

Audio

Basic Concepts



ExplorNet CareerTech

from The Centers for Quality Teaching and Learning





Audio in Multimedia

Digital Audio:

- ✓ Sound that has been captured or created electronically by a computer
- ✓ In a multimedia production, sound and music are crucial in helping to establish moods and create environments.





History of Digital Audio

Some important dates in history include:

- ✓ **1975** – Digital tape recording becomes common in professional recording studios
- ✓ **1980** – Multi-track digital audio recorder is introduced
- ✓ **1981** – Philips introduces the compact disk (CD)
- ✓ **1999**- MP3 format becomes the accepted digital format for distribution for audio on the Internet





History of Digital Audio

Important dates (cont.):

- ✓ **1999** – Napster (a P2P [peer to peer] – file distribution program) is launched. This technology ushered in an era of illegal file sharing of music on the Internet
- ✓ **2001** – Apple iPod is introduced
- ✓ **2001** – XM Radio is launched as the first satellite radio service





Uses of Digital Audio

How digital audio is used:

- ✓ Education
- ✓ Information
- ✓ Entertainment
- ✓ Advertising





Digital Audio

Digital Audio Recording:

- ✓ Digital recording devices capture sound by sampling the sound waves.
- ✓ Sampling – reproducing a sound or motion by recording many fragments of it.
- ✓ VU meter (Volume units) – displays the audio signal level





Factors in Audio File Size

The quality and size of digital audio depends on:

- ✓ The sampling rate – number of times per second a device records a sample of the sound wave being created
- ✓ The sample size (audio resolution) – number of bits of data in each sample
- ✓ The number of channels – streams of audio
- ✓ The time span of the recording - length





Factors in Audio File Size

The sampling rate:

- ✓ The number of times per second a device records a sample of the sound wave being created
- ✓ A sample is a small fragment of a sound wave
- ✓ It takes many samples to accurately reproduce sound
- ✓ Measured in kilohertz (kHz).
- ✓ CD's have a sample rate of 44.1 kHz (44,100 samples per second.)
- ✓ Higher sampling rate = better quality sound





Factors in Audio File Size

The sampling size:

- ✓ Also called audio resolution
- ✓ The number of bits of data in each sample
- ✓ The more bits the better the sound quality of the recording
- ✓ 16-bit sound file is higher quality audio file over 8-bit file





Factors in Audio File Size

The number of channels:

- ✓ Streams of audio
 - **Monaural (Mono)** – a single channel audio
 - **Stereophonic (Stereo)** – two channels of audio
 - **Surround sound** – multiple channels (currently 5-7)
- ✓ The more channels of audio = the more realistic the sound and a larger audio file size





Factors in Audio File Size

The time span of the recording:

✓ The length of the recording

- *The longer the length of the recording, the larger the file size*





Streaming Audio

What is streaming audio?

- ✓ Streaming audio is the process of transmitting audio/video files, over the Internet, that can begin playing as the remaining data is temporarily transferring to your computer.
- ✓ First developed by Real Audio
- ✓ User friendly as it can be listened to as the file is loading
- ✓ The user does not have to wait for the completed file to load to begin hearing the audio





Streaming Audio

Compression:

- ✓ Process used to reduce the size of a file
- ✓ Can be *lossless* or *lossy*:
 - **Lossless** –
 - *No data is permanently discarded during compression.*
 - *The lossless process provides full audio sound, but can create large files that cause problems with streaming.*
 - **Lossy**
 - *Some data is discarded during compression.*
 - *More data is lost as the compression increases*





Streaming Audio

Important Terms:

- ✓ **Codec** (compression/decompression) – Software used to compress the file before transmitting and to decompress it at the receiving end.
- ✓ **Transcoding** – a transcoder converts incompatible or obsolete data into a more suitable format
- ✓ **Bandwidth** – the rate of data transferred, in a given amount of time, over a network





Digital Audio

Digital Audio Equipment

- ✓ Computer
- ✓ Mixer/Audio board
- ✓ Microphones
 - Condenser
 - Dynamic
 - Piezoelectric
 - Wireless





Digital Audio

Digital Audio Equipment (cont.):

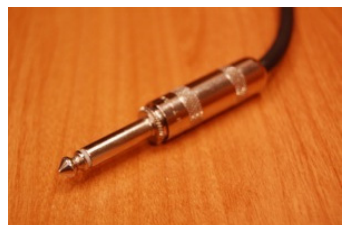
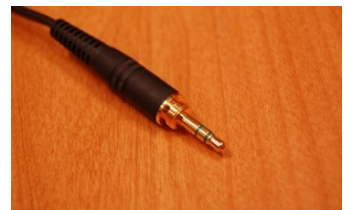
- ✓ Speakers
- ✓ Headphones
- ✓ Cables/connectors



Audio Cables

Common audio cables include:

- ✓ **RCA** – commonly used cable with multiple electronic devices (red, white, yellow cables)
- ✓ **XLR** – used for microphones; preferred cable by professionals; best audio quality
- ✓ **Mini** – found in many consumer electronic devices; poor overall quality
- ✓ **¼" (Phono)** – used in music industry to connect speakers, guitars, and amps





Audio Cables

Common audio cables (cont.):

- ✓ **Fiber optic** (digital optical) – used to connect digital signal from receivers to DVD players, DVR's, TV's
- ✓ **Firewire** – most common way to connect digital audio and video to a computer





Digital Audio

Microphone Pickup Patterns:

✓ **Omnidirectional**

- Captures sound from all directions
- Useful for capturing audio from all parts of a room
- Example: Microphone found on consumer video cameras





Digital Audio

Microphone Pickup Patterns (cont.):

✓ **Cardioid (heart shaped)**

- Captures sound at close range
- Very little sound is picked up from the sides and rear
- Example: handheld microphone





Digital Audio

Microphone pickup patterns (cont.):

✓ Shotgun

- Captures sound in the direction the microphone is pointed
- Pickup pattern is highly directional
- Subject does not have to be in close proximity to microphone
- Example: microphone found on professional news cameras





Audio File Formats

Common file formats include:

- ✓ **MP3** (MPEG-1 Audio Layer 3) – standard audio format for sending music files over the Internet
- ✓ **WAV** (Waveform) – standard audio format for Microsoft and IBM PC's
- ✓ **MIDI** (Musical Instrument Digital Interface) – format for recording music from electronic instruments





Audio File Formats

Common file formats (cont.):

- ✓ **AIFF** (Audio Interchange File Format) – standard audio file format for Apple computers
- ✓ **ACC** (Advanced Audio Coding) – standard audio file format for portable devices such as phones and gaming systems
- ✓ **WMA** (Windows Media Audio) – Windows streaming audio file format

