical to, or prefer to, type information rather than selecting it from a list.
 - ▶ When users can recall and type information faster than selecting it from a list.
 - ▶ When it is useful to provide the users a reminder of the choices available.
 - ▶ Where data must be entered that is not contained in the selection list.
 - ▶ Where screen space is available.
 - ▶ For data and choices that are:
 - ▶ Best represented textually.
 - ▶ Somewhat familiar or known.

Combo Boxes









Drop-down/Pop-up combo Boxes

- ▶ A single rectangular text box with a small button to the side and an associated hidden list of options
- ▶ Selection are made by using the mouse or keyboard
- ▶ The information keyed doesn't not have to match
- ▶ Unlimited number of entries and choices
- ▶ Flexible, permitting selection or typed entry
- ▶ Requiring scrolling

▶ Proper usage

Baud Rate: 

Baud Rate:

9600	
1200	
2400	
4800	
9600	
19200	

- ▶ Where screen is limited
- ▶ For data and choices that are
 - Best represented textually
 - Frequently changed
 - Large in number
- ▶ Provide a visual cue that a list box is hidden by including a downward-pointing

Slider:

- ▶ A scale exhibiting degrees of a quality on a continuum
- ▶ To make a setting when a continuous qualitative adjustment is acceptable
- ▶ Spatial representation of relative setting
- ▶ Not as precise as an alphanumeric indication

▶ Proper usage:

- ▶ When an object has a limited range of possible settings
- ▶ When the range of values is continuous
- ▶ When graduations are relatively fine



Tabs

Def. A **tab control** is a window containing tabbed dividers that create pages or sections. Also referred to as a **notebook**, the tabs are analogous to dividers in a file cabinet or notebook.

- ▶ Microsoft Windows has a window organization scheme called a *workbook* that is similar to the notebook control.
- ▶ Tabs from Microsoft Windows are illustrated in Figure below.



Tabs from Microsoft Windows.

► Purpose:

- To present information that can be logically organized into pages or sections within the same window.

► Advantages:

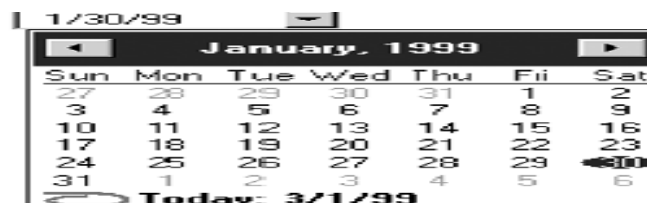
- Resembles their paper-based cousins.
- Visually distinctive.
- Effectively organize repetitive, related information.

■ Disadvantages:

- Visually complex.

■ Proper usage:

- To present discrete, logically structured, related, information.
- To present the setting choices that can be applied to an object.
- When a short tab label can meaningfully describe the tab's contents.
- When the order of information use varies.



Date-Picker

Def. A *date-picker control*, is a **drop-down list box** that displays a 1-month calendar in the drop-down.

- The displayed month can be changed through pressing command buttons with left- and right-pointing arrows.
- The left arrow moves backward through the monthly calendars.
- The right arrow moves forward through the monthly calendars.

A date for the list box can be selected from the drop-down calendar.

■ Purpose:

To select a date for inscribing in a drop-down list box.

■ Advantages:

- Provides a representation of a physical calendar, a meaningful entity.

- ▶ usually distinctive.

■ Disadvantages:

- ▶ Requires an extra step to display the calendar.
- ▶ When displayed, all month choices are not visible, requiring a form of scrolling to access the desired choice.

■ Proper usage:

- ▶ To select and display a single date in close monthly proximity to the default month presented on the drop-down list box.

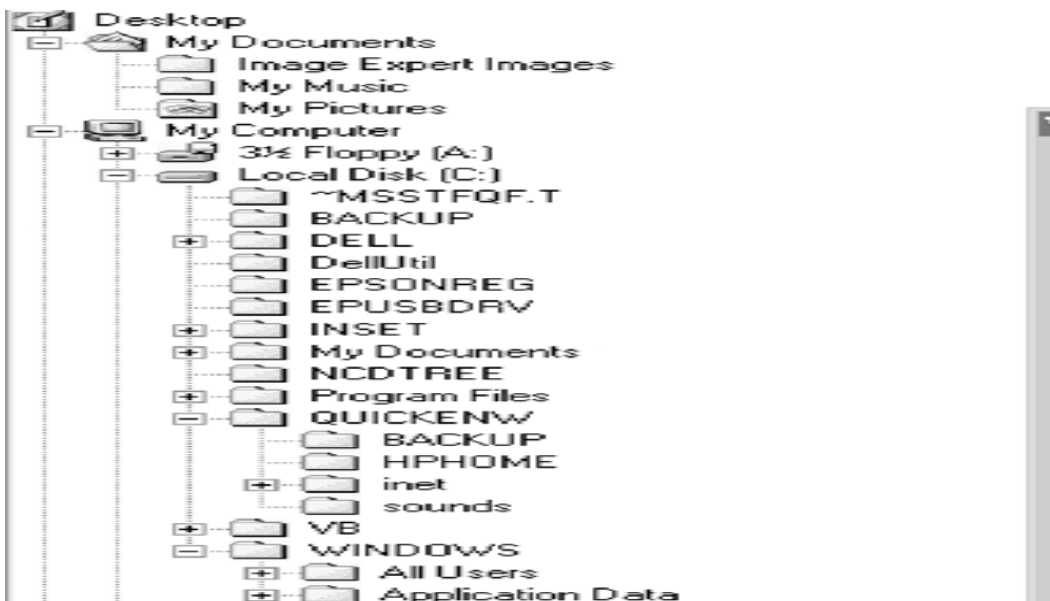
Tree View

Def. A **tree view control**, is a **special list box control** that displays a set of objects as an indented outline, based on their **logical hierarchical relationship**.

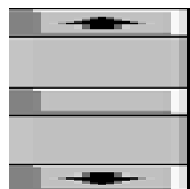
- ▶ Includes, optionally, buttons that expand and collapse the outline.
- ▶ A button inscribed with a plus (+) expands the outline.
- ▶ A button inscribed with a minus (-) collapses the outline.
- ▶ Elements that can optionally be displayed are:
- ▶ Icons.
- ▶ Graphics, such as a check box.
- ▶ Lines to illustrate hierarchical relationships

■ Purpose and proper usage:

- ▶ To display a set of objects as an indented outline to illustrate their logical hierarchical relationship.



A tree view control



Scroll Bars

Def. An elongated rectangular container consisting of:

- ▶ A scroll area.
- ▶ A slider box or elevator inside.
- ▶ Arrows or anchors at either end.
- ▶ Available, if needed, in primary and secondary windows, some controls, and Web pages.
 - ▶ May be oriented vertically or horizontally at the window or page edge.

■ Purpose:

- ▶ To find and view information that takes more space than the allotted display space.

■ Advantages:

- ▶ Permits viewing data of unlimited size.

■ Disadvantages:

- ▶ Consumes screen space.
- ▶ Can be cumbersome to operate.

■ Proper use:

- ▶ When more information is available than the window space for displaying it.
- ▶ Do not use to set values

Presentation controls:

Presentation controls are purely informational. They Provide details about other screen elements or controls or assist in giving the screen structure.

1. Static Text Fields
2. Group boxes
3. Column Headings
4. ToolTips
5. Balloon Tips
6. Progress indicators

Static Text Fields:

A *static text field*, provides read-only textual information. It is a standard Microsoft Windows control.

■ Purpose:

- ▶ To identify a control by displaying a control caption.
- ▶ To clarify a screen by providing instructional or prompting information.
- ▶ To present descriptive information.

■ Proper usage:

- ▶ To display a control caption.
- ▶ To display instructional or prompting information.
- ▶ To display descriptive information.

Caption:

HEADING

This message is very important!

Static text field.

Group Boxes

Def. A *group box* is a standardized rectangular frame that surrounds a control or group of controls.

- ▶ An optional caption may be included in the frame's upper-left corner.

Sizing Grid

Granularity: 0

Border Width: 3

Group Box

■ Purpose:

- ▶ To visually relate the elements of a control.
- ▶ To visually relate a group of related controls.

■ Proper usage:

- ▶ To provide a border around radio button or check box controls.
- ▶ To provide a border around two or more functionally related controls.

■ Guidelines:

- ▶ Label or heading:
- ▶ Typically, use a noun or noun phrase for the label or heading.
- ▶ Provide a brief label or heading, preferably one or two words.
- ▶ Relate label or heading's content to the group box's content.
- ▶ Capitalize the first letter of each significant word.
- ▶ Do not include an ending colon (:).
- ▶ Follow all other guidelines presented for control and section borders.

Column Headings

Def. A **column heading control**, also known as a **header control**, is used to display a heading above columns of text or numbers.

- ▶ Can be divided into two or more parts.

■ Purpose:

- ▶ To identify a column of information contained in a table.

■ Proper usage:

- ▶ To display a heading above a column of information contained in a table.

■ Guidelines:

- ▶ Heading:
- ▶ Provide a brief heading.
- ▶ Can include text and a graphic image.
- ▶ Capitalize the first letter of each significant word.
- ▶ Do not include an ending colon (:).
- ▶ The width of the column should fit the average size of the column entries.
- ▶ Does not support keyboard access.

Name	Size	Type	Modified
11-12.bmp	233 KB	Bitmap Image	1/23/95 3:00 PM
11-13.bmp	470 KB	Bitmap Image	1/23/95 3:01 PM
11-14.bmp	151 KB	Bitmap Image	1/17/95 5:05 PM
11-15.bmp	151 KB	Bitmap Image	1/17/95 5:06 PM



Time

ToolTips

Def. A **ToolTip**, sometimes called a **Screen Tip**, is a standard Microsoft Windows control. A small pop-up window containing descriptive text that appears when a pointer is moved over a control or element either:

- ▶ Not possessing a label.
- ▶ In need of additional descriptive or status information.

■ Purpose:

- ▶ To provide descriptive information about a control or screen element.

■ Advantages:

- ▶ Identifies an otherwise unidentified control.
- ▶ Reduces possible screen clutter caused by control captions and descriptive information.
- ▶ Enables control size to be reduced.

■ Disadvantages:

- ▶ Not obvious, must be discovered.
- ▶ Inadvertent appearance can be distracting.

■ Proper usage:

- ▶ To identify a control that has no caption.
- ▶ To provide additional descriptive or status information about a screen element.

Balloon Tips

Def. A *balloon tip*, is a small pop-up window that contains information presented in a word balloon.

- ▶ Components can include:
 - ▶ Title.
 - ▶ Body text.
 - ▶ Message Icons.
- ▶ Appear adjacent to the item to which they apply, generally above or to left.
- ▶ Only one tip, the last posted, is visible at any time.
- ▶ Tips are removed after a specified time period.

■ Purpose:

- ▶ To provide additional descriptive or status information about a screen element.

■ Advantages:

- ▶ Provides useful reminder and status information.

■ Disadvantages:

- ▶ If overused they lose their attention-getting value.
- ▶ If overused in situations the user considers not very important, their continual appearance can be aggravating.

■ Proper usage:

- ▶ To display noncritical:
- ▶ Reminder information.
- ▶ Do not use tips to display critical information.



Progress Indicators:

Def. A *progress indicator* is a *rectangular bar* that fills as a process is being performed, indicating the percentage of the process that has been completed.

■ Purpose:

- ▶ To provide feedback concerning the completion of a lengthy operation.

■ Proper usage:

- ▶ To provide an indication of the proportion of a process completed.

■ Guidelines:

- ▶ When filling the indicator:
 - ▶ If horizontally arrayed, fill it from left to right.
 - ▶ If vertically arrayed, fill it from bottom to top.
- Fill it with a color or a shade of gray.
- Include descriptive text for the process, as necessary.
- Place text outside of the control.



Sample Box:

Def. A *sample box* is a box illustrating what will show up on the screen based upon the parameter or parameters currently selected.

- ▶ May include text, graphics, or both.

■ Purpose:

- ▶ To provide a representation of actual screen content based upon the parameter or parameters selected.

■ Guidelines:

- ▶ Include a brief label.
- ▶ Use mixed case in the headline style.
- ▶ Locate it adjacent to the controls upon which it is dependent.

Scrolling Tickers:

Def. A *scrolling ticker* is a *window* that contains text scrolling horizontally.

■ Advantages:

- ▶ Consume less screen space than full text.

■ Disadvantages:

- ▶ Hard to read.
- ▶ Time-consuming to interpret.
- ▶ Distracting.

■ Guideline:

- ▶ Do not use it.

Selecting the Proper Controls:

- ▶ Providing the proper control, or mix of controls, is critical to a system's success.
- ▶ The proper control will enable a person to make needed selections, entries, and changes quickly, efficiently, and with fewer mistakes.
- ▶ Improper selection most often leads to the opposite result.

Selecting the Proper Controls:

Task	Best Control	If screen Space Constraints Exist
Mutually Exclusive	Radio Buttons	Drop-down/Pop-up List Box
Not Mutually Exclusive	Check Boxes	Multiple-Selection List Box
Select or Type a Value Text Entry Field	Radio Buttons with “Other”	Drop-down Combo Box
Setting a Value within a Range	Spin Button	Text Box

Suggested Uses for Graphical Controls

IF:	USE:
<ul style="list-style-type: none"> •Mutually exclusive alternative •Best represented verbally •Very limited in number (2 to 8) 	
<p>AND:</p> <ul style="list-style-type: none"> •Typed entry is never necessary •Content can never change •Adequate screen space is available 	Radio Buttons
<p>OR:</p> <ul style="list-style-type: none"> •Typed entry is never necessary •Content can never change •Adequate screen space is not available 	Drop-down/Pop-up List Box
<p>OR:</p> <ul style="list-style-type: none"> •Typed entry may be necessary •Content can change •Adequate screen space is available 	Combo box
<p>OR:</p> <ul style="list-style-type: none"> • Type entry may be necessary •Content can change •Adequate screen space is not available 	Drop-down/Pop-up Combo Box

IF:	USE:
<ul style="list-style-type: none"> •Mutually exclusive alternative •Best represented verbally •Potentially large in number (9 or more) 	
AND: <ul style="list-style-type: none"> •Typed entry is never necessary •Content can never change •Adequate screen space is available 	Single-Selection List Box
OR: <ul style="list-style-type: none"> •Typed entry is never necessary •Content can never change •Adequate screen space is not available 	Drop-down/Pop-up List Box
OR: <ul style="list-style-type: none"> •Typed entry may be necessary •Content can change •Adequate screen space is available 	Combo box
OR: <ul style="list-style-type: none"> • Typed entry may be necessary •Content can change •Adequate screen space is not available 	Drop-down/Pop-up Combo Box

Suggested Uses for Graphical Controls

IF:	USE:
<ul style="list-style-type: none">•Mutually exclusive alternative•Best represented graphically•Content rarely changes•Small or large number of items	Palette
IF:	USE:
<ul style="list-style-type: none">•Mutually exclusive alternatives•Not frequently selected•Content does not change•Predictable, consecutive data•Typed entry sometimes desirable	
And: <ul style="list-style-type: none">•Adequate screen space is not available	Spin Box
OR: <ul style="list-style-type: none">•Adequate screen space is not available	Combo Box

Suggested Uses for Graphical Controls

IF:	USE:
<ul style="list-style-type: none">•Mutually exclusive alternative•Continuous data with a limited range of setting•Value increases/decreases in a well-known, predictable way•Spatial representation enhances comprehension	Slider
IF:	USE:
<ul style="list-style-type: none">•Nonexclusive alternatives•Best represented verbally•Typed entry is never necessary•Content can never change•Adequate screen space is available	
And: <ul style="list-style-type: none">•Very limited in number (2 to 8)	Check Boxes
OR: <ul style="list-style-type: none">•Potentially large in number (9 or more)	Multiple-Selection List Box

HUMAN COMPUTER INTERACTION

UNIT-V

UNIT-V :

Graphics: Icons, Multimedia, colors, uses problems, choosing colors.

Testing: The purpose and importance of usability testing, Scope of testing, Prototypes, Kinds of Tests, Developing and conducting the test.

TEXT BOOK :

1. The essential guide to user interface design, Wilbert O Galitz, Wiley DreamaTech.

Create Meaningful Graphics, Icons and Images



Creating Images

- ▶ Create familiar and concrete shapes
- ▶ Create visually and conceptually distinct shapes
 - ▶ Incorporate unique features of an object
 - ▶ Do not display within a border
- ▶ Clearly reflect object represented
- ▶ Simple reflect object represented, avoiding excessive detail
- ▶ Create as a set, communicating relationships to one another through common shapes
- ▶ Provide consistency in icon type
- ▶ Create shapes of the proper emotional tone
- ▶ Create familiar and concrete shapes
- ▶ Create visually and conceptually distinct shapes
- Incorporate unique features of an object
- Do not display within a border
- ▶ Clearly reflect object represented
- ▶ Simple reflect object represented, avoiding excessive detail
- ▶ Create as a set, communicating relationships to one another through common shapes
- ▶ Provide consistency in icon type
- ▶ Create shapes of the proper emotional tone

Icons

- ▶ Icons are most often used to represent objects and actions with which users can interact
- ▶ Icons may stand alone on a desktop or in a window, or be grouped together in a toolbar
- ▶ A secondary use of a icon is to reinforce important information, a warning icon in a dialog message box

Characteristics of Icons

- ▶ **Syntactics** refers to an icon's physical structure
 - ▶ Shape, Color, Size
 - ▶ Similar shapes and colors can be used to classify a group of related icons
- ▶ **Semantics** is the icon's meaning
 - ▶ What does it refer – a file, a waste basket, or some other objects?
- ▶ **Pragmatics** is how the icons are physically produced and depicted
 - ▶ Is the screen resolution sufficient to illustrate ?
- ▶ Syntactics, semantics and pragmatics determine an icon's effectiveness and usability

Influences on Icon Usability

- ▶ Provide icons that are
 - ▶ Familiar
 - ▶ Clarity
 - ▶ Simple
 - ▶ Consistent
 - ▶ Directness of the meaning
 - ▶ Efficient
 - ▶ Discriminable from others
- ▶ Also consider the
 - ▶ Context in which the icon is used
 - ▶ Expectancies of users
 - ▶ Complexity of task

Choosing Icons

- ▶ A Successful Icon
 - ▶ Looks different from all other icons
 - ▶ Is obvious what it does or represents
 - ▶ Is recognizable when no larger than 16 pixels square
 - ▶ Look as good in black and white as in color
- ▶ Size
 - ▶ 16x16, 24x24, 26x26, 32x32 pixels 16-and-256 color version
 - ▶ Use colors from the system palette
- ▶ Provide as large a hot zone as possible
 - ▶ With stylus or pen: 15 pixels square
 - ▶ With mouse: 20 pixels square
 - ▶ With finger: 40 pixels square

Choosing Images

- ▶ Use existing icons when available
- ▶ Use images for nouns, not verbs
- ▶ Use traditional images
- ▶ Consider user cultural and social norms

Creating Images

- ▶ Create familiar and concrete shapes
- ▶ Create visually and conceptually distinct shapes
 - ▶ Incorporate unique features of an object
 - ▶ Do not display within a border
- ▶ Clearly reflect object represented

- ▶ Simple reflect object represented, avoiding excessive detail
- ▶ Create as a set, communicating relationships to one another through common shapes
- ▶ Provide consistency in icon type
- ▶ Create shapes of the proper emotional tone
- ▶ Create familiar and concrete shapes
- ▶ Create visually and conceptually distinct shapes
 - ▶ Incorporate unique features of an object
 - ▶ Do not display within a border
- ▶ Clearly reflect object represented
- ▶ Simple reflect object represented, avoiding excessive detail
- ▶ Create as a set, communicating relationships to one another through common shapes
- ▶ Provide consistency in icon type
- ▶ Create shapes of the proper emotional tone

Drawing Images

- ▶ Providing consistency in shape over varying sizes
- ▶ Do not use triangular arrows in design to avoid confusion with other system symbols
- ▶ When icons are used to reflect varying attributes, express these attributes as meaning meaningfully as possible
- ▶ Provide proper scale and orientation
- ▶ Use perspective and dimension whenever possible
- ▶ Accompany icon with a label to assure intended meaning

Icon Animation and Audition

- ▶ Animation
 - ▶ Use
 - To provide feedback
 - For visual interest
 - ▶ Make it interruptible or independent of user's primary interaction
 - ▶ Do not use it for decoration
 - ▶ Permit it to be turned off by the user
 - ▶ For fluid animation, present images at 16++ frames /second
- ▶ Auditions
 - ▶ Consider auditory icons

The design Process

- ▶ Define the icon's purpose and use

- ▶ Collect, evaluate, and sketch ideas
- ▶ Draw in black and white
- ▶ Draw using an icon-editing utility or drawing package
- ▶ Test for users
 - ▶ Expectations
 - ▶ Recognition
 - ▶ Learning
- ▶ Test for clarity
- ▶ Register new icons in the system's registry

Graphics in Web

- ▶ Use Graphics to
 - ▶ Supplements the textual content, not as a substitute for it
 - ▶ Convey information that can't be effectively accomplished using text
 - ▶ Enhance navigation through
 - Presenting a site overview
 - Identifying site pages
 - Identifying content areas
 - ▶ Limit the use of graphics that take long time to load
 - ▶ Coordinate the graphics with all other page elements

Images

- ▶ Use standard images, image internationalization
- ▶ Provide descriptive text or labels with all images
- ▶ Distinguish navigational images from decorative images
- ▶ Minimize
 - ▶ The number of presented images
 - ▶ The size of presented images
 - ▶ Image animation
 - ▶ Number of colors
- ▶ GIF, JPEG is prefer

Photographs/Pictures

- ▶ Use when every aspect of the images is relevant
- ▶ Use JPEG format
- ▶ On the initial page
 - ▶ Display a small version
 - A thumbnail
 - Zoom-in on most relevant detail

Video

- ▶ To show the proper way to perform a task
- ▶ To provide a personal message
- ▶ To grab attention
- ▶ Never automatically download a video into a page
- ▶ Provide controls (playing, pausing, and stopping)
- ▶ Considering using
 - ▶ A slide show with audio

Diagrams

- ▶ To show the structure of objects
- ▶ To show the relationship of objects
- ▶ To show the flow of a process or task
- ▶ To reveal a temporal or spatial order

Animation

- ▶ To explain ideas involving a change in
 - ▶ Time
 - ▶ Position
- ▶ To illustrate the location or state of a process
- ▶ To show continuity in transitions
- ▶ To enrich graphical representations
- ▶ To aid visualization of 3-D structures
- ▶ Provide a freeze frame and stop mode
- ▶ Avoid distracting animation

Audition

- ▶ Uses as a supplement to text and graphics
- ▶ To establish atmosphere
- ▶ To create a sense of place
- ▶ To teach
- ▶ To sample
- ▶ The content should be simple
- ▶ Provide audio controls

Combining Mediums

- ▶ Use sensory combination that work best together
 - ▶ Auditory text with visual graphics
 - ▶ Screen text with visual graphics
- ▶ Both the visual and auditory information should be totally relevant to the task being performed
- ▶ Visual and auditory textual narrative should be presented simultaneously
- ▶ Considering downloading times when choosing a media
- ▶ Testing
 - ▶ Legibility
 - ▶ Comprehensibility
 - ▶ Acceptance

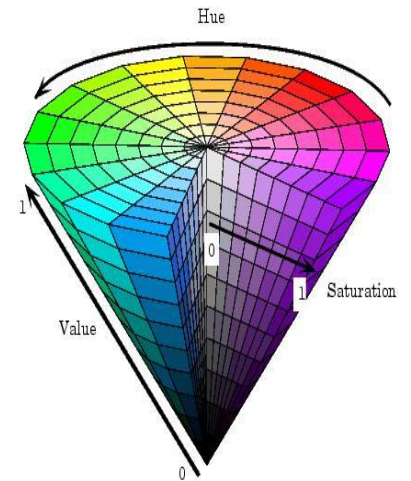
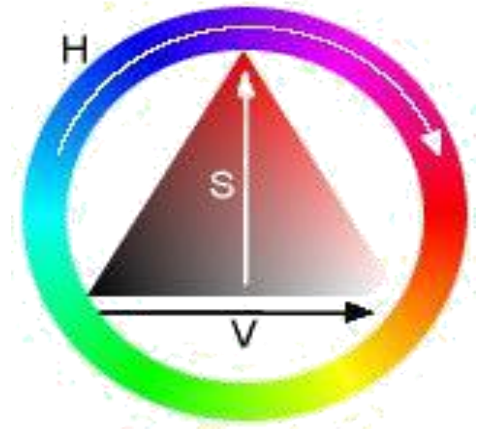
Learning Improvements for Various Media

MEDIUM	% more Learning
Hearing spoken text and viewing graphics	91%
Viewing graphics alone	63%
Viewing text and viewing graphics	56%
Hearing spoken text, viewing text, and viewing graphics	46%
Hearing spoken text and viewing text	32%
Viewing text alone	12%
Hearing Spoken text alone	7%

Choose the Proper Colors

- Color adds dimension, or realism, to screen usability.
- Color draws attention because it attracts a person's eye.

HSV color space



Color Uses

- Use color to assist in formatting
 - ▶ Relating elements into grouping
 - ▶ Breaking apart separate groupings of information
 - ▶ Highlighting or calling attention to important information
- Use color as visual code to identify
 - ▶ Screen captions and data
 - ▶ Information from different sources
 - ▶ Status of information
- Use color to
 - ▶ Realistically portray natural objects
 - ▶ Increase screen appeal

Possible Problems with Color

- High Attention-Getting Capacity
 - ▶ Viewer might associate, tie together, screen elements of same color
 - ▶ Result in confusing, slower reading
- Interference with Use of Other Screens
- Varying Sensitivity of the Eye to Different Colors
 - ▶ Viewing red and blue □ Eye fatigue
- Color-Viewing Deficiencies
- Cross-Disciplinary and Cross-Cultural Differences
 - ▶ For financial managers - Corporate qualities or reliability
 - ▶ For health care professionals – Death
 - ▶ For nuclear reactor monitors – Coolness or water
 - ▶ For American movie audiences – Tenderness or Pornography

Choosing Colors for Categories of Information

- ▶ Color chosen to organize information or data on a screen must aid the transfer of information from the display to the user, Some examples of using color code
 - ▶ If decisions are made based on the status of information on the screen, color-code the types of status the information
 - ▶ Screen searching is performed to locate information of particular kind, color-code for contrast
 - ▶ If the sequence of information use is constrained or ordered, use color to identify the sequence
 - ▶ If the information on a screen is crowded, use color to provide visual grouping
- ▶ Never rely on color as the only way of identifying a screen element
- ▶ Always consider how spatial formatting, highlighting, and messages may also be useful

Color in Context

- ▶ Color are subject to contextual effects
- ▶ Small adjacent colored images may appear to the eye to merge or mix
- ▶ A color on a dark background will look lighter and brighter than the same color on a light background
- ▶ Colors also change as light levels change

Usage

- ▶ Design for monochrome first or in shades of black, white and gray
- ▶ Doing this will permit the screen to be effectively used:
 - ▶ By people with a color-viewing deficiency
 - ▶ On monochrome displays
 - ▶ In conditions where ambient lighting distorts the perceived color
 - ▶ If the color ever fails
- ▶ Use colors conservatively
 - ▶ Do not use color where other identification techniques, such as location, are available

Discrimination and Harmony

- ▶ Select 4-5 colors for best absolute discrimination
 - ▶ Red, yellow, green, blue, and brown
- ▶ Select 6-7 colors for best comparative discrimination
 - ▶ Orange, yellow-green, cyan, violet, and magenta
- ▶ Choose harmonious colors
 - ▶ One color plus two colors on either side of its complement
 - ▶ Three colors at equidistant point around the color circle
- ▶ For extended viewing or older viewers, use brighter colors

Emphasis

- ▶ To draw attention or to emphasize elements, use bright or highlighted colors or use less bright colors for deemphasize
 - ▶ The perceived brightness of colors from most to least is white, yellow, green, blue, red
- ▶ To emphasize separation, use contrasting colors
 - ▶ Red and green, blue and yellow
- ▶ To convey similarity, use similar colors

- ▶ Orange and yellow, blue and violet

Common Meanings

- ▶ To indicate that actions are necessary, use warm colors
 - ▶ Red, orange, yellow
- ▶ To provide status or background, use cool colors
 - ▶ Green, blue, violet, purple
- ▶ Conform to human expectation
 - ▶ Red: Stop, fire, hot, danger
 - ▶ Yellow: Caution, slow, test
 - ▶ Green: Go, OK, clear, vegetation, safety
 - ▶ Blue: Cold, water, calm, sky, neutrality
- ▶ Gray, White: Neutrality
- ▶ Warm colors: Action, response required, spatial closeness
- ▶ Cool colors: Status, background information, spatial remoteness

Common Meanings

- ▶ Typical implications of color with dramatic portrayal are
 - High illumination: Hot, active, comic situations
 - Low illumination: Emotional, tense, tragic, romantic situations
 - High saturation: Emotional, tense, hot, comic situations
 - Warm colors: Active, leisure, recreation, comic situations
 - Cool colors: Efficiency, work, tragic and romantic situations
- ▶ Proper use of color also requires consideration of the experiences and expectation of the screen viewers

Location and Ordering

- ▶ In the center of the visual field, use red and green
- ▶ For peripheral viewing, use blue, yellow, black, and white
- ▶ Use adjacent colors that differ by hue and value or lightness for a sharp edge and maximum differentiation
- ▶ Order colors by their spectral position
 - ▶ Red, orange, yellow, green, blue, indigo, violet

Foregrounds and Backgrounds

► **Foregrounds**

- Use colors that highly contrast with the background color

- For text or data

Black on light-color background of low intensity (no bright white)

Desaturated spectrum colors such as white, yellow, or green on dark background

Warmer more active colors

- To emphasize an element, highlight it in a light value of the foreground color, pure white, or yellow

- To deemphasize an element, lowlight it in a dark value of the foreground color

► **Backgrounds**

- Use colors that do not compete with the foreground

- Use

Light-colored backgrounds of low intensity: Off-white or light gray

Desaturated colors

Cool, dark colors such as blue or black

Colors on the spectral extreme end

– Blue, black, gray, brown, red, green, and purple

Foregrounds and Backgrounds

► **Backgrounds**

- Use colors that do not compete with the foreground

- Use

Light-colored backgrounds of low intensity: Off-white or light gray

Desaturated colors

Cool, dark colors such as blue or black

Colors on the spectral extreme end

– Blue, black, gray, brown, red, green, and purple

Color spectrum □ <http://www.brobstsystems.com/colors.htm>

Gray Scale

- For fine discrimination use a black-gray-white scale

- Recommend values

White: Screen background, text located in any black area

- Light gray: Background of a Pushbutton area

- Medium gray: Icon background area, Menu drop shadow, Window drop shadow, Inside area of system icons, Filename

bar

- Dark gray: Window boarder
- Black: Text, Window title bar, Icon border, Icon elements,
Ruled lines

Text in Color

- ▶ Text in color is not as visible as it is in black
- ▶ When switching text from black to color
 - ▶ Double the width of lines
 - ▶ Use bold or larger type:
 - If originally 8 to 12 points, increase by 1 to 2 points
 - If originally 14 to 24 points, increase by 2 to 4 points
- ▶ Text in color is not as visible as it is in black
- ▶ When switching text from black to color
 - ▶ Double the width of lines
 - ▶ Use bold or larger type:
 - If originally 8 to 12 points, increase by 1 to 2 points
 - If originally 14 to 24 points, increase by 2 to 4 points
- ▶ Check legibility by squinting at text
 - ▶ Too-light type will recede or even disappear

Effective Combination

Background								
Foreground	Black	Blue	Green	Cyan	Red	Magenta	Brown	White
BLACK	X			GOOD		GOOD		Good
BLUE		X			POOR			Good
H.I BLUE			POOR	POOR			POOR	poor
CYAN	GOOD		POOR	X			POOR	
H.I. CYAN	GOOD	GOOD		GOOD	GOOD	GOOD		
GREEN	GOOD	GOOD	X	POOR	GOOD		POOR	poor
H.I. GREEN		GOOD						
YELLOW	GOOD	GOOD		GOOD		GOOD		
RED			POOR		X	POOR	POOR	
H.I. RED			POOR					
MAGENTA			POOR		POOR	X	POOR	
H.I. MAGENTA	GOOD		GOOD			POOR		
BROWN			POOR			POOR	X	

GRAY		POOR			POOR		POOR	
WHITE		GOOD		POOR				X
H.I.WHITE	GOOD		GOOD	GOOD				

Choosing color for web pages

- ▶ Always minimize the number of presented colors for faster downloading
- ▶ Always consider color in context, never in isolation
- ▶ Use similar or same color schemes throughout a Web site □ help the user maintain a sense of place
- ▶ Foreground colors should be as different as possible from background colors
- ▶ The most recommended foreground text color is black presented on a light-colored background of low intensity (off white or light gray)
- ▶ Use dark backgrounds when establishing contrast between an area of the screen and the main screen body
- ▶ High intensity colors as back-ground such as red, magenta and bright green) must be avoided
- ▶ When choosing foreground and background colors, ensure that contrasting combinations are selected
- ▶ Use a uniform color in large screen areas
 - ▶ Large areas of the same color download faster
- ▶ For smaller element, the more contrast is required
- ▶ Use flat Web-safe colors
- ▶ Select color that can be easily reproduced in black and white

Use of Color to Avoid

- ▶ Relying exclusively on color (Spatial Formatting and component locations)
- ▶ Too many colors at one time
- ▶ Highly saturated, spectrally extreme colors together
 - ▶ Red/blue and yellow/purple
 - ▶ Yellow/blue, green/blue and red/green
- ▶ Low-brightness color for extended viewing or older viewer
- ▶ Colors of equal brightness
- ▶ Colors lacking contrast
- ▶ Fully saturated colors for frequently read screen components
- ▶ Pure blue for text, thin lines, and small shapes

- ▶ Colors in small areas
- ▶ Colors for fine details
 - ▶ Black, gray, and white will provide better resolution
 - ▶ Other colors for large area or attracting attention
- ▶ Non-opponent colors
 - ▶ Red/yellow or green/blue
 - ▶ Recommend: Red/green or yellow/blue
- ▶ Red and green in the periphery of large-scale displays
 - ▶ Yellow and blue are much better
- ▶ Adjacent colors only differing in the amount of blue they possess
- ▶ Single color distinctions for color-deficient user
- ▶ Using colors in unexpected ways
- ▶ Using color to improve readability of densely packed text
 - ▶ Recommend to use space lines

Testing

- ▶ The design of graphical systems and Web pages, and their screens, is a complicated process.
- ▶ Web page design factors include the proper integration of text, graphics, navigation links, and controls, page size, writing for simplicity and clarity, the characteristics of browsers and monitors, and accessibility requirements
- ▶ In graphical systems among the many design elements are the types of windows used, the way the windows are organized, what controls are selected to collect and present information, and the way the controls are organized within one window and between several windows.
- ▶ To test the design factors, Testing steps to be reviewed are:
 - Identifying the purpose and scope of testing.
 - Understanding the importance of testing.
 - Developing a prototype.
 - Test, Test,
 - and Retest

The Purpose of Usability Testing

- ▶ Usability testing serves a twofold purpose.
- ▶ First, it establishes a communication bridge between developers and users. Through testing, the developer learns about the user's goals, perceptions, questions, and problems. Through testing, the user is exposed to the capabilities of the system early on, before design is solidified.
- ▶ Second, testing is used to evaluate a product. It validates design decisions. It also can identify potential problems in design at a point in the development process where they can be more easily addressed. Testing also enables comparison of alternate versions of a design element, when a clear direction is not immediately evident. How well the interface and screens meet user needs and expectations can also be assessed.
- ▶ Thorough testing also has one other benefit for the developer. It can prevent the massive embarrassment that often results from letting things "slip through the cracks."

The Importance of Usability Testing

- ▶ A thorough usability testing process is important for many reasons
- ▶ Developers and users possess different models.
- ▶ Developer's intuitions are not always correct.
- ▶ There is no average user.
- ▶ It's impossible to predict usability from appearance.
- ▶ Design standards and guidelines are not sufficient.
- ▶ Informal feedback is inadequate.
- ▶ Products' built-in pieces almost always have system-level inconsistencies.
- ▶ Problems found late are more difficult and expensive to fix.
- ▶ Problems fixed during development mean reduced support costs later.
- ▶ Advantages over a competitive product can be achieved.

Scope of Testing

- ▶ Testing should begin in the earliest stages of product development and continue throughout the development process.
- ▶ It should include as many of the user's tasks, and as many of the product's components, as reasonably possible.
- ▶ Always involve all members of the design team in the testing to ensure a common reference point for all.
- ▶ Involving all also permits multiple insights into the test results from the different perspectives of team members.

Prototypes

- ▶ A prototype is primarily a vehicle for exploration, communication, and evaluation.
- ▶ Its purpose is to obtain user input in design, and to provide feedback to designers.
- ▶ Its major function is the communicative role it plays, not accuracy or thoroughness.
- ▶ A prototype enables a design to be better visualized and provides insights into how the software will look and work. It also aids in defining tasks, their flow, the interface itself, and its screens.
- ▶ A prototype may have great breadth, including as many features as possible to present concepts and overall organization, or it might have more depth, including more detail on a given feature or task to focus on individual design aspects. By nature, a prototype cannot be used to exercise all of a system's functions, just those that are notable in one manner or another.
- ▶ Particularly useful early in design, a prototype should be capable of being rapidly changed as testing is performed. A prototype is characterized by its fidelity, the exactness and thoroughness of its replication of a system's screens and user interaction. Prototypes range in fidelity from low to high, from rough hand-drawn sketches to fully functioning software (Microsoft, 1995; Weinschenk, 1995; Winograd, 1995). Various kinds of prototypes, in general order of increased fidelity, are as follows.

Kinds of Tests

- A test is a tool that is used to measure something. "Something" may be:
 - ▶ Conformance with a requirement.
 - ▶ Conformance with guidelines for good design.
 - ▶ Identification of design problems.
 - ▶ Ease of system learning.
 - ▶ Retention of learning over time.
 - ▶ Speed of task completion.

- ▶ Speed of need fulfillment.
- ▶ Error rates.
- ▶ Subjective user satisfaction

- A test is usually formal; it is created and applied intentionally and with a purpose.
- It is usually based upon some kind of criteria, an understanding of what a good result would be.

Developing and Conducting the Test

- ▶ A usability test requires developing a test plan, selecting test participants, conducting the test, and analyzing the test results.

The Test Plan

- Define the scope of the test.
- Define the purpose of the test.
 - ▶ Performance goals.
 - ▶ What the test is intended to accomplish.
- Define the test methodology.
 - ▶ Type of test to be performed.
 - ▶ Test limitations.
 - ▶ Developer participants.
- Identify and schedule the test facility or location.
- Develop scenarios to satisfy the test's purpose.