



# Graphics, Digital Media and Multimedia

Chapter 6 Multimedia Part 2

# Topics

- Multimedia Definition
- Animation
- Video
- Audio
- Hypertext and Hypermedia
- Interactive Multimedia

# Multimedia

- Multimedia means that computer information can be represented through audio, video, and animation in addition to traditional media (i.e., text, graphics/drawings, images).



# Animation



- Is a method in which pictures are manipulated to appear as moving images. The effect of animation is achieved by a rapid succession of sequential images that minimally differ from each other.
- A **frame** is one of the many still images which compose the complete *moving picture*, Each frame has a drawn picture.
- Frame Rate:
  - Is the frequency (rate) at which consecutive images called frames appear on a display.
  - Usually ( > 24 frames/sec → standard 30)
- A 20 second 30fps animation, how many frames?

# Computer Animation

- Computer Animation used in television and movies to create effects that would be difficult or impossible to achieve without computers
- Most animations are made with computer-generated imagery (CGI)
- [https://en.wikipedia.org/wiki/Computer-generated\\_imagery](https://en.wikipedia.org/wiki/Computer-generated_imagery)
- Tweening:
  - It is the process of generating intermediate frames between two images, called key frames, to give the appearance that the first image evolves smoothly into the second image



# Video

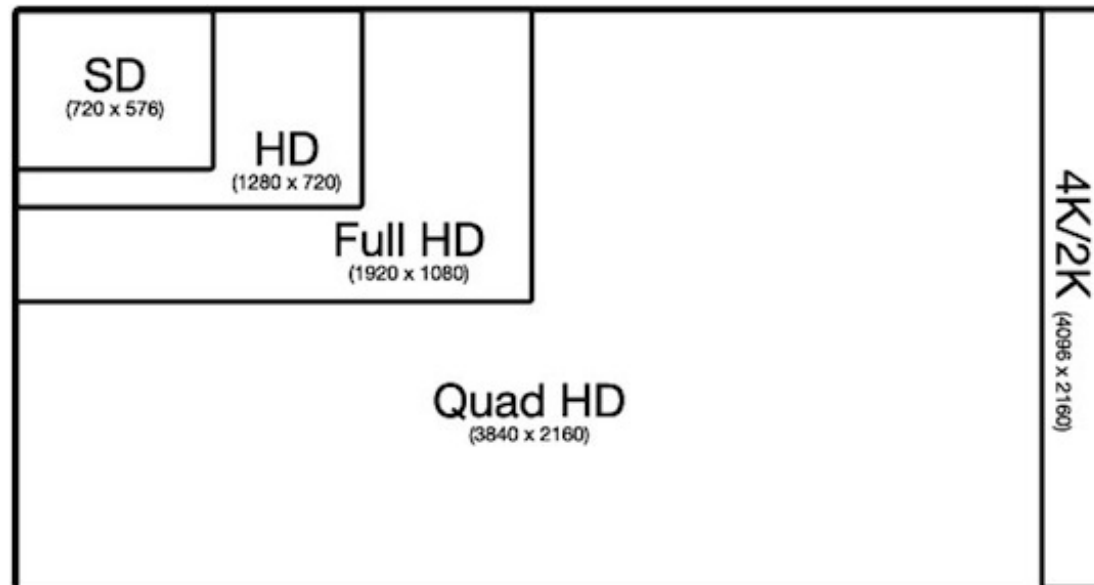


- Is an electronic medium for the recording, copying, playback, broadcasting, and display of moving visual media.
- Digital video is a series of bitmap images that, when played back, create the illusion of movement.



# Video

- The quality and overall file size of digital video is determined by its frame size, bit depth & frames per second (fps).
- Frame size: Width x Height
  - E.g. High-definition video: 1280x720



# Special Effects

- Morphing
  - is a special effect in motion pictures and animations that changes (or morphs) one image or shape into another through a seamless transition
  - Uses a series of frames to create a smooth movement (YouTube Link [Chapter 6 part 2.2](#))

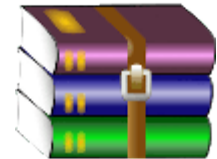




# Data Compression

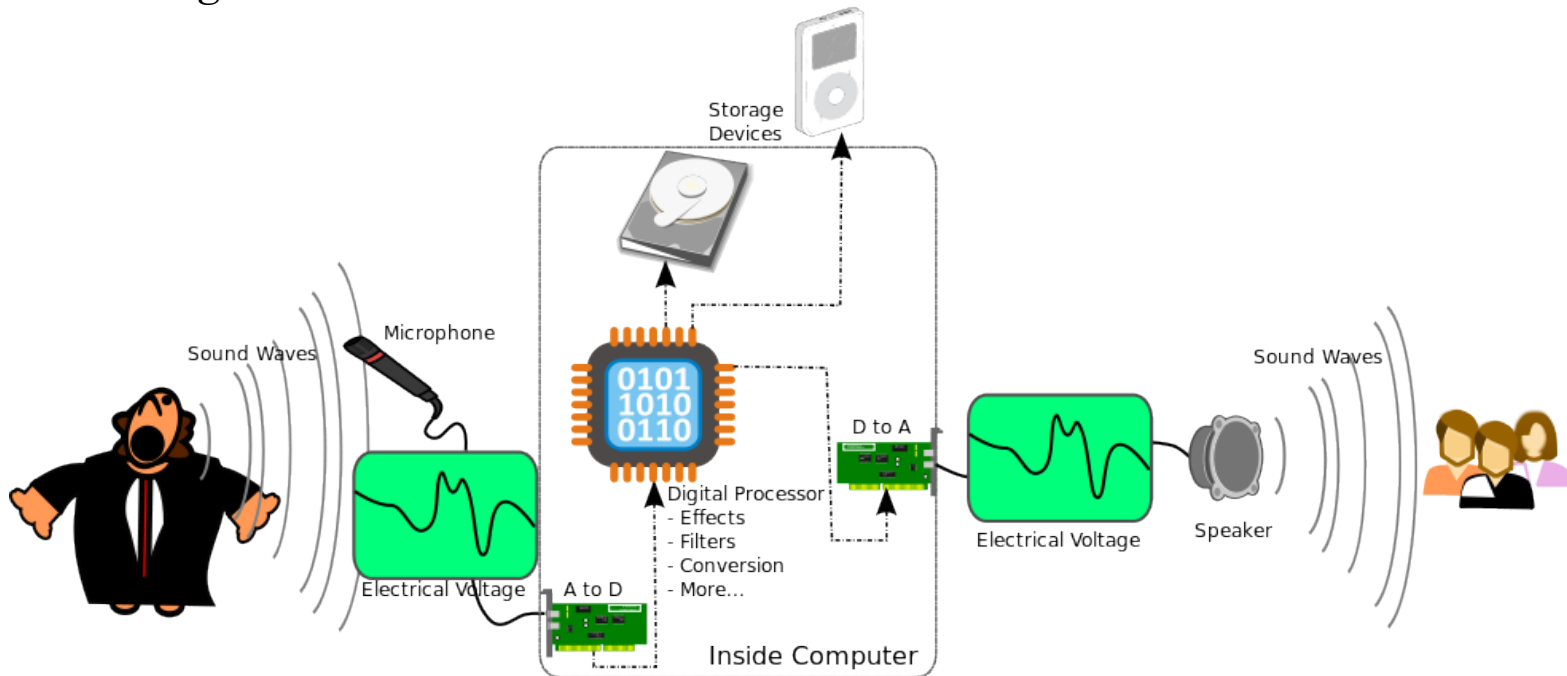


- Encoding information using fewer bits than the original representation. Compression can be either lossy or lossless.
- Lossless : recover the original representation
  - E.g. WinZip, WinRar,
  - Not good enough for Multimedia Data!
- Lossy: recover a representation similar to the original one
  - Throw away nonessential (perceptually less relevant) parts of the data stream
  - Examples: MP3, JPEG, MPEG Video
  - high compression ratios
  - More practical use



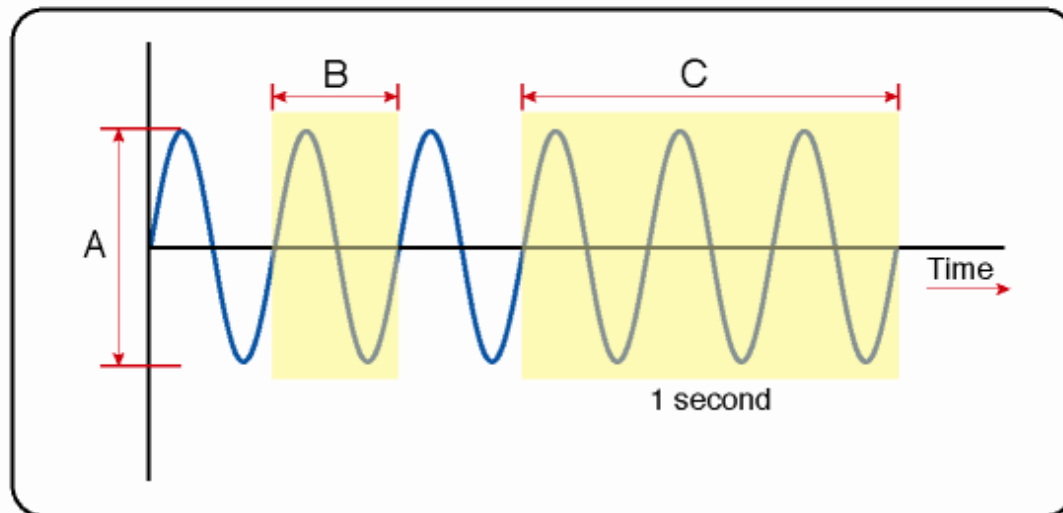
# Digital Audio

- Using a microphone to capture sound and convert it into an analog form (Electric Wave)
- Electric wave is converted into digital data by Audio digitizer



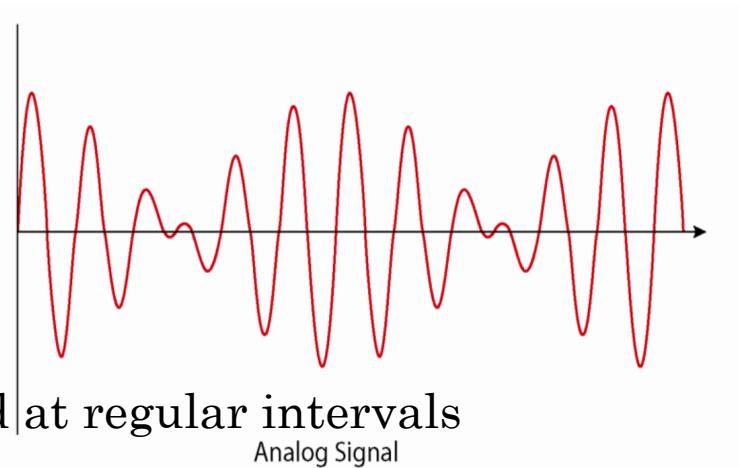
# Visualizing a Sound Wave

- Sine waves visualize the repetitive oscillations of sound vibrations.
  - A. Amplitude
  - B. Wavelength
  - C. Frequency

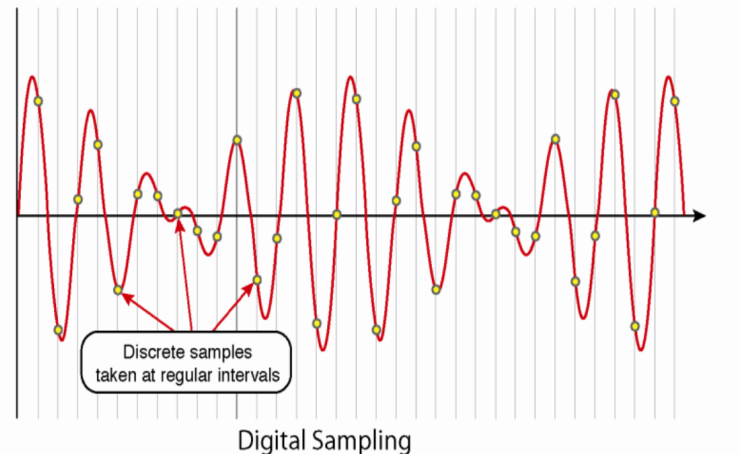


# Digital Sampling

- An analog audio signal is continuous without interruption (top)

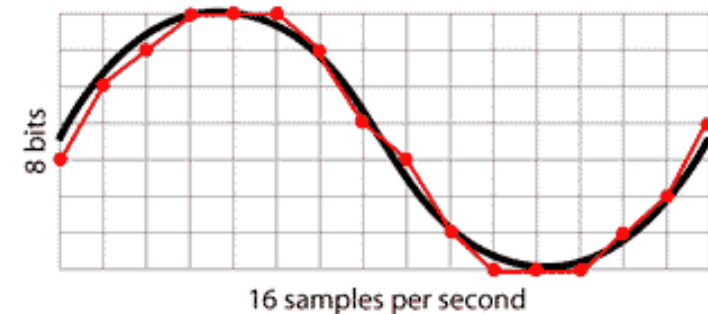
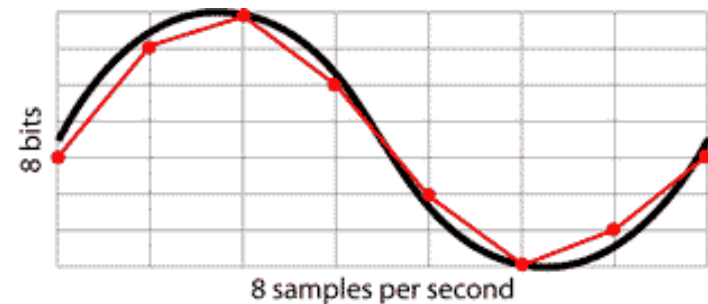


- A digital audio signal is sampled at regular intervals (bottom)



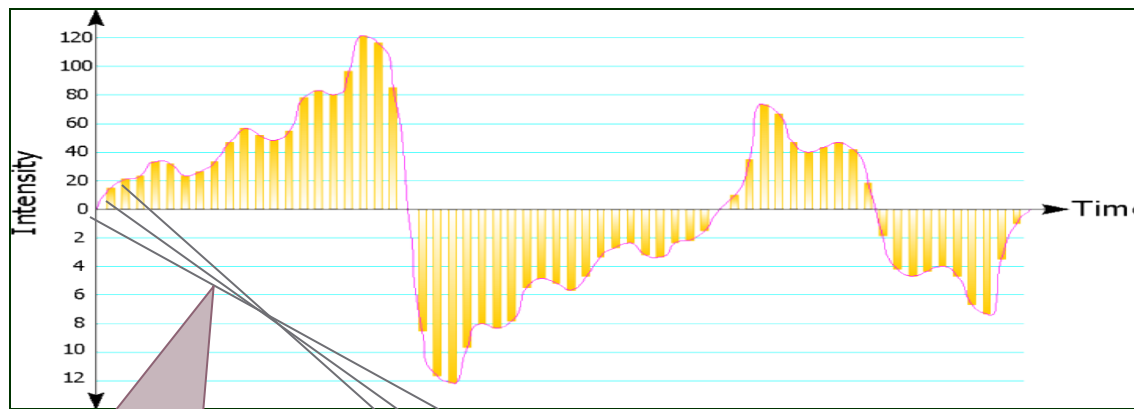
# Audio Quality

- What determines the quality of digital audio?
  - The sampling Rate:
    - How often the samples are taken per second
    - Frequency measured in Hertz (Hz)
  - The sample size (Bit Depth)
    - How many bits are used to represent a sample
    - Bit depth measured in bits
  - The number of channels
    - Mono or Stereo



# Audio Digitizer

- Captures sound(Analog) and stores it as a data file

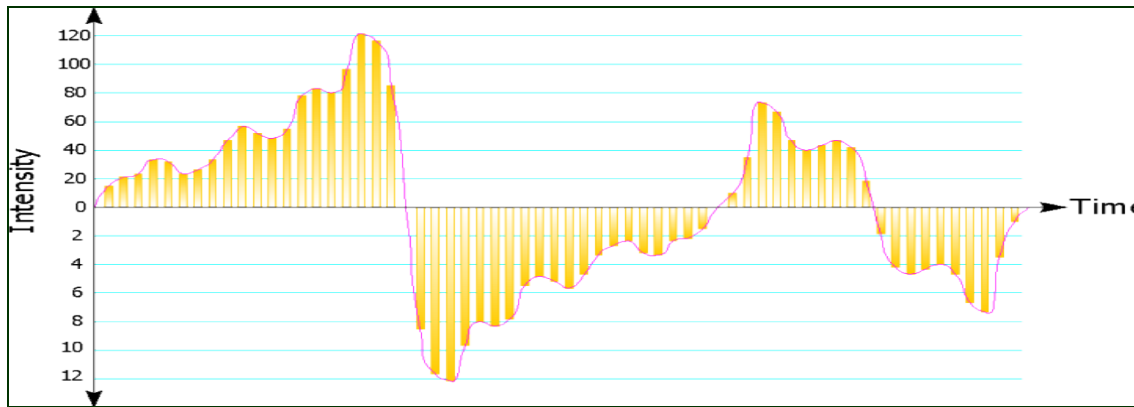


*Snapshots*

0	33	80	-122	-56	-21	40	-43
15	47	96	-96	-47	-15	43	-40
21	56	122	-80	-33	0	47	-46
24	52	117	-84	-26	10	42	-66
34	48	85	-78	-24	35	18	-74
32	55	0	-55	-32	74	-18	-35
24	78	-85	-48	-34	66	-42	-10
26	84	-117	-52	-24	46	-47	0

# Playing back digital audio

- Digital data converted to analog wave and played



0	33	80	-122	-56	-21	40	-43
15	47	96	-96	-47	-15	43	-40
21	56	122	-80	-33	0	47	-46
24	52	117	-84	-26	10	42	-66
34	48	85	-78	-24	35	18	-74
32	55	0	-55	-32	74	-18	-35
24	78	-85	-48	-34	66	-42	-10
26	84	-117	-52	-24	46	-47	0

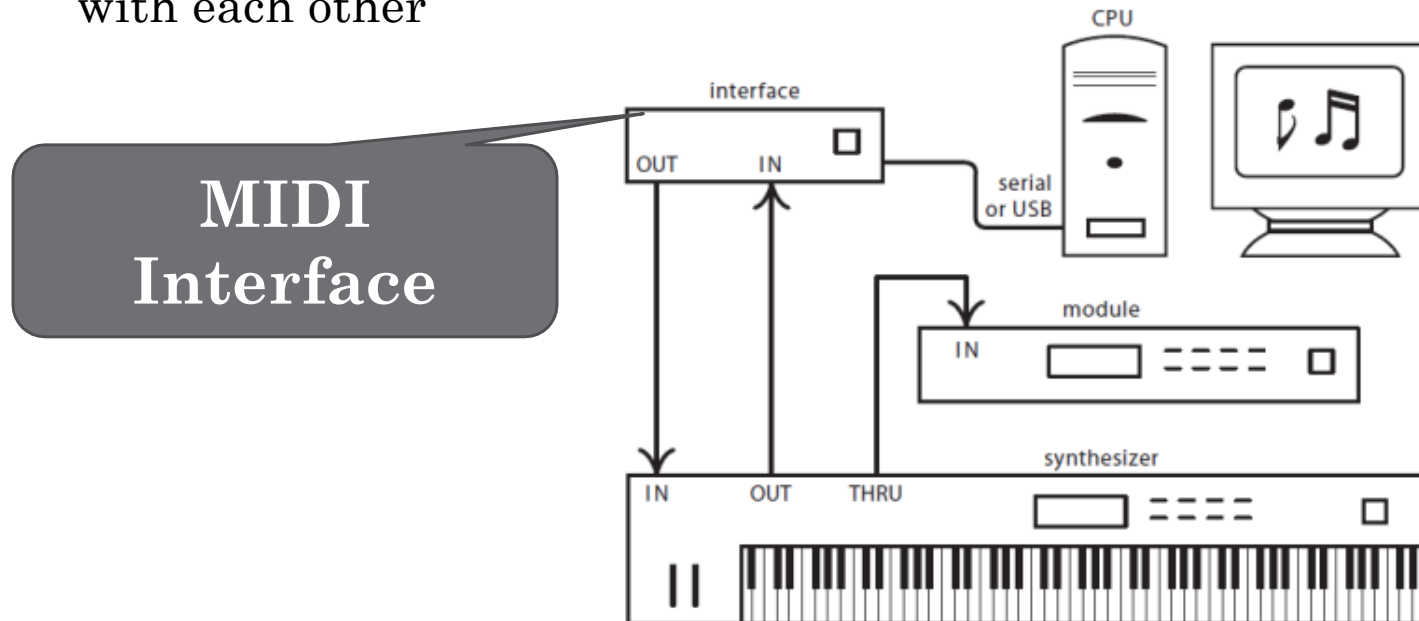
# Audio Formats

Format	Description
<b>WAV, AIFF</b>	Uncompressed audio for Windows and the Mac OS
<b>MP3</b>	1/10 the size of the original
<b>WMA</b>	An alternative to MP3 for Windows.
<b>AAC</b>	Apple's alternative to MP3
<b>OGG</b>	Similar to MP3 → open source and freely available



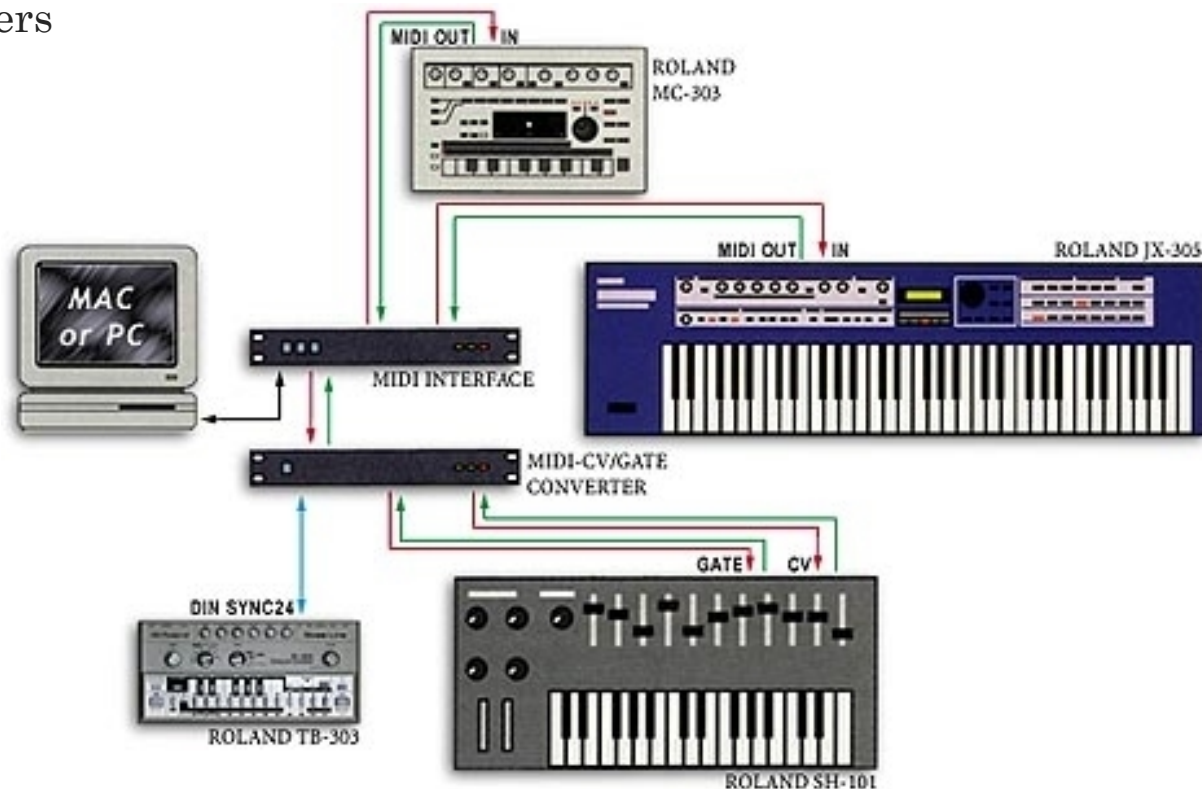
# MIDI- Musical Instrument Digital Interface

- A standard for digitally representing and transmitting sounds that was first developed in the 1980s.
- Enables electronic musical instruments such as keyboard controllers, computers, synthesizers, sound cards, samplers, drum machines, and other electronic equipment to communicate, control, and synchronize with each other



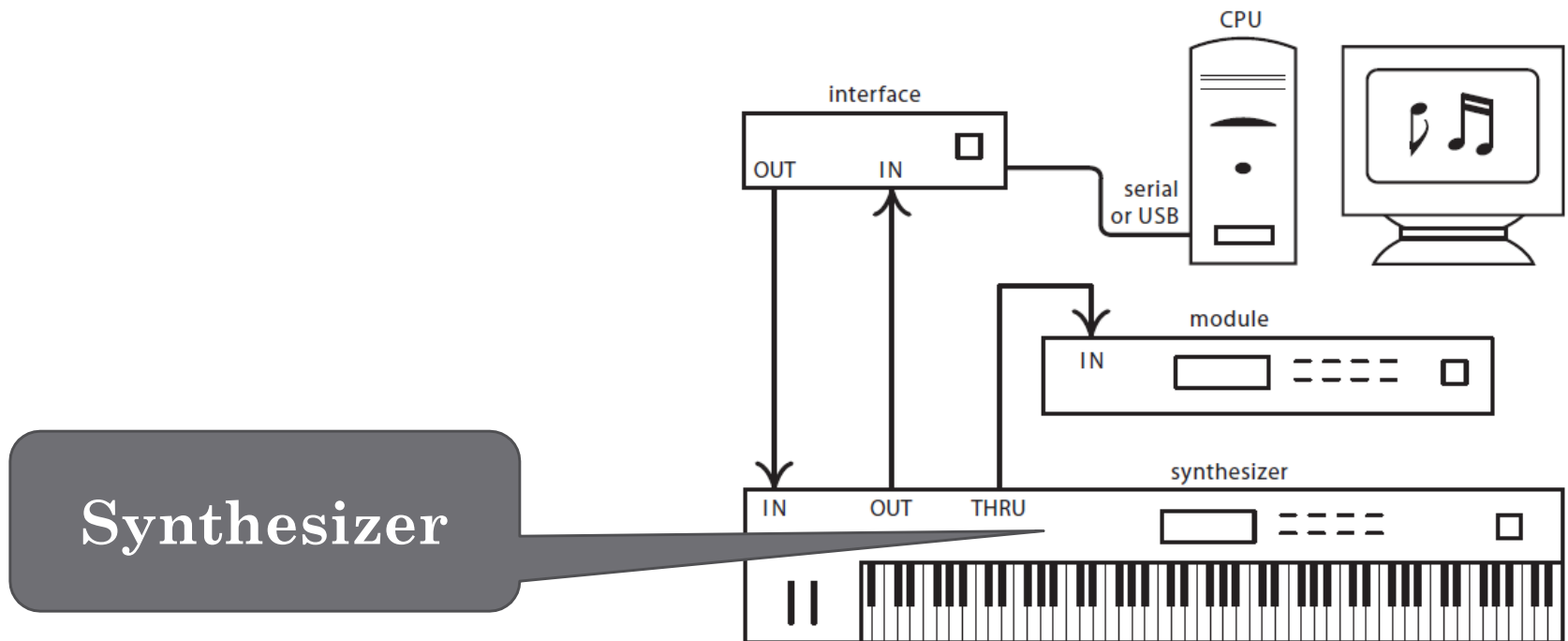
# Computers and Music

- MIDI commands can be interpreted by
  - Music Synthesizers
  - Samplers



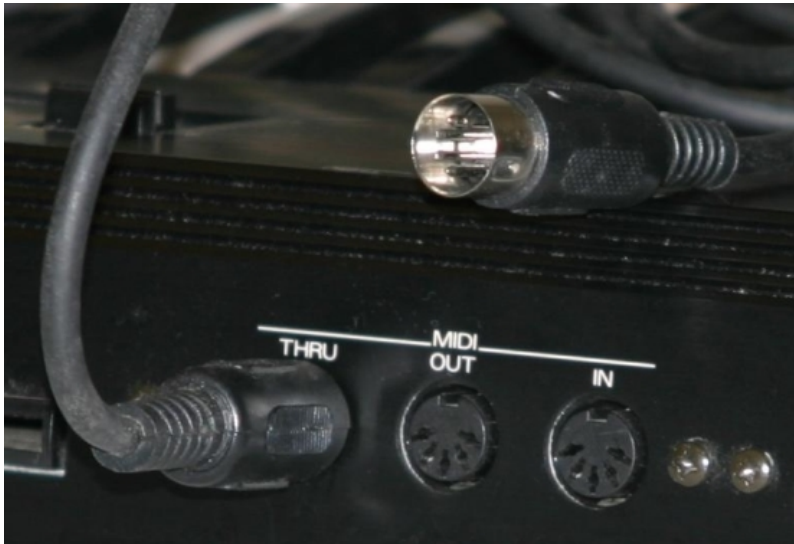
# Synthesizer

- An electronic instrument that synthesize, create, produce, etc. sounds using mathematical formulas



# Samplers

- An electronic instrument similar in some respects to a synthesizer but, instead of generating sounds, it uses recordings (or "samples") of sounds that are loaded or recorded into it by the user



# Computers and Music

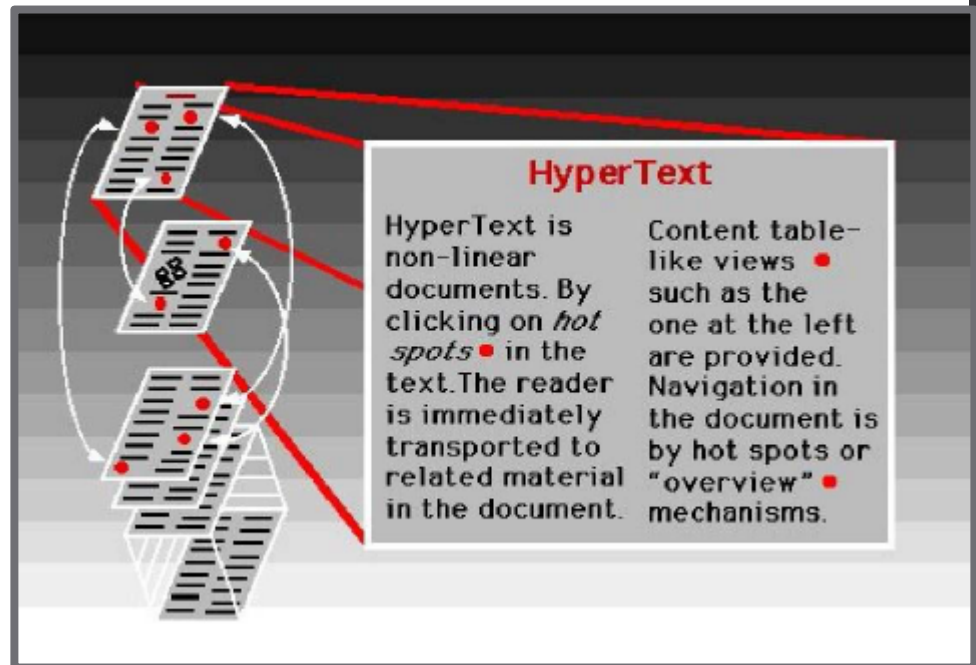
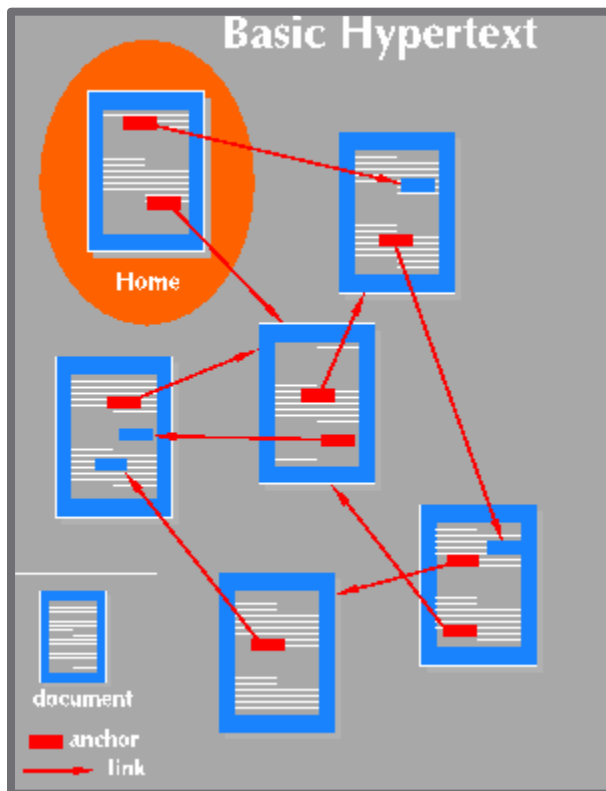
- Computer interprets the MIDI commands using sequencing software
- Sequencing Software is an application software that can record, edit, or play back music, by handling note and performance information in several forms, typically MIDI.



A growing number of musicians depend on sequencers to play along with live musicians in performance

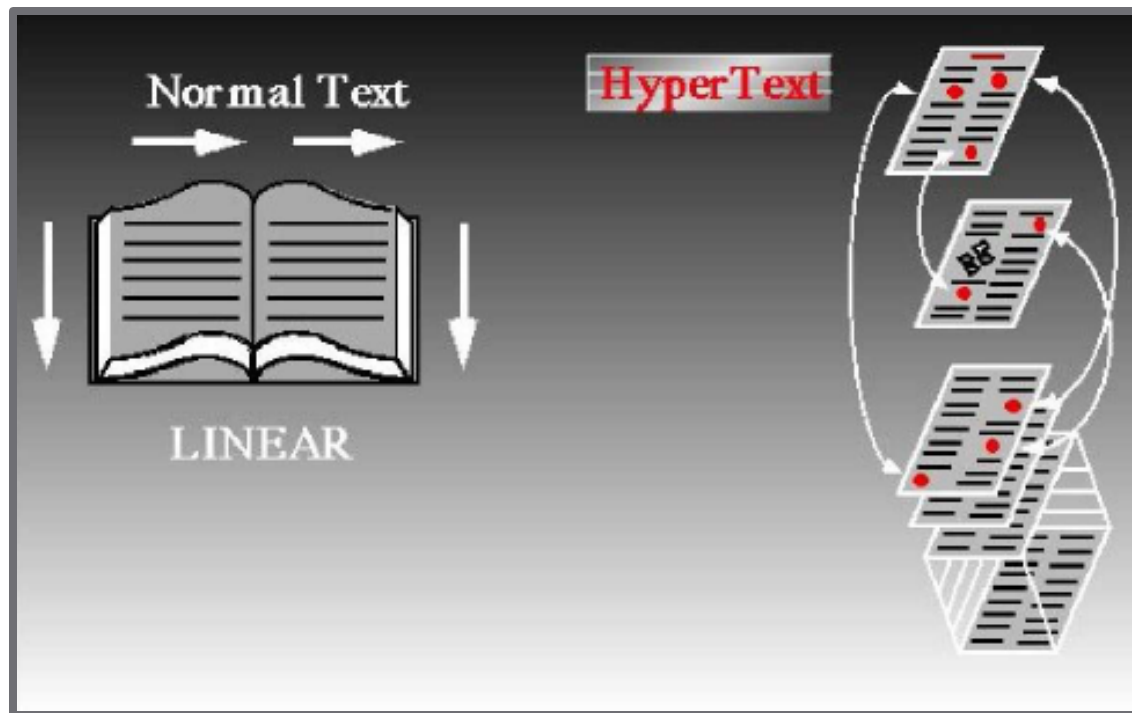
# HyperText

- Text which contains links to other texts
- Information linked in non-sequential ways.



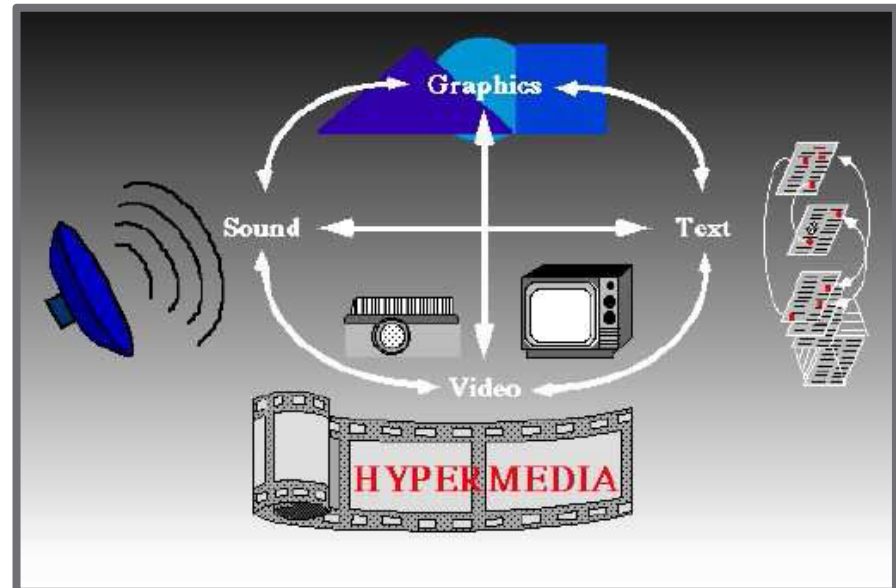
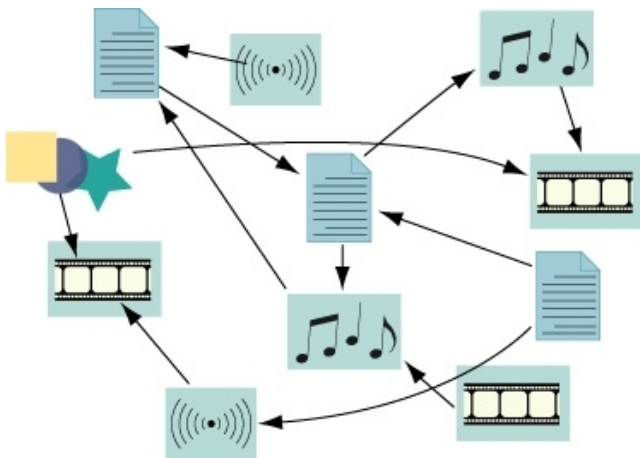
# HyperText

- Traversal through pages of hypertext is therefore usually non-linear.



# HyperMedia

- Hypermedia is not constrained to be text-based, it can include other media
- Hypermedia: combines
  - text, numbers
  - graphics, animation
  - sound, music





# Interactive Multimedia

- Is the integration of digital media including combinations of electronic text, graphics, moving images, and sound, into a structured digital computerized environment that allows people to interact with the data for appropriate purposes.



# Interactive Multimedia

- [Siftable](#): YouTube
  - Developed as a platform for hands-on interactions with digital information and media.
- [The Funky Forest](#)
  - Children manage resources to influence the environment around them using their bodies



# Interactive Multimedia

- [Interactive Ear](#)
  - Provides visual guide to Hearing
- We Choose The Moon
  - [www.wechoosethemoon.org/](http://www.wechoosethemoon.org/)
- The Great Animal Orchestra
  - <http://www.legrandorchestredesanimaux.com/en>