

## ***Multimedia Systems***

A ***Multimedia System*** is a system capable of processing multimedia data and applications.

A ***Multimedia System*** is characterised by the processing, storage, generation, manipulation and rendition of Multimedia information.

## ***Characteristics of a Multimedia System***

A Multimedia system has four basic characteristics:

- ✓ Multimedia systems must be ***computer controlled***.
- ✓ Multimedia systems are **integrated**.
- ✓ The information they handle must be represented **digitally**.
- ✓ The interface to the final presentation of media is usually **interactive**.

## ***Components of a Multimedia System***

Now let us consider the Components (Hardware and Software) required for a multimedia system:

**- Capture devices**

Video Camera, Video Recorder, Audio Microphone, Keyboards, mice, graphics tablets, 3D input devices, tactile sensors, VR devices.

Digitising/Sampling Hardware

**- Storage Devices**

Hard disks, CD-ROMs, Jaz/Zip drives, DVD, *etc*

**- Communication Networks**

Ethernet, Token Ring, FDDI, ATM, Intranets, Internets.

**- Computer Systems**

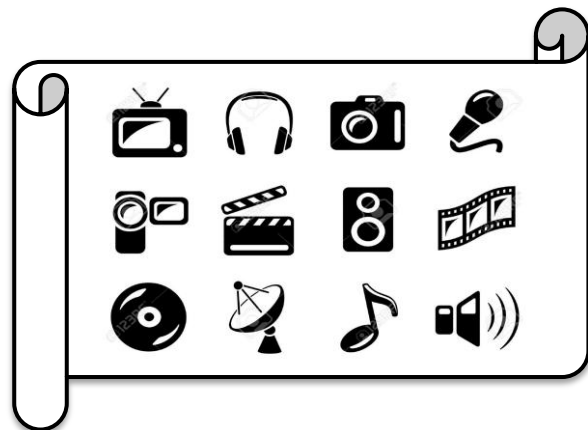
Multimedia Desktop machines, Workstations, MPEG/VIDEO/DSP Hardware

**- Display Devices**

CD-quality speakers, HDTV, SVGA, Hi-Res monitors, Colour printers *etc.*

Amazingly, one of the most predominant networked multimedia applications has its roots in nuclear physics! As noted in the previous section, Tim Berners-

Lee proposed the World Wide Web to CERN (European Center for Nuclear Research) as a means for organizing and sharing their work and experimental results. The following is a short list of important dates in the creation of the WWW.



## TEXT

**Text: main form of communicating knowledge**

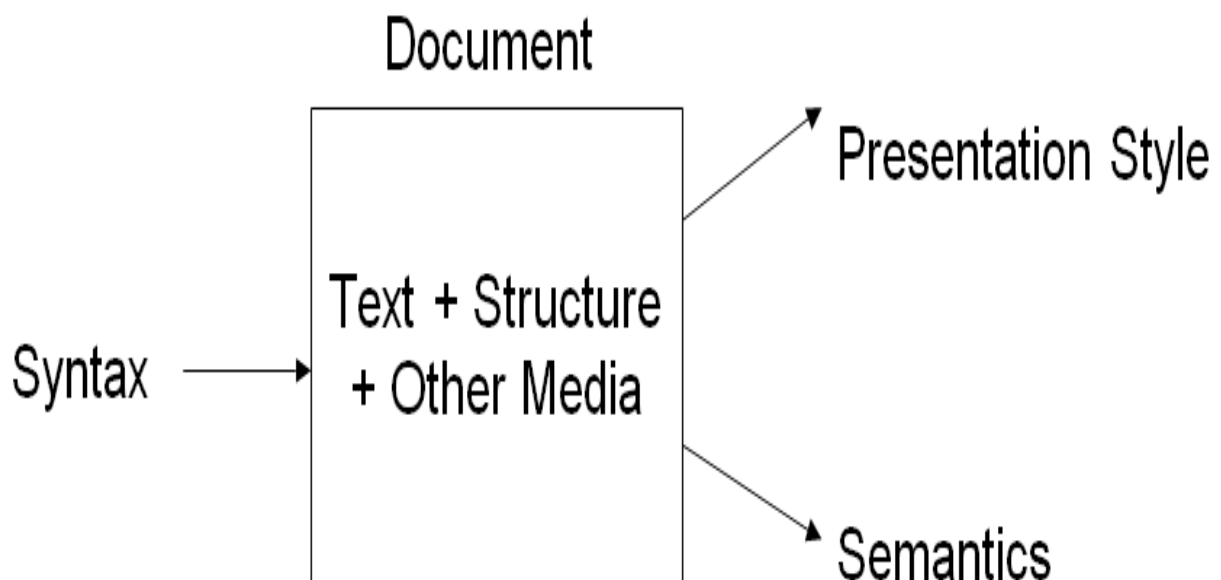
Source: keyboard, speech input, optical character recognition, data stored on disk.

- A document has
  - syntax:
  - structure :

- semantics: specified by the author
- presentation style: specifies how it should be displayed or printed.

## Characteristics of a Document

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## Format of TEXT

- Full ASCII syntax: TeX

- Binary syntax: Word, WordPerfect, FrameMaker
- Rich Text Format (RTF)
  - ✓ used by word processors
  - ✓ has ASCII syntax
  - ✓ developed for document interchange
- Portable Document Format (PDF) and Postscript
  - ✓ developed for displaying and printing documents
  - ✓ Multipurpose Internet Mail Exchange (MIME)
  - ✓ interchange formats
  - ✓ used to encode electronic mail
- Compressed text:
  - Compress (Unix)
  - ARJ (PCs)
  - ZIP (gzip-Unix, Winzip-Windows), etc.
- Conversion tools: convert binary files (compressed text) to ASCII text for transmission:
  - uuencode/uudecode
  - binhex.

## **Stored and input character by character:**

For other forms of data (e.g. Spreadsheet files). May store format as text (with formatting) others may use binary encoding.

## **IMAGE**

- Still image which (uncompressed) are represented as a bitmap (a grid of pixels).
- Input: digitally scanned photographs/pictures or direct from a digital camera.
- Input: May also be generated by programs “similar” to graphics or animation programs.
- Stored at 1 bit per pixel (Black and White), 8 Bits per pixel (Grey Scale, Color Map) or 24 Bits per pixel (True Color)
- Size: a 512x512 Grey scale image takes up 1/4 MB, a 512x512 24 bit image takes 3/4 MB with no compression.
- This overhead soon increases with image size — modern high digital camera 10+ Megapixels  $\approx$  29MB uncompressed! Compression is commonly applied

## **Image Representation**

Image/Graphics Data Types: There are number of file formats used in multimedia to represent image or graphics data. In general, image or graphics data can be represented as follows:

**1) 1-bit Images:** Image Consist of pixels or pels – picture elements in digital images. It contains On(1) or Off(0) bits stored in single bit. So they are also known as Binary image. It is also called as Mono chrome image because it contains no color. 640x480 image Requires 38.4 KB of storage.

**2) 8-bit gray Level Images:** Consider 8-bit image, One for which each pixel has Gray value between 0 to 255 stored in single byte. Image is a Two dimensional array known Bitmap. Image resolution refers to number of pixels in digital image like 1600x1200 is high resolution where as 640x480 is low resolution with aspect ration of 4:3. Frame buffer is a hardware used to store array of pixels of image. Special hardware is used for this purpose known as Video/ Graphics card. 8-bit image is a collection of 1-bit bit planes. 640x480 image requires 300 KB of storage.

**Dithering:** Printing images is a complex task, 600 Dot per Inch (dpi) laser printer can usually print a dot or not print it. However, 600x600 image will be printed in 1-inch space. Basic strategy of dithering is to trade Intensity resolution for spatial resolution. For printing 1-bit printer, dithering is used to calculate larger patterns of dots. Replace a pixel value by a larger pattern say 2x2, 4x4.

**3) 24-bit color image:** In color 24-bit images, Each pixel is represented by three bytes, usually representing components R, G, B. Each value is in range 0-255, this format supports 256x256x256 possible combined colors. 640x480 size image takes 921.6 KB of storage. Actually it is stored in 32 bits, extra byte of data for each pixel storing alpha value for representing special effect information. Alpha channel is used for overlapping graphical objects known as Transparency.

**4) 8-bit color image:** Accurate color images can be obtained by quantizing color information to 8-bit, Called as 256 color image. 24 bit image is obtained from 8-bit using a concept of Lookup Table.



**Color Lookup table:** which stores color information. Image stores just set of bytes which is an index into table with 3 byte values that specify color for pixel. It is useful to choose which colors to represent best in image.

**Color histogram:** all colors in 24 bit image are collected in 256x256x256 set of cells, along with count of how many pixels belong to each of these colors stored in that cell. Then we can get a three dimensional array structure known as Color Histogram. Few important clusters of color information, corresponding to R, G, and B allows us to pick most important 256 groups of colors for construction of Color look up table.