FUNDAMENTAL OF MULTIMEDIA
MULTIMEDIA ELEMENTS : SOUNDS

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Chapter Description

- Expected Outcomes

At the end of this lesson you will understand:

- **Know what is audio**
- **Audio format**
- **The characteristic of Audio**
- **Usage of Audio in Multimedia**

- References

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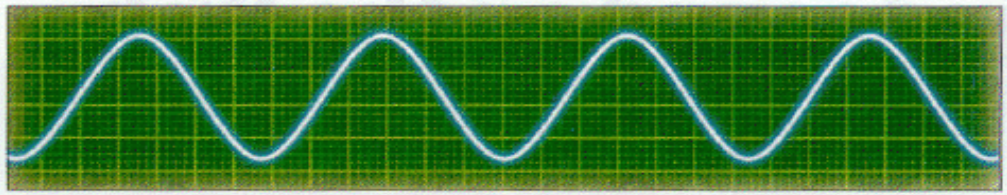
- Savage, T.M., Vogel, K.E. An Introduction to Digital Multimedia 2nd ed.. 2013. Jones & Bartlett Learning ASIN: B00LZM6ESY.
- Parag Havaldar, Gerard Medioni. Multimedia Systems: Algorithms, Standards, and Industry Practices (Advanced Topics) 1st Edition. Cengage Learning. 2011. ISBN-13: 978-1418835941

Sound

- Analog wave patterns – these wave patterns have two attributes
  - Volume – the height of each peak in the sound wave
  - Frequency – (sometimes referred to as pitch) the distance between the peaks. The greater the distance, the lower the sound.

This analog wave pattern represents the volume and frequency of a sound



Audio in Multimedia

In a multimedia production, sound and music are crucial in helping to establish moods and create environments.

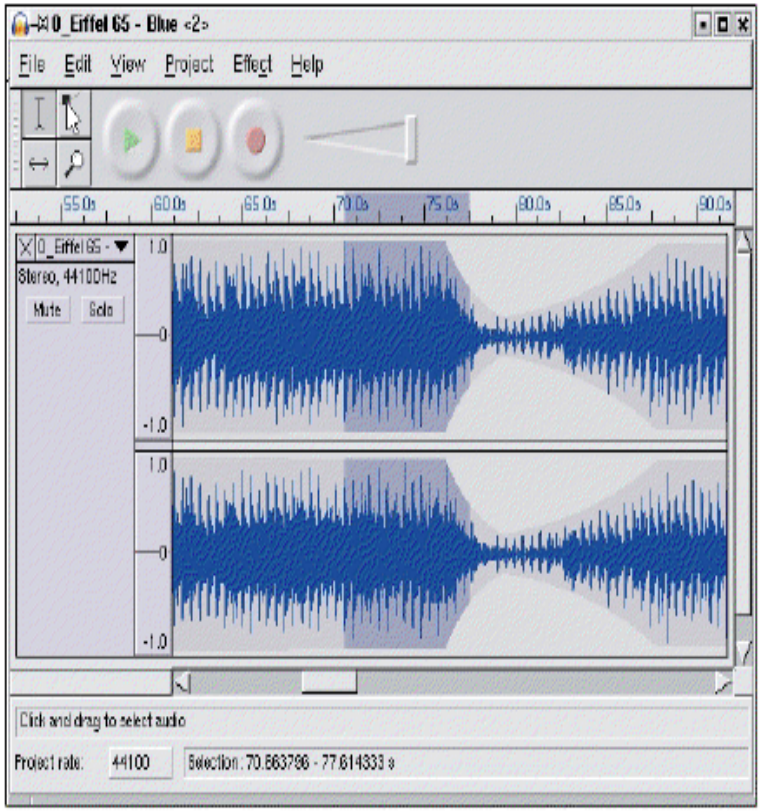
Audio on PCs

Many types of sounds are accessible with a PC. They include:

- Music
- Sound effects
- Spoken narration
- Video soundtracks
- Real-time telephone conversations
- Operating system alerts and prompts

Digital Audio Recording

Digital recording devices capture sound by sampling the sound waves.



Digital Audio Quality

The quality and size of digital audio depends on:

- The sampling rate
- The sample size
- The number of channels
- The time span of the recording

What is streaming audio?

Streaming audio plays as it reaches your PC, making it unnecessary to wait until the entire file is downloaded to the computer.

Audio File Formats

An audio file's format determines what files a PC can open and play, and how much space the file occupies on a disk. File formats include:

- MP3
- WAV
- MIDI

MP3 Format

MP3 is a standard format for music files sent over the Internet. MP3s:

- Use one of three MPEG standards for audio compression
- Can compress an audio file to about one-twelfth of the space it occupies on a CD with no significant loss of sound quality

WAV Format

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WAV is a standard for sound files on Windows and Macintosh PCs. WAVs:

- Do not compress audio as much as MP3s
- Are generally used for sound effects and other small files

Audio Format

- Macintosh – AIFF, MIDI, etc.
- Windows – MP3, WAV, MIDI, MPEG, WMA, etc.
- Internet – MP3, WAV, AIF, AU, MIDI, etc.

MIDI Format

MIDI is a method and format for recording music from synthesizers and other electronic instruments.

MIDIs:

- Are created with a computer that has a sequencer
- Do not contain actual musical notes
- Do not contain sound waves or use sampling
- Are small and load quickly on a Web site

MIDI vs Digital Audio

- **MIDI**
  - MIDI files contain no sound. Repeat, ***MIDI files contain no sound!*** They contain only performance data.

- **Advantages Of MIDI Files**
  - MIDI files are *tiny*, often 10K or less. They download from a web page in no time and fit easily on a floppy disk. MIDI files are ideal any time you want music to start playing immediately.

- **Disadvantages Of MIDI Files**
  - Because they sound a little different when played on different sound cards, there is no guarantee that those lush horns won't sound like blaring trumpets on the next guy's machine. Making universal MIDI files is a combination of art, skill, and experience.

Audio Software for the PC

Most new PCs come with some software and hardware for recording and managing audio files.

- **Audio editing software** allows you to edit audio files and convert them from one format to another.
- **MIDI software** includes programs for recording, storing, replaying, and editing MIDI files.
- **Composition software** allows you to create sheet music for many voices or instruments.

Audio Hardvare Devices

Audio hardware devices for the PC may include:

- Audio or sound cards
- Speakers
- Microphones for voice input
- MIDI input devices
- CD/DVD burners

Digital Audio

- **Digital Audio**
  - Digital audio files are like tape recordings. They store every yelp, screech and caterwaul exactly as you make it, then reproduce them on playback, no matter what kind of machine they are played on.
- **Advantages Of Audio Files**
  - They can reproduce exact sounds with better-than-CD quality, including all yelps, screeches and caterwauls.

- **Disadvantages Of Audio Files**
  - HUGE! They can take up 10MB or more per minute of sound. Even with high-speed Internet connections, a simple audio file can take several minutes to download.
  - On the web, audio files are best used as streaming media, where the user clicks to hear a selection as it comes down, saving the trouble of waiting for a long download. Even so, the size of these files, especially when combined with video, can cause problems.

Power of Sound

Sounds can closely ‘touch’ our emotion or feeling.

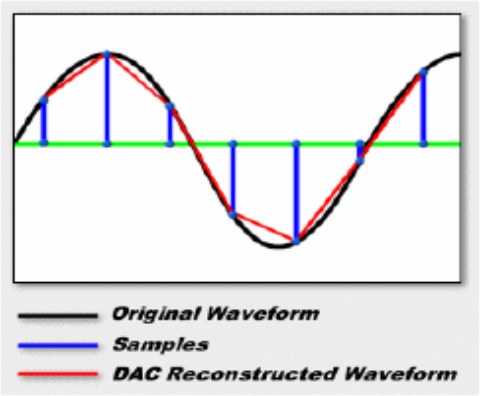
Different intonations represent different messages even for the same sentences.

Some feel-good music powerfully fills the heart, generating emotions of love etc.

Animation or video would not seems ‘alive’ without sounds.

Digital Audio

- Digitizing is a process converting a sound wave into numbers (binary system).
- Digitized sound is sampled sound. Every n^{th} fraction of a second, a sample of sound is taken and stored as digital information in bits and bytes.
- The quality is depends on samplin frequency in kilohertz (kHz).



Sound in Multimedia

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Sound, also called audio, can be:

- Voice-over or narration
- Sound effects
- Music

File Size Vs Quality

- Sampling at higher rates (44.1 kHz) more accurately captures the high frequency content of sound.
- Audio resolution (8- or 16-bit) determines the accuracy with which a sound can be digitized.
- Stereo recordings are more lifelike and realistic because human beings have two ears.
- Mono recordings tend to sound a bit flat and uninteresting.

Determine File Size

File size (in bytes) = a*b*c*d

a = sampling rate (44.1 kHz, 11 kHz etc)
b = duration or recording in seconds
c = bit resolution
d = channel (stereo = 2, mono = 1)

Audio Tools & Applications

- Sound Recorder