

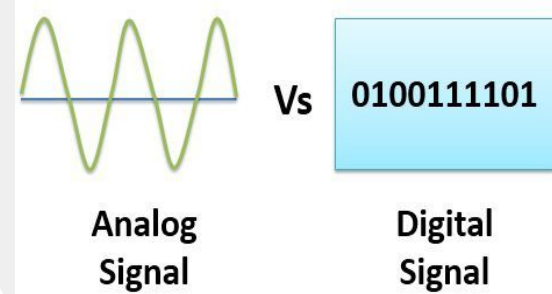
Digital Signal Processing

Presented by: Drashti S.



Lecture 1 - Topics

- a. **Introduction**
- b. **Definitions**
- c. **Basic Elements of DSP (Not in syllabus)**
- d. **Advantages of Digital over Analog**
- e. **Disadvantages of Digital over Analog**
- f. **Comparison**
- g. **Applications of DSP**



Introduction



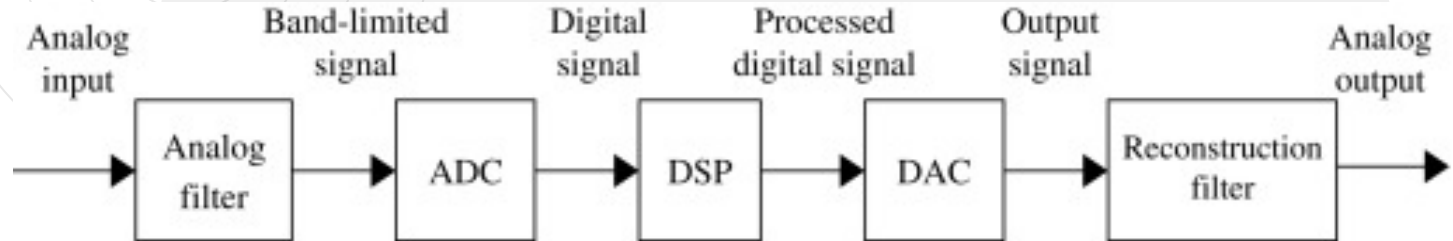
- Anything that carries information can be called as **signal**. It can also be defined as a physical quantity that varies with time or with any independent variables such as speech signal or video signal.
- The process of operation in which the characteristics of a signal undergoes a change is known as **signal processing**.
- **Note** – Any unwanted signal interfering with the main signal is termed as **noise**. So, noise is also a signal but unwanted.
- According to their representation and processing, signals can be classified into various categories which we will be discussing later.

Definitions



- **Digital** : Operating by the use of Discrete signals to represent data/signals in form of numbers.
- **Signal** : A variable parameter by which information is passed thru an electronic circuit.
- **Processing** : To perform various operations on data.

Elements of DSP



Elements of DSP



1. Analog Filter : It removes noise.
2. Sample and hold circuit : It keeps the signal constant.
3. ADC : Converts analog to digital signal.
4. DSP : Performing operations on digital signal.
5. DAC : Conversion of Digital to Analog signal.
6. Reconstruction filter : If signal contains any high frequency elements, it is removed here.

Advantages of Digital signal over Analog



- **Versatility** : can be used in most of the systems.
- Repeatability** : digital signals can be easily repeated.
- **Accuracy** : Provides best results.
- **Implementation of algo** : Mathematical algos can be easily implemented.
- **Easy upgrading.**

Disadvantages of Digital signal over Analog

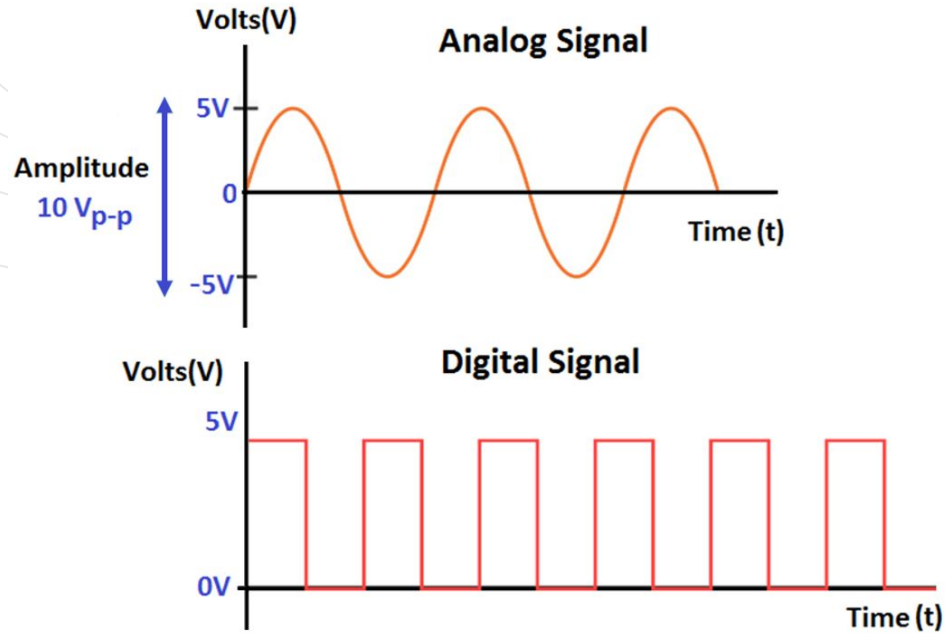


- **System Complexity** : DSP uses ADC and DAC , which induces lot of complexities.
- **Bandwidth Limitation** : If signal is having wide bandwidth, it will reduce speed of operation.
- **Consumes more power.**
- **Cost effective.**

Comparison

	Analog signal transmission	Digital signal transmission
signal	Analog signal is a continuous signal which represents physical measurements.	Digital signals are discrete time signals generated by digital modulation.
Waves	Denoted by sine waves	Denoted by square waves
Representation	Uses continuous range of values to represent information	Uses discrete or discontinuous values to represent information
Example	Human voice in air, analog electronic devices.	Computers, CDs, DVDs, and other digital electronic devices.
Technology	Analog technology records waveforms as they are.	Samples analog waveforms into a limited set of numbers and records them.
Data transmissions	Subjected to deterioration by noise during transmission and write/read cycle.	Can be noise-immune without deterioration during transmission and write/read cycle.
Response to Noise	More likely to get affected reducing accuracy	Less affected since noise response are analog in nature.

Comparison



Applications of DSP



- **Image Processing : Animation**
- **Biomedical : ECG analysis**
- **Telecommunication : Data communication**
- **Military : Secure Communications**
- **Scientific : Earthquake analysis**

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Thank you!