RAMA UNIVERSITY

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FACULTY OF ENGINEERING & TECHNOLOGY

BCS -504 Computer Graphics & Multimedia

Lecture-31

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OUTLINE

- **PROCESSING SOUND**

Processing Sound

What is Sound ?

The human ear measures time dependent air pressure and transforms these pressure variations into electrical signals that are fed into our brain and give us the sensation of what we call sound.

A sound source (a human voice, a piano, a hand hitting the table, etc.) causes pressure changes in the air. These pressure differences propagate in the air giving rise to a sound wave.

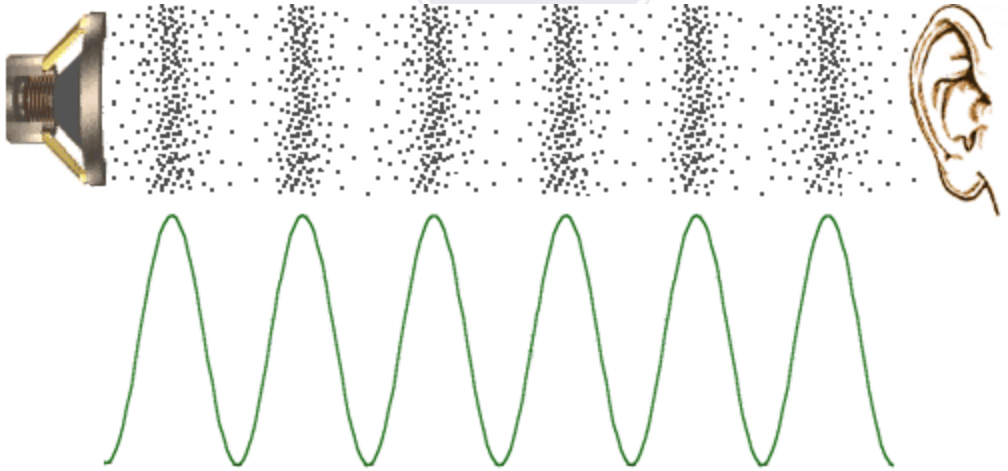
When you throw a pebble in water you see a wave propagating outwards in concentric circles. The displacement of the water in the wave is perpendicular to the direction in which the wave travels: the wave moves horizontally, the water itself moves up and down. Water waves are transverse waves.

On the other when you hit the table with your hand the sound wave emitting from that point is a longitudinal wave: the air moves forward and backward in the direction in which the wave also moves.

What is Sound ?

In the figure below the loudspeaker on the left vibrates and causes the air to vibrate with it. The air molecules close to the speaker are forced away from the speaker, colliding into the next ‘layer’ of molecules. These molecules start vibrating as well and collide into the next layer etc. In this way the vibration is transported through the air. Note that the air particles do not travel from left to right.

The dots in the figure illustrate where there are many molecules with larger velocity (i.e. high pressure) and where there are less (low pressure). This variation in pressure, at one moment in time, can be characterized as a function of pressure again time (the lower plot).



Processing Sound

Audio Processing in multimedia

Audio signal processing, sometimes referred to as audio processing, is the intentional alteration of auditory signals, or sound, often through an audio effect or effects unit. As audio signals may be electronically represented in either digital or analog format, signal processing may occur in either domain.

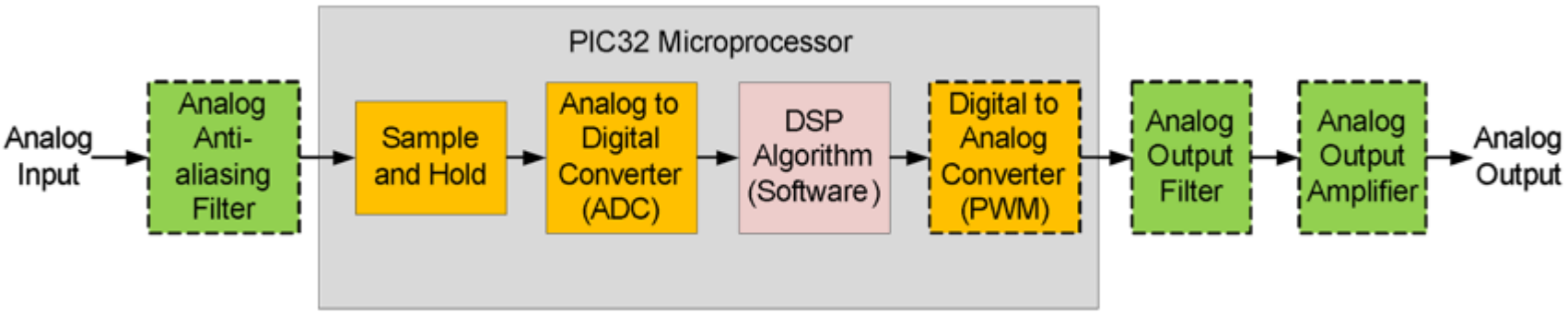
Audio processing covers many diverse fields, all involved in presenting sound to human listeners. Three areas are prominent:

(1) high fidelity music reproduction, such as in audio compact discs

(2) voice telecommunications, another name for telephone networks, and

(3) synthetic speech,

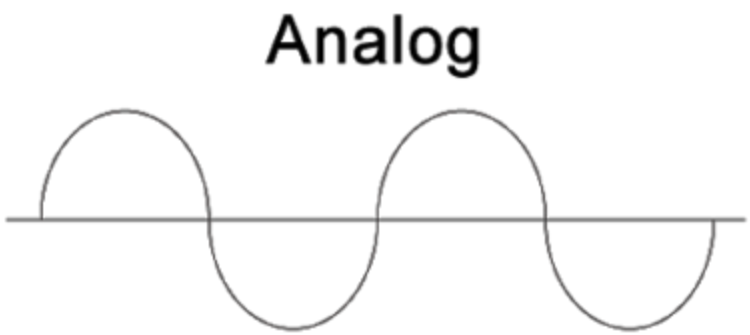
where computers generate and recognize human voice patterns.



Analog Signals

An analog audio signal is a continuous signal represented by an electrical voltage or current that is “analogous” to the sound waves in the air. Analog signal processing then involves physically altering the continuous signal by changing the voltage or current or charge via electrical circuits.

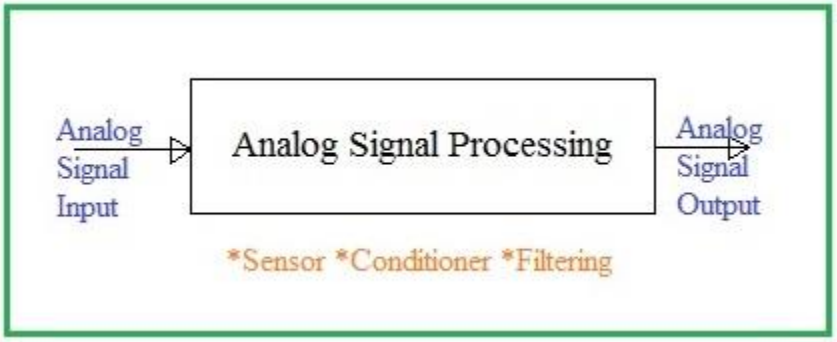
Historically, before the advent of widespread digital technology, analog was the only method by which to manipulate a signal. Since that time, as computers and software have become more capable and affordable and digital signal processing has become the method of choice. However, in music applications, analog technology is often still desirable as it often produces nonlinear responses that are difficult to replicate with digital filters.



Analog signal processing

Analog signal processing is a type of signal processing conducted on continuous analog signals by some analog means (as opposed to the discrete digital signal processing where the signal processing is carried out by a digital process). "Analog" indicates something that is mathematically represented as a set of continuous values. This differs from "digital" which uses a series of discrete quantities to represent signal. Analog values are typically represented as a voltage, electric current, or electric charge around components in the electronic devices. An error or noise affecting such physical quantities will result in a corresponding error in the signals represented by such physical quantities.

Examples of analog signal processing include crossover filters in loudspeakers, "bass", "treble" and "volume" controls on stereos, and "tint" controls on TVs. Common analog processing elements include capacitors, resistors and inductors (as the passive elements) and transistors or opamps (as the active elements).



Digital Signals

A digital representation expresses the audio waveform as a sequence of symbols, usually binary numbers. This permits signal processing using digital circuits such as digital signal processors, microprocessors and general-purpose computers. Most modern audio systems use a digital approach as the techniques of digital signal processing are much more powerful and efficient than analog domain signal processing.

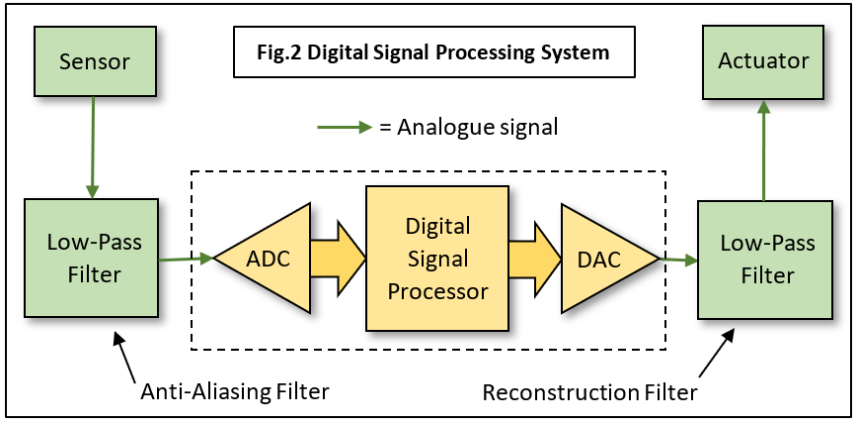
Processing Sound

Digital signal processing

Digital signal processing (DSP) is the use of digital processing, such as by computers or more specialized digital signal processors, to perform a wide variety of signal processing operations. The digital signals processed in this manner are a sequence of numbers that represent samples of a continuous variable in a domain such as time, space, or frequency. In digital electronics, a digital signal is represented as a pulse train, which is typically generated by the switching of a transistor.

Digital signal processing and analog signal processing are subfields of signal processing. DSP applications include audio and speech processing, sonar, radar and other sensor array processing, spectral density estimation, statistical signal processing, digital image processing, data compression, video coding, audio coding, image compression, signal processing for telecommunications, control systems, biomedical engineering, and seismology, among others.

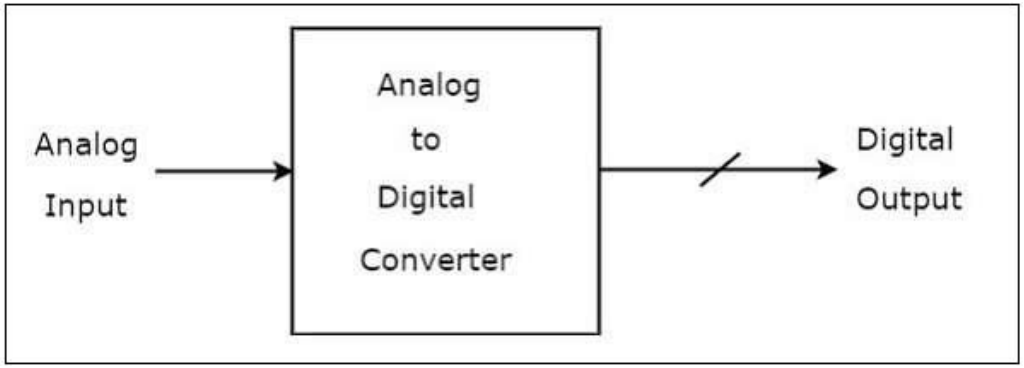
The application of digital computation to signal processing allows for many advantages over analog processing in many applications, such as error detection and correction in transmission as well as data compression. Digital signal processing is also fundamental to digital technology, such as digital telecommunication and wireless communications. DSP is applicable to both streaming data and static (stored) data



Analog-to-digital converter

In electronics, an analog-to-digital converter (ADC, A/D, or A-to-D) is a system that converts an analog signal, such as a sound picked up by a microphone or light entering a digital camera, into a digital signal. An ADC may also provide an isolated measurement such as an electronic device that converts an input analog voltage or current to a digital number representing the magnitude of the voltage or current. Typically the digital output is a two's complement binary number that is proportional to the input, but there are other possibilities.

There are several ADC architectures. Due to the complexity and the need for precisely matched components, all but the most specialized ADCs are implemented as integrated circuits (ICs). These typically take the form of metal–oxide–semiconductor (MOS) mixed-signal integrated circuit chips that integrate both analog and digital circuits.



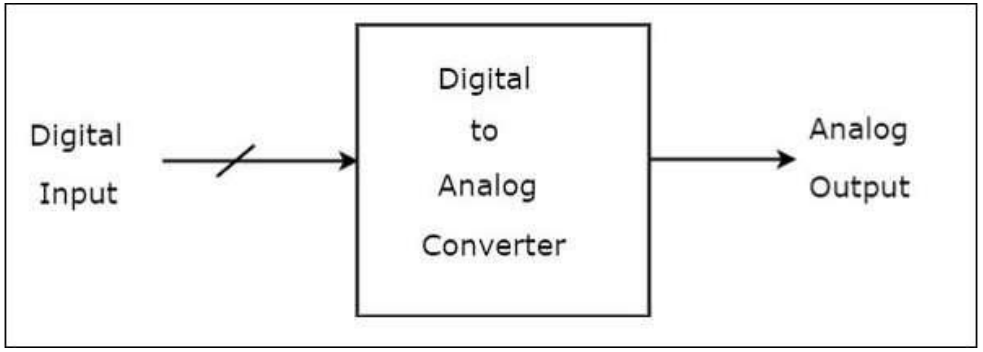
Digital – to - Analog converter

In electronics, a digital-to-analog converter (DAC, D/A, D2A, or D-to-A) is a system that converts a digital signal into an analog signal. An analog-to-digital converter (ADC) performs the reverse function.

There are several DAC architectures; the suitability of a DAC for a particular application is determined by figures of merit including: resolution, maximum sampling frequency and others. Digital-to-analog conversion can degrade a signal, so a DAC should be specified that has insignificant errors in terms of the application.

DACs are commonly used in music players to convert digital data streams into analog audio signals. They are also used in televisions and mobile phones to convert digital video data into analog video signals which connect to the screen drivers to display monochrome or color images. These two applications use DACs at opposite ends of the frequency/resolution trade-off. The audio DAC is a low-frequency, high-resolution type while the video DAC is a high-frequency low- to medium-resolution type.

Due to the complexity and the need for precisely matched components, all but the most specialized DACs are implemented as integrated circuits (ICs). These typically take the form of metal–oxide–semiconductor (MOS) mixed-signal integrated circuit chips that integrate both analog and digital circuits.



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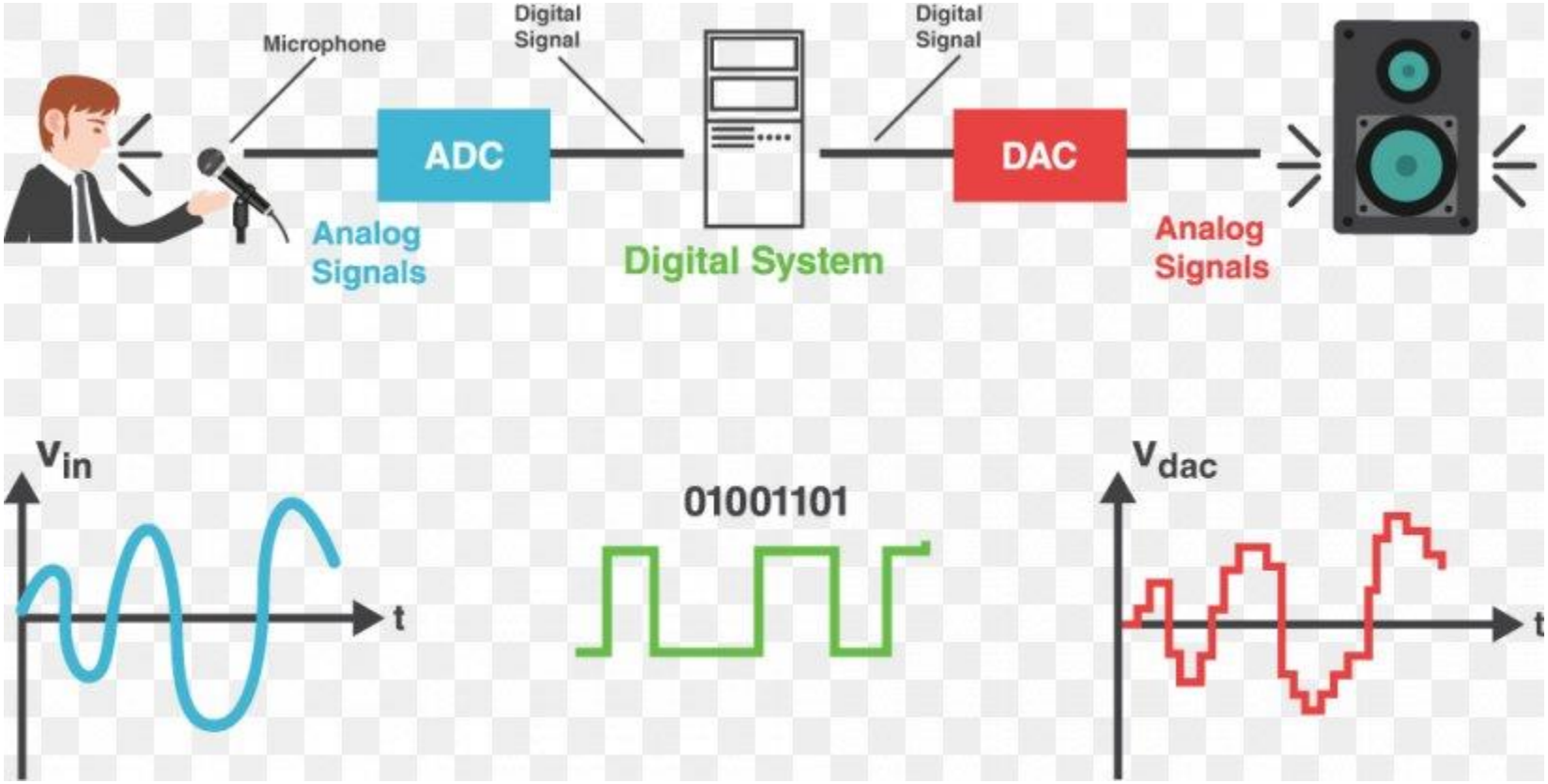
A-D Conversion AND D-A Conversion



Multiple Choice Question

MUTIPLE CHOICE QUESTIONS:

Sr no	Question	Option A	Option B	OptionC	OptionD
1	Digital differential analyzer (DDA) is scan conversion …….. based on calculating .	Circle drawing algorithm	line drawing algorithm	both a & b	none of these
2	Midpoint approach generates …….. position as generated by bresenham's circle algorithm	same pixel	different pixel	alternate pixel	none of these
3	Basic attributes of a straight line segment are …….	its type	its dimension	its color	All of these
4	Dashed line could be displayed by generating an inter dash spacing that is equal to the…….. of the solid sections	width	length	size	shape
5	Bresenham which scan converts line using only incremental integer calculations that can be modified to …….	display circles	other curves	both a & b	none of these

REFERENCES

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