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FACULTY OF ENGINEERING & TECHNOLOGY

BCS -504 Computer Graphics & Multimedia

Lecture-29

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OUTLINE

- **DIGITAL AUDIO**

DIGITAL AUDIO

Digital audio is a representation of sound recorded in, or converted into, digital form. In digital audio, the sound wave of the audio signal is encoded as numerical samples in a continuous sequence. For example, in CD audio, samples are taken 44100 times per second each with 16 bit sample depth. Digital audio is also the name for the entire technology of sound recording and reproduction using audio signals that have been encoded in digital form. Following significant advances in digital audio technology during the 1970s, it gradually replaced analog audio technology in many areas of audio engineering and telecommunications in the 1990s and 2000s.

In a digital audio system, an analog electrical signal representing the sound is converted with an analog-to-digital converter (ADC) into a digital signal, typically using pulse-code modulation. This digital signal can then be recorded, edited, modified, and copied using computers, audio playback machines, and other digital tools. When the sound engineer wishes to listen to the recording on headphones or loudspeakers (or when a consumer wishes to listen to a digital sound file), a digital-to-analog converter (DAC) performs the reverse process, converting a digital signal back into an analog signal, which is then sent through an audio power amplifier and ultimately to a loudspeaker.

Digital audio systems may include compression, storage, processing, and transmission components. Conversion to a digital format allows convenient manipulation, storage, transmission, and retrieval of an audio signal. Unlike analog audio, in which making copies of a recording results in generation loss and degradation of signal quality, digital audio allows an infinite number of copies to be made without any degradation of signal quality.

CONVERSION PROCESS

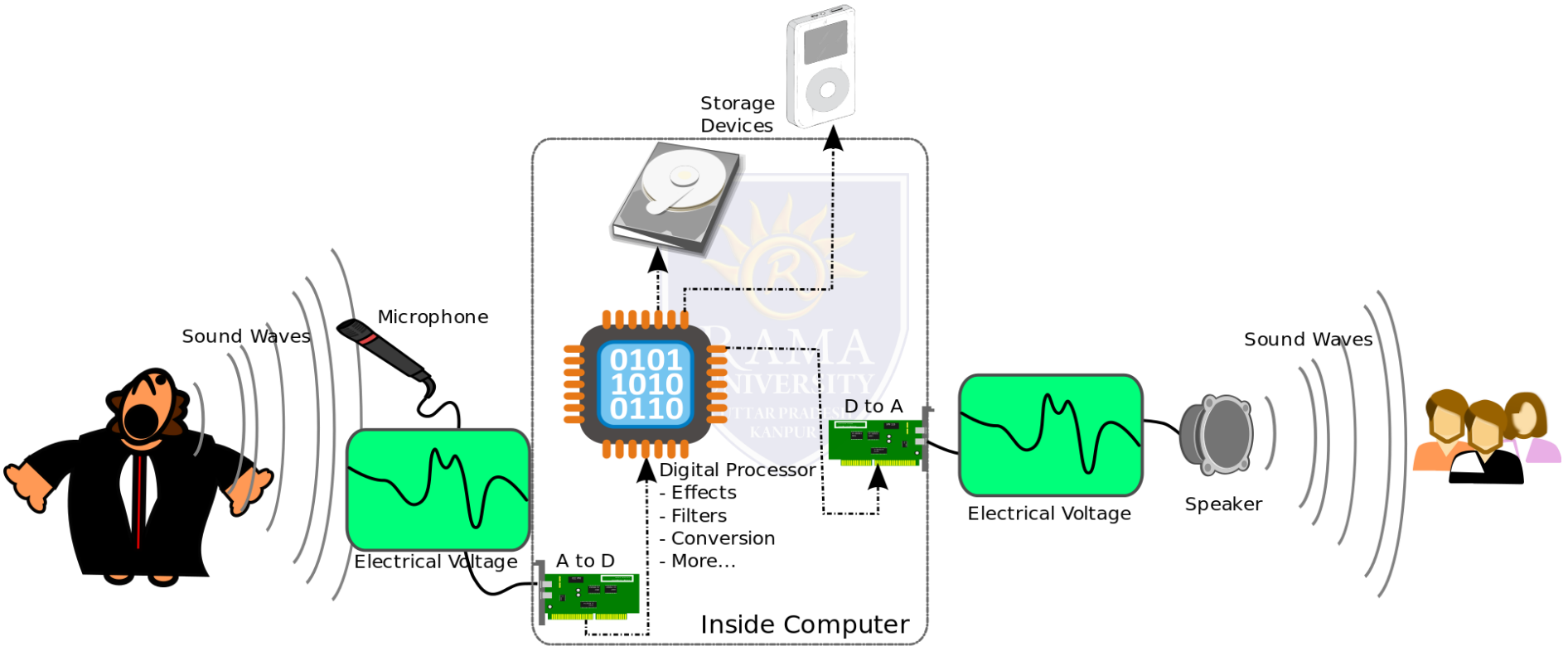
A digital audio system starts with an ADC that converts an analog signal to a digital signal.The ADC runs at a specified sampling rate and converts at a known bit resolution. CD audio, for example, has a sampling rate of 44.1 kHz (44,100 samples per second), and has 16-bit resolution for each stereo channel. Analog signals that have not already been bandlimited must be passed through an anti-aliasing filter before conversion, to prevent the aliasing distortion that is caused by audio signals with frequencies higher than the Nyquist frequency.

A digital audio signal may be stored or transmitted. Digital audio can be stored on a CD, a digital audio player, a hard drive, a USB flash drive, or any other digital data storage device. The digital signal may be altered through digital signal processing, where it may be filtered or have effects applied. Sample-rate conversion including upsampling and downsampling may be used to conform signals that have been encoded with a different sampling rate to a common sampling rate prior to processing. Audio data compression techniques, such as MP3, Advanced Audio Coding, Ogg Vorbis, or FLAC, are commonly employed to reduce the file size. Digital audio can be carried over digital audio interfaces such as AES3 or MADI. Digital audio can be carried over a network using audio over Ethernet, audio over IP or other streaming media standards and systems.

For playback, digital audio must be converted back to an analog signal with a DAC. According to the Nyquist–Shannon sampling theorem, with some practical and theoretical restrictions, a bandlimited version of the original analog signal can be accurately reconstructed from the digital signal.

AUDIO: DIGITAL AUDIO

CONVERSION PROCESS



The lifecycle of sound from its source, through an ADC, digital processing, a DAC, and finally as sound again.

SOUND QUALITY

Although the goal of both analog and digital systems is to reproduce audio perfectly, there are several obstacles to achieving this goal. They include:

- Analog noise floor in the capturing circuitry, and have inherent capacitance and inductance that limit the bandwidth of the system, and resistance that limits the amplitude.
- Digital quantization noise in the capturing circuitry, and sampling rate limits the bandwidth and its bit resolution limits the dynamic range (resolution of amplitude creation).

In order to achieve better fidelity, higher quality components are required, which increased overall cost.

DIGITAL AUDIO TECHNOLOGIES

Digital audio technologies

•Digital Audio Broadcasting (DAB)

•Digital audio workstation

•Digital audio player

Storage technologies:

•Digital Audio Tape (DAT)

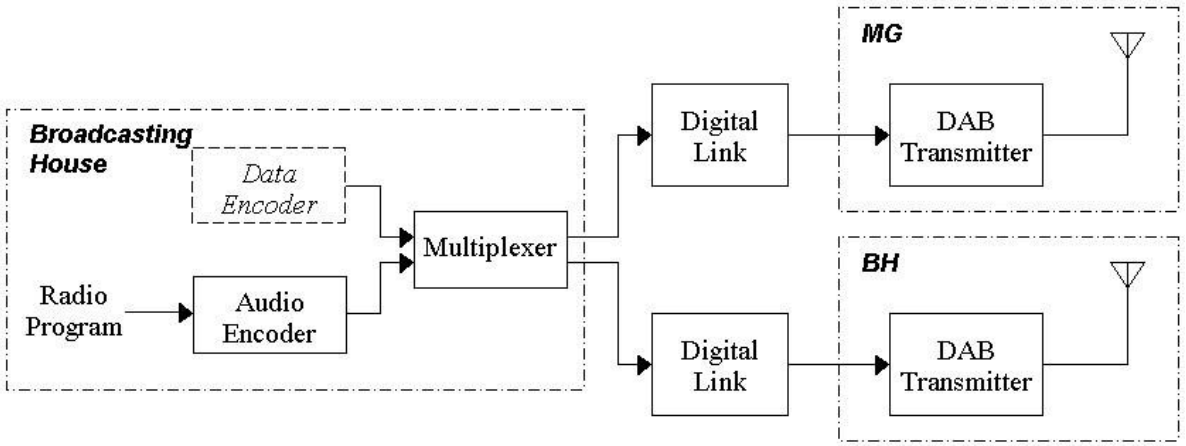
•Compact disc (CD)

•DVD DVD-A

•MiniDisc

•Super Audio CD

•various audio file formats



AUDIO: DIGITAL AUDIO

DIGITAL AUDIO TECHNOLOGIES

Audio-specific interfaces include:

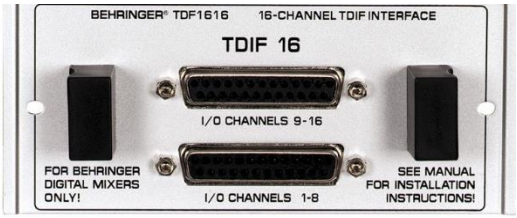
•AC97 (Audio Codec 1997) interface between Integrated circuits on PC motherboards

•Intel High Definition Audio A modern replacement for AC97

•ADAT interface

•AES/EBU interface with XLR connectors

•AES47, Professional AES3 digital audio over Asynchronous Transfer Mode networks



•I^2S (Inter-IC sound) interface between Integrated circuits in consumer electronics

•MADI Multichannel Audio Digital Interface

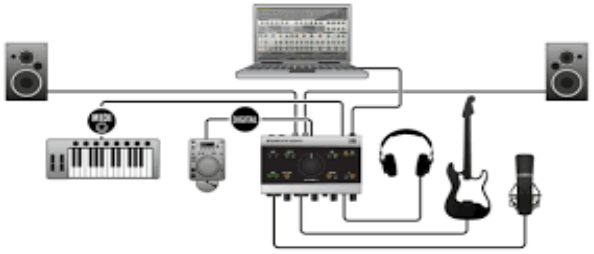
•MIDI low-bandwidth interconnect for carrying instrument data; cannot carry sound

•S/PDIF, either over coaxial cable or TOSLINK

•TDIF, Tascam proprietary format with D-sub cable

•Bluetooth via A2DP

Naturally, any digital bus (such as USB, FireWire, and PCI) can carry digital audio.



Multiple Choice Question

MUTIPLE CHOICE QUESTIONS:

Sr no	Question	Option A	Option B	OptionC	OptionD
1	In CAD,uses the……..for medical and business systems.	Special-purpose application	generic-purpose application	both a & b	none of these
2	Special-purpose package may allow use of other coordinates which suits …….	application	software	Graphics	image
3	We can construct shape of object with separate coordinate system called ……..	modeling coordinates	local coordinates	master coordinates	All of these
4	Display coordinates system are referred to as …….	Device Coordinates	Screen Coordinates	both a & b	none of these
5	World-coordinates description of the scene is transferred to ……. output device reference frame for display	one or more	single	more or unque	none of these

REFERENCES

- http://www.engppt.com/search/label/Computer%20Graphics