4 : Interfaces focused in User Experience Design

IT4106 – User Experience Design (UXD)

Level II - Semester 4

Overview

- The goal of this topic is to give an overview of the diversity of interfaces that can be developed for different environments, people, places, and activities.

Intended Learning Outcomes

- At the end of this lesson, you will be able to;
  - Study about 20 different interface types, starting with command-based and ending with smart ones.

List of sub topics

1.1 Interfaces
- 1.1.1 Command line
- 1.1.2. GUI and WIMP components
- 1.1.3 Multimedia
- 1.1.2 Virtual and Augmented Reality
- 1.1.3 Web Interfaces
- 1.1.4 Mobile Interfaces
- 1.1.5 Embedded Interfaces
- 1.1.6 Voice based interfaces
- 1.1.6 Pen based interfaces
- 1.1.7 Touch, Haptics and Gestures
- 1.1.8 Multimodal Interfaces
- 1.1.9 Shareable and Tangible Interfaces
- 1.1.10 Wearable interfaces
- 1.1.11 Robots and Drones
- 1.1.12 Brain Computer Interfaces
- 1.1.13 Smart Interfaces- Combination of multiple interfaces
- 1.1.14 Natural Interfaces

1.1 Interfaces in UXD

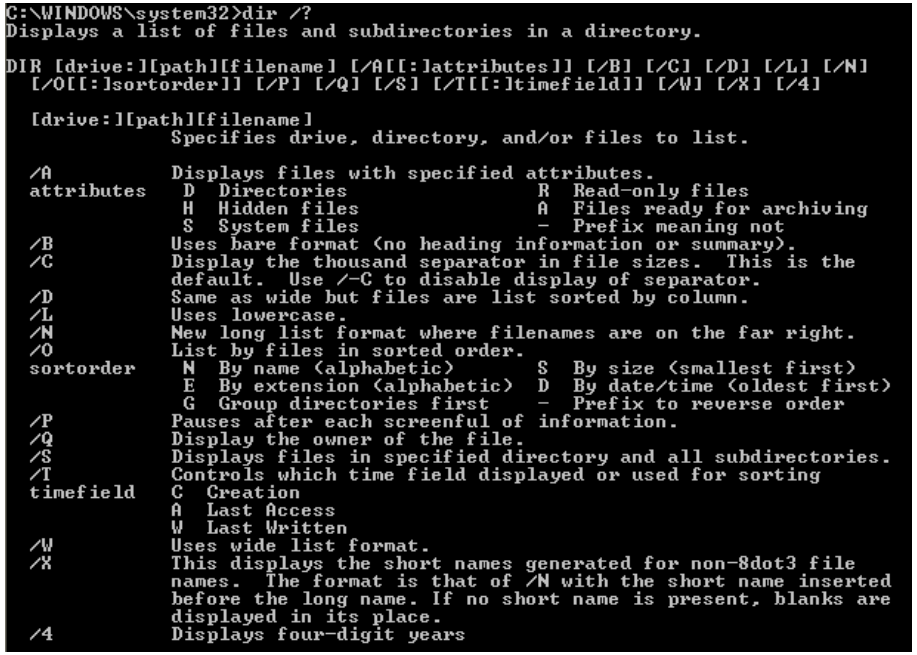
- The user interface is the point at which human users interact with a computer, website or application.
- A central concern is how to design them to be interoperable across different devices and browsers, which takes into account the varying form factors, size, and shape of smart watches, smartphones, laptops, smart TVs, and computer screens.
- Besides the app and the web, many other kinds of interfaces have been developed, including voice interfaces, touch interfaces, gesture interfaces, and multimodal interfaces.

Interface types

- The different types of interfaces that have been developed, including graphical, command, speech, multimodal, invisible, ambient, affective, mobile, intelligent, adaptive, smart, tangible, touchless, and natural
- Some of the interface types are primarily concerned with a function
- Others focus on the interaction style used, the input/output device used (for instance, pen-based, speech-based, or gesture-based), or the platform being designed for (for example, tablet, mobile, PC, or wearable)

Command line

- Command-line interfaces were largely superseded by graphical interfaces that incorporated commands such as menus, icons, keyboard shortcuts, and popup/predictable text commands as part of an application



```
C:\WINDOWS\system32>dir /?
Displays a list of files and subdirectories in a directory.

DIR [drive:][path][filename] [/A[[:]attributes]] [/B] [/C] [/D] [/L] [/N]
  [/O[[:]sortorder]] [/P] [/Q] [/S] [/T[[:]timefield]] [/W] [/X] [/4]

  [drive:][path][filename]
              Specifies drive, directory, and/or files to list.

  /A          Displays files with specified attributes.
  attributes   D  Directories                R  Read-only files
               H  Hidden files               A  Files ready for archiving
               S  System files               -  Prefix meaning not
  /B          Uses bare format (no heading information or summary).
  /C          Display the thousand separator in file sizes.  This is the
              default.  Use /-C to disable display of separator.
  /D          Same as wide but files are list sorted by column.
  /L          Uses lowercase.
  /N          New long list format where filenames are on the far right.
  /O          List by files in sorted order.
  sortorder    N  By name (alphabetic)       S  By size (smallest first)
               E  By extension (alphabetic)  D  By date/time (oldest first)
               G  Group directories first    -  Prefix to reverse order
  /P          Pauses after each screenful of information.
  /Q          Display the owner of the file.
  /S          Displays files in specified directory and all subdirectories.
  /T          Controls which time field displayed or used for sorting
  timefield   C  Creation
              A  Last Access
              W  Last Written
  /W          Uses wide list format.
  /X          This displays the short names generated for non-8dot3 file
              names.  The format is that of /N with the short name inserted
              before the long name. If no short name is present, blanks are
              displayed in its place.
  /4          Displays four-digit years
```

GUI

The graphical user interface (GUI

Visually designing the interface became possible

Use of color, typography, and imagery

GUIs have been adapted for mobile and touchscreens

Default action for most users is to swipe and touch using a single finger when browsing and interacting with digital content

WIMP interface

Windows

Icons

Menus

Pointers

- default style for majority of interactive computer systems, especially PCs and desktop machines

Windows

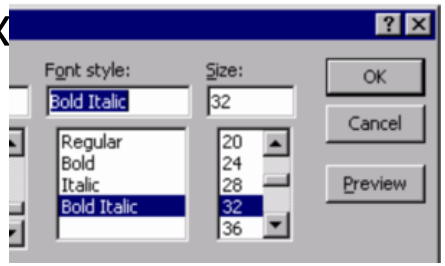
- Areas of the screen that behave as if they were independent
  - can contain text or graphics
  - can be moved or resized
  - can overlap and obscure each other, or can be laid out next to one another (tiled)
- Scrollbars
  - allow the user to move the contents of the window up and down or from side to side
- Title bars
  - describe the name of the window

Widgets – elements of WIMP

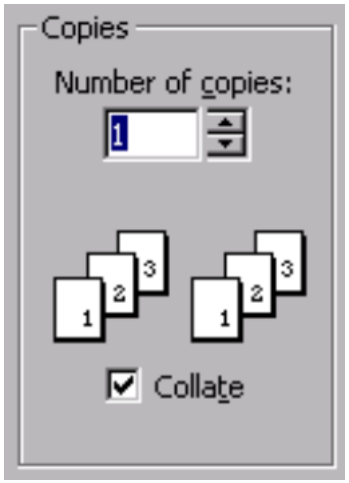
- three aspects of widgets:
  - appearance - what they look like
  - interaction - how they behave
  - semantics - what they mean

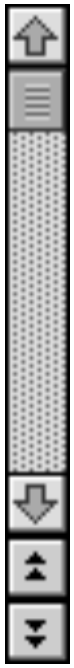
- elements of the wimp interface

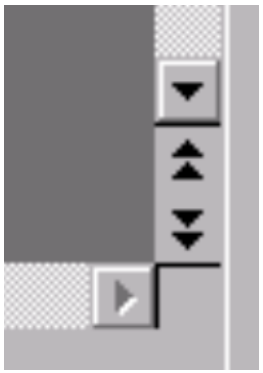
windows, icons, menus, pointers
+++ buttons, toolbars, palettes, dialog box



Appearance, Interaction and Semantics

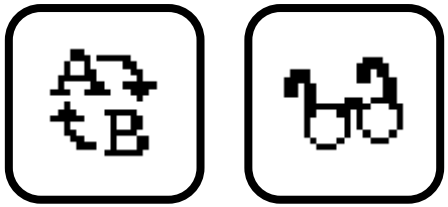






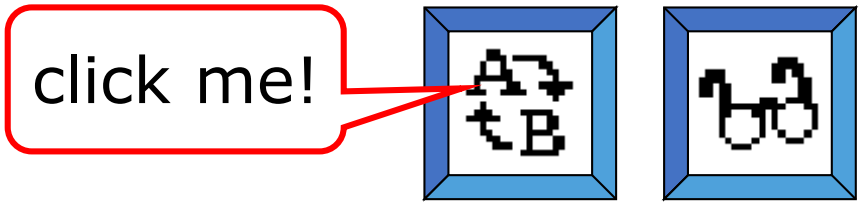
Three dimensional interfaces

- Facilitates to develop immersive environment
- Virtual Reality
- https://www.youtube.com/watch?v=UT5xtpHRdlE

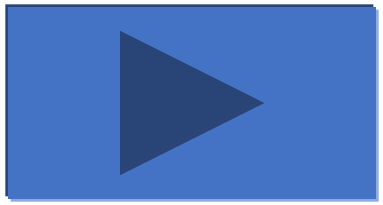


flat buttons …

- ‘ordinary’ window systems
  - highlighting
  - visual affordance
  - indiscriminate use just confusing!



… or sculptured



Icons

- small picture or image

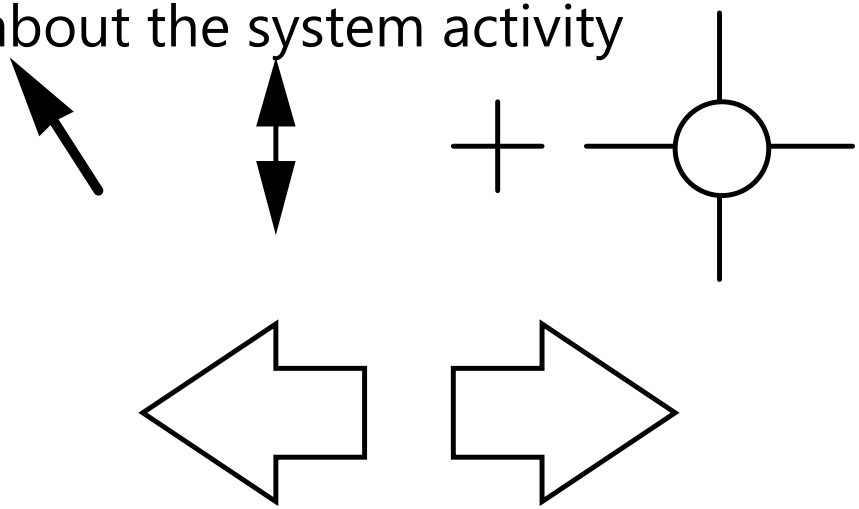
- represents some object in the interface
  - often a window or action
- windows can be closed down (iconised)
  - small representation many accessible windows
- icons can be many and various
  - highly stylized
  - realistic representations

Pointers

- important component
  - WIMP style relies on pointing and selecting things

- uses mouse, trackpad, joystick, trackball, cursor keys or keyboard shortcuts

- wide variety of graphical images for pointer cursors to tell the user about the system activity



Point and click interfaces (direct interaction)

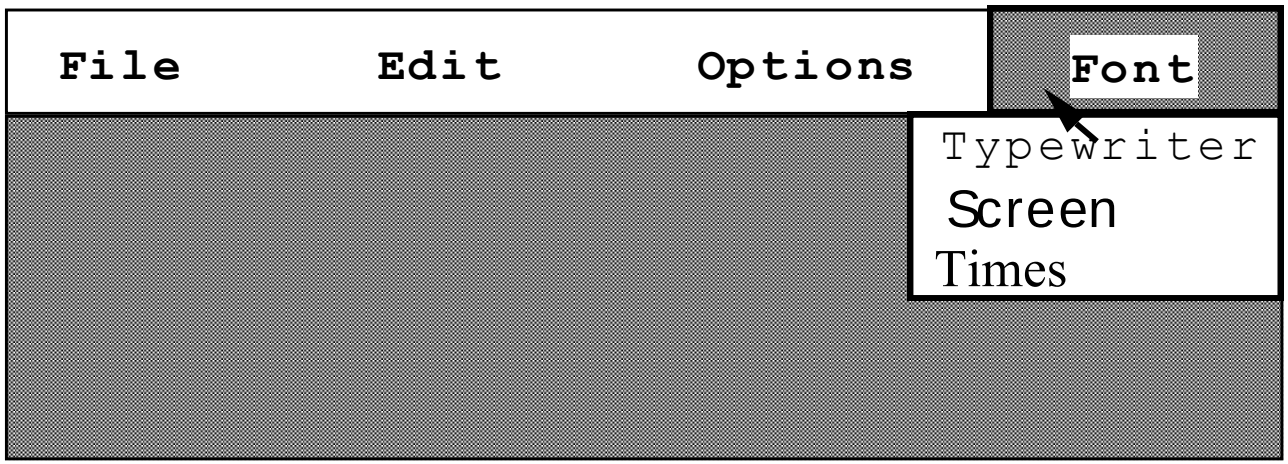
- used in ..
  - multimedia
  - web browsers
  - hypertext

- just click
- icons, text links or location on map

- minimal typing

Menus

- Choice of operations or services offered on the screen
- Required option selected with pointer



problem – take a lot of screen space
solution – **pop-up**: menu that appears when needed

Kinds of Menus

- Menu Bar at top of screen (normally), menu drags down
  - pull-down menu - mouse hold and drag down menu
  - drop-down menu - mouse click reveals menu
  - fall-down menus - mouse just moves over bar!

- Contextual menu appears where you are
  - pop-up menus - actions for selected object
  - pie menus - arranged in a circle
    - easier to select item (larger target area)
    - quicker (same distance to any option)
      … but not widely used!

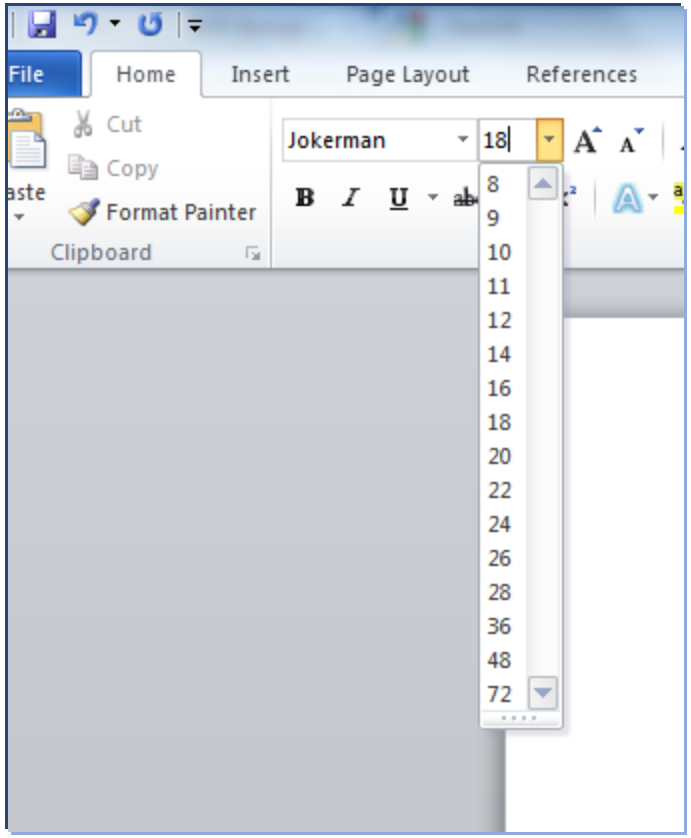
Menus extras

- Cascading menus
  - hierarchical menu structure
  - menu selection opens new menu
- Keyboard accelerators
  - key combinations - same effect as menu item
  - two kinds
    - active when menu open – usually first letter
    - active when menu closed – usually Ctrl + letter

Scrolling Menu

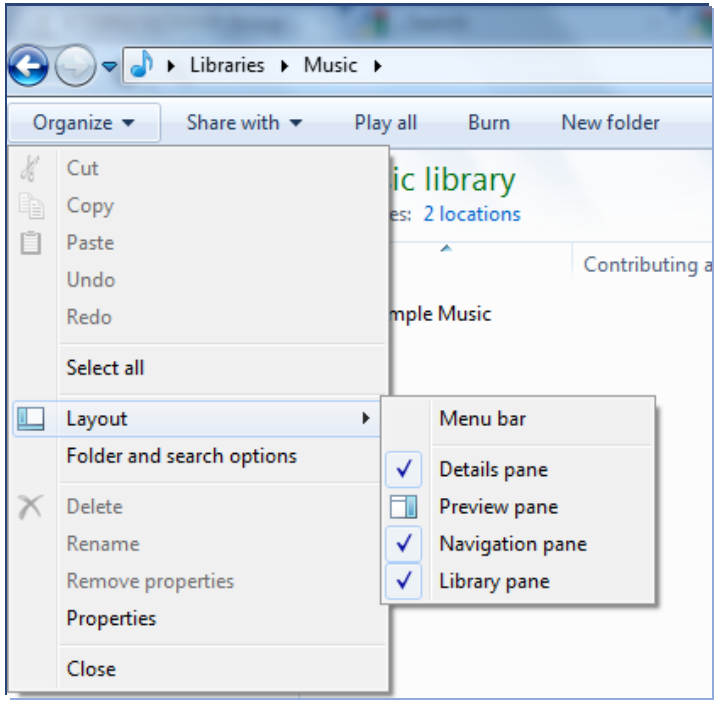
- When a full choice list can not be displayed within the menu area, scrolling of the menu items is required.

- This would enable the user to view and select the menu items that cannot be accommodated on the screen. However, in a scrolling menu all the commands should be highly correlated, so that the user can easily locate a command that he needs. This is important since the user cannot see all the commands at any one time.



Walking & Hierarchical Menus

- **Walking menu**
  Walking menu is very commonly used to structure a large collection of menu items. In this technique, when a menu item is selected, it causes further menu items to be displayed adjacent to it in a sub-menu.



- **Hierarchical menu**

In this technique, the menu items are organized in a hierarchy or tree structure. Selecting a menu item causes the current menu display to be replaced by an appropriate sub-menu.

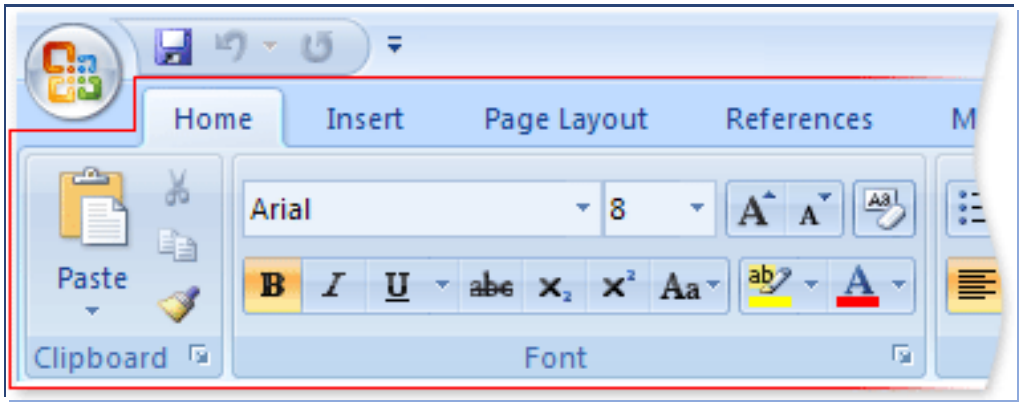
Advantages and disadvantages of Menus

- **Advantages**
- Effective with users that have little training, if users are unfamiliar with the terminology
- The users does not need to remember and type lots of commands and data

- **Disadvantages**
- May have to switch screens to access menus
- Issues with response time and display rate
- Ineffective sequence of present items

New Style of WIMP

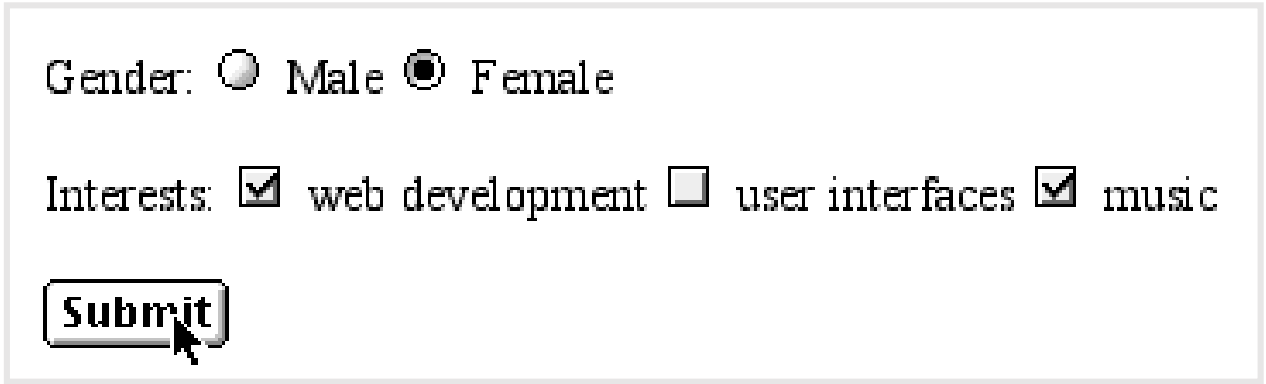
- simultaneous display of several windows.
- menus tool bars have replaced by **Ribbons.**
- Pointers and pointing devices are finding themselves coexisting with touch interfaces.
- File management is (quite rightly) being replaced.
- **Gesture – Post WIMP**



Buttons

- Individual and isolated regions within a display that can be selected to invoke an action

- Special kinds
  - radio buttons
    - set of mutually exclusive choices
  - check boxes
    - set of non-exclusive choices

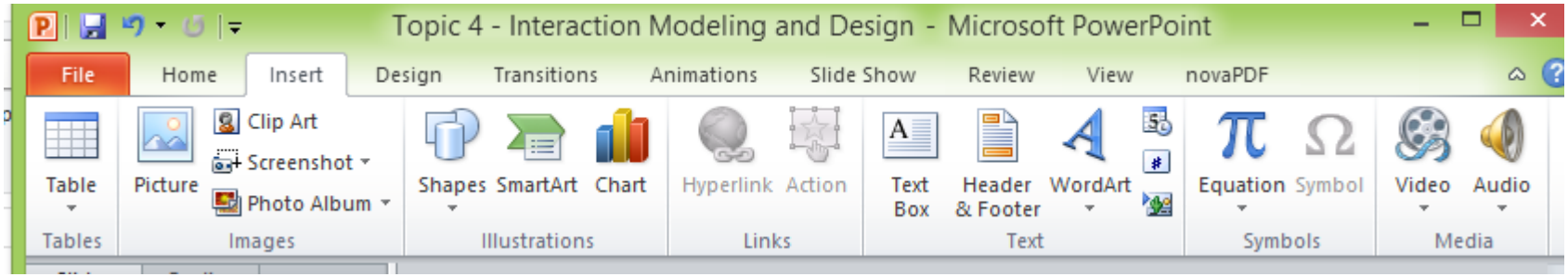


Toolbars

- long lines of icons …
  … but what do they do?

- fast access to common actions

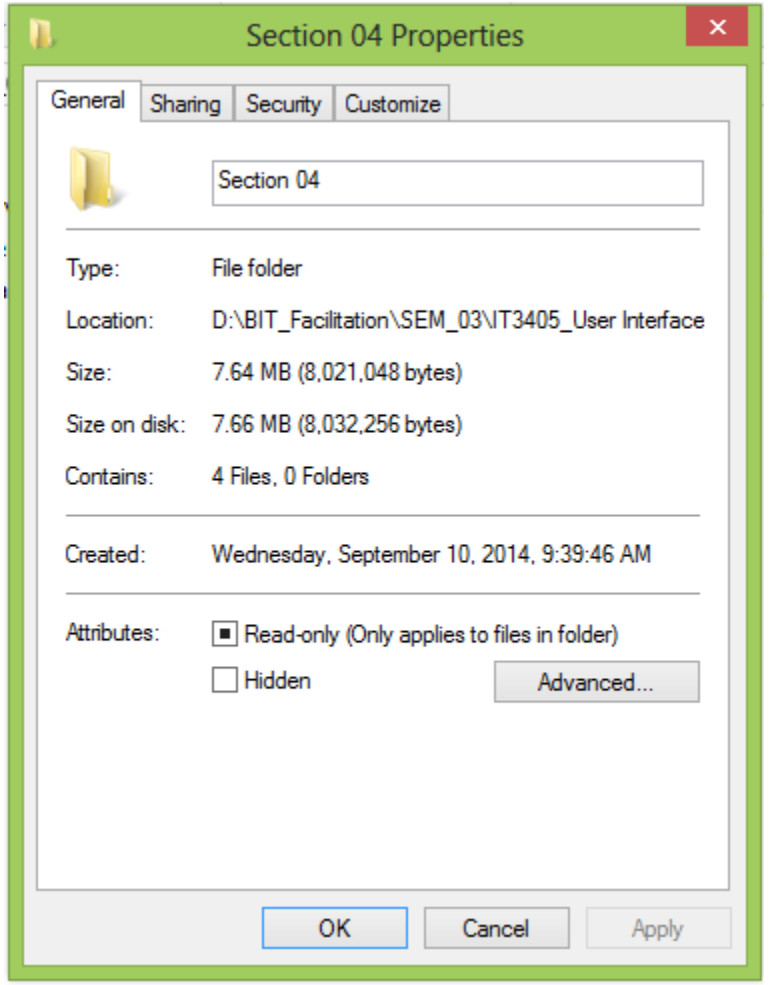
- often customizable:
  - choose ***which*** toolbars to see
  - choose ***what*** options are on it



Dialogue boxes

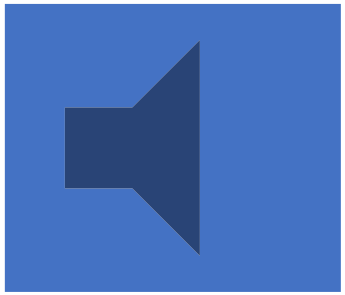
- Information windows that pop up to inform of an important event or request information.

  e.g: when saving a file, a dialogue box is displayed to allow the user to specify the filename and location. Once the file is saved, the box disappears.



Behavior

Move mouse over button
– will end the show

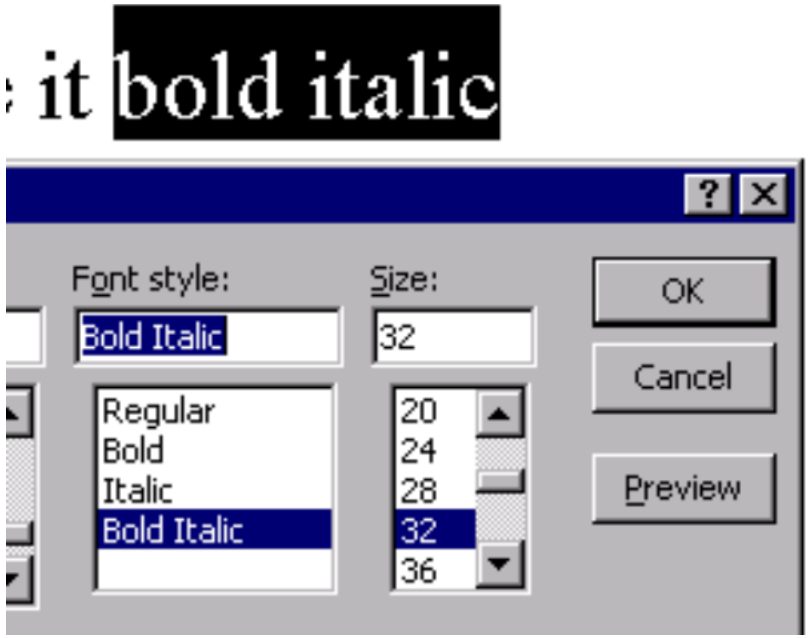


Will make a background sound

Start a program

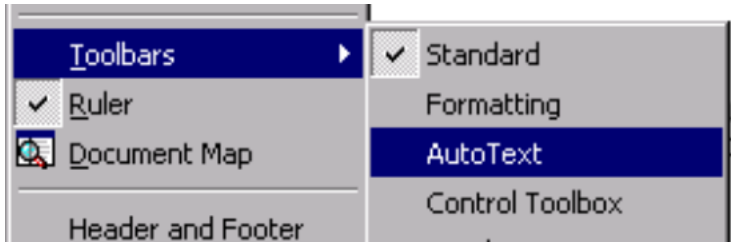
Semantics

- menus, buttons,…, etc.
- do things …
- … lets make it ***bold italic***



What do you want?

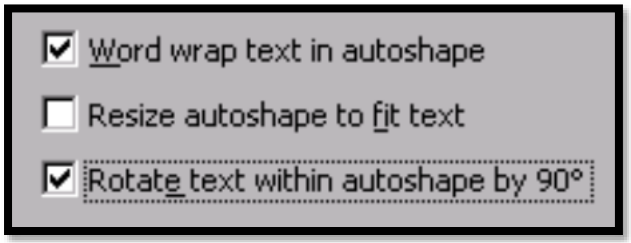
- Actions
  - usually menu, buttons, or toolbar
- Setting state/options
  - usually checkbox, radio button, combi-box
- but …
  - menus can be used to set state etc. ...



How many?

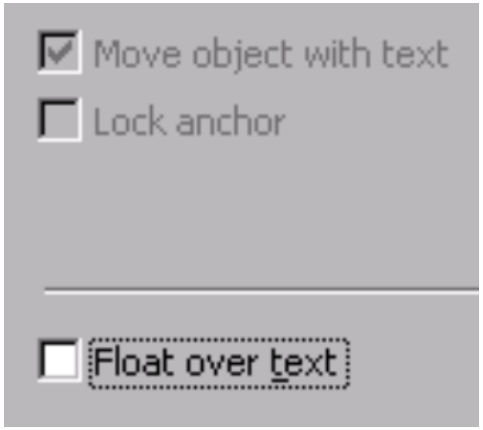
- one of several options
  - radio buttons, selection menu

- zero, one or more options
  - checkbox, multi-choice menu



and more ...

- Number
  - fixed e.g. bold, italic, underline
  - variable e.g. font list
  - scrolling through telephone list ...
- Liveness
  - grey out inactive options
- Dynamic interactions
  - some choices dependent on others



Other interfaces

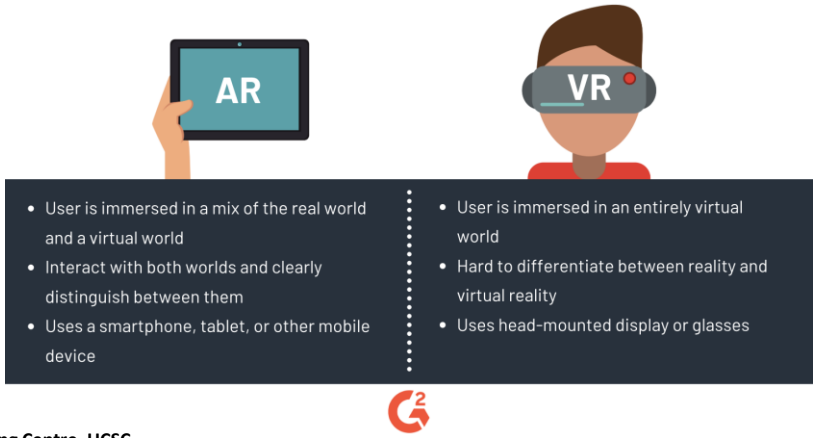
Multimedia

- Combines different media within a single interface (graphics, text, video, sound, and animation, and links)
- Users can click links in an image or text that triggers another media such as an animation or a video
- Ability to facilitate rapid access to multiple representations of information

Virtual and Augmented Reality

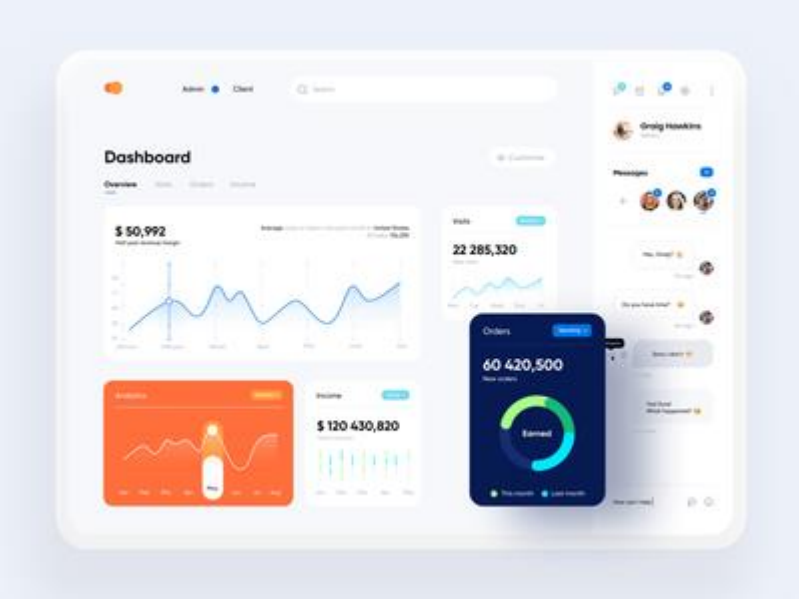
- ***Virtual Reality*** (VR) is the use of computer technology to create a simulated environment. Unlike traditional user interfaces, VR places the user inside an experience. Instead of viewing a screen in front of them, users are immersed and able to interact with 3D worlds.

- In ***augmented reality*** (AR) interfaces, three dimensional virtual images appear superimposed over real objects. AR applications typically use head mounted or handheld displays to make computer graphics appear in the user's environment.



Web Interfaces

- A Web user interface or Web app allows the user to interact with content or software running on a remote server through a Web browser



Mobile Interfaces

- Mobile devices have become pervasive, with people increasingly using them in all aspects of their everyday and working lives including phones, fitness trackers, and watches.
- Customized mobile devices are also used by people in a diversity of work settings where they need access to real-time data or information while walking around.

Embedded Interfaces

Appliances include machines for everyday use in the home (washing machines, microwave ovens, refrigerators, toasters, bread makers, and smoothie makers)

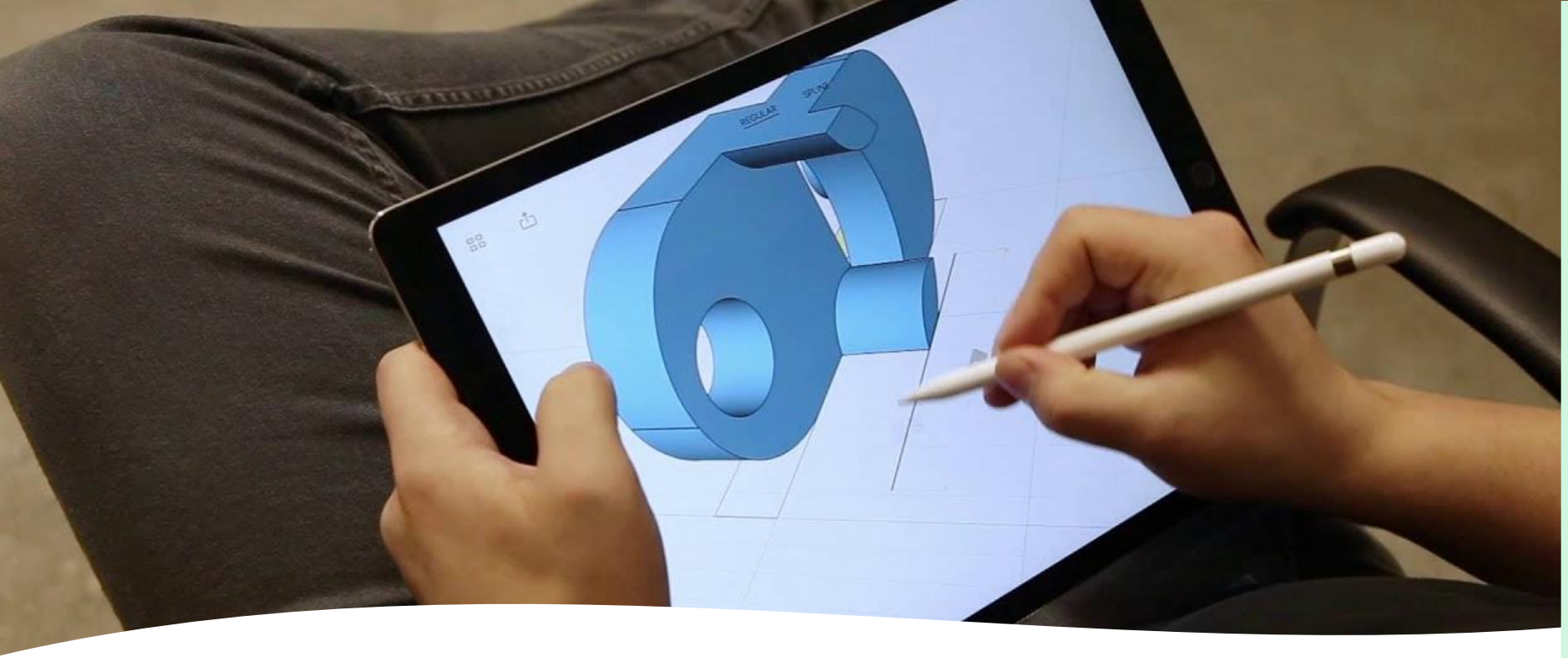
Trying to get something specific done in a short period of time

Many of them now have LED displays

Some have begun to be connected to the Internet

Voice based interfaces

- A ***voice user interface*** **(VUI)** involves a person talking with a spoken language app (search engine, a train timetable, a travel planner, or a phone service).
  - Used for inquiring about specific information or issuing a command to a machine



Pen based interfaces

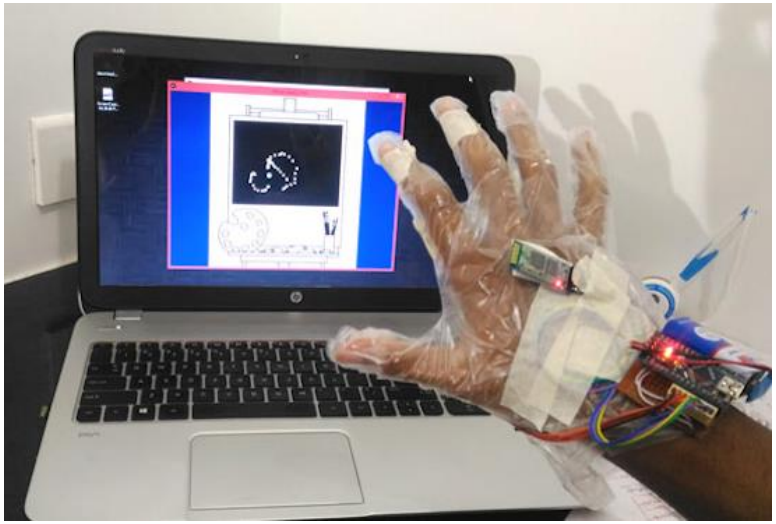
- ***Pen-based devices*** enable people to write, draw, select, and move objects on an interface using light pens or styluses
  - Interact with tablets and large displays, instead of mouse, touch, or keyboard input, for selecting items and supporting freehand sketching.

Touch Interfaces

- ***Single touchscreens***, used in walk-up kiosks such as ticket machines or museum guides, ATMs, and cash registers have been around for a while.
  - Detect the presence and location of a person's touch on the display
  - Options are selected by tapping on the screen
- ***Multitouch surfaces***, support a much wider range of more dynamic fingertip actions, such as swiping, flicking, pinching, pushing, and tapping

Gestures based interfaces

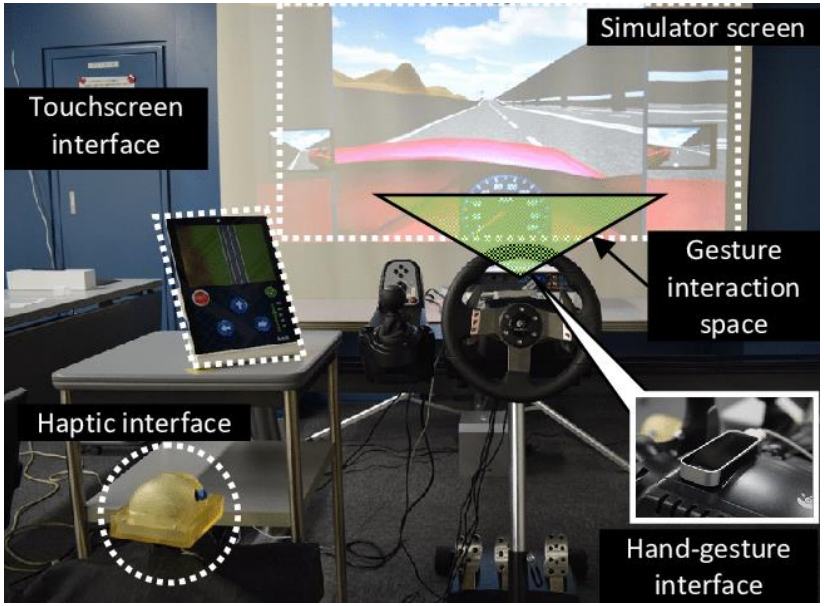
- ***Gestures*** involve moving arms and hands to communicate or to provide information to someone
  - How technology can be used to capture and recognize a user's gestures for input by tracking them using cameras and then analyzing them using machine learning algorithms



Haptic interfaces

- ***Haptic interfaces*** provide tactile feedback
  - Applying vibration and forces to the person, using actuators that are embedded in their clothing or a device that they are carrying, such as a smartphone or smart watch

Multimodal Interfaces



- Enhance the way information is experienced and controlled at the interface through using different modalities, such as touch, sight, sound, and speech
- Include speech and gesture, eye-gaze and gesture, haptic and audio output, and pen input and speech
- Support more flexible, efficient, and expressive means of human–computer interaction

Shareable and Tangible Interfaces

- Designed for more than one person to use.
- Provide multiple inputs and sometimes allow simultaneous input by collocated groups.
- These include large wall displays(Smart Boards) where people use their own pens or gestures, and interactive tabletops

Wearable Interfaces

- Worn on the body
- Smartwatches, fitness trackers, fashion tech, and smart glasses.
- Head and eye cameras enable to record while accessing digital information

Robots

- Play an important role as part of manufacturing assembly lines, as remote investigators of hazardous locations and as search and rescue helpers in disasters or faraway places
- Console interfaces, joysticks and keyboard controls together with cameras and sensor-based interactions used to control robots
- Interfaces were designed enabling users to steer and move a remote robot effectively with the aid of live video and dynamic maps

Drones

- Form of unmanned aircraft that are controlled remotely
- Can fly low and stream photos to a ground station

Brain Computer Interfaces

- *Brain–computer interfaces* (BCI) provide a communication pathway between a person's brain waves and an external device
- Every time we think, move, feel, or remember something, these neurons become active
- Small electric signals rapidly move from neuron to neuron, which to a certain extent can be detected by electrodes that are placed on a person's scalp
- The electrodes are embedded in specialized headsets, hairnets, or caps

Smart Interfaces- Combination of multiple interfaces

- Smartphone, smartwatch, smart building, smart home, or smart appliance
- The device has some intelligence and it is connected to the Internet
- Designed to interact with users and other devices
- Connected to a network
- Automated
- Context-aware
- Smart devices implemented using AI can learn the context and a user's behavior

Natural Interfaces

- A ***natural user interface*** **(NUI)** is designed to allow people to interact with a computer in the same way that they interact with the physical world
- Enable users to speak to machines, stroke their surfaces, gesture at them in the air, dance on mats that detect feet movements, smile at them to get a reaction etc