UNIT - 1

INTRODUCTION

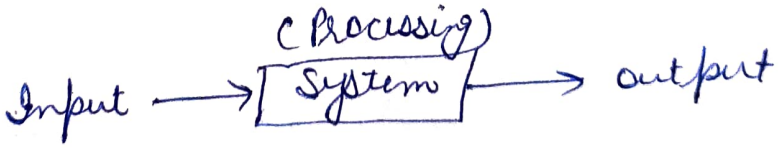
Digital → operating by the use of discrete signals to represent data in the form of numbers.

Signal → A variable parameter by which information is conveyed through an electronic ckt.

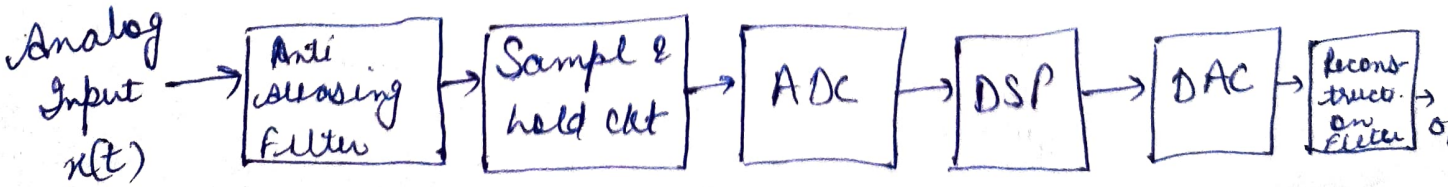
Processing → To perform operations on data according to programmed instructions

Definition of DSP → DSP is defined as changing or analysing information which is measured as discrete sequence of numbers.

System → System is nothing but physical device that performs an operation on a signal.



Basic Elements of DSP →



DSP → Digital Signal Processor DAC → Digital to Analog Conversion

(2)

Input Signal → Signal generated from transducer or from some communication systems. It may be bio-medical like ECG, EEG, . generally Analog represented by $x(t)$

Anti-Aliasing Filter → It is basically a LPF. used for following purposes:-

(1) It removes the high freq noise contains in I/P signal.

(2) It avoids aliasing effect. That means use to band limit the signal

Sample and Hold circuit → This block takes the samples of input signal. It keeps the voltage level of input signal relatively constant which is the requirement of ADC.

Some time amplifiers are used to bring voltage level of I/P signal upto the required voltage level of ADC

Analog to digital converter → Convert Analog signal voltage to digital signal. This is required bcoz DSP accept the signal which is digital in nature

Digital Signal Processor → It processes digital I/P signal digitally. Modifying the signal as per requirement. Ex ADSP 2100, TMS 320

Digital to Analog Converter → The O/P of DSP is digital in nature, but the required final output is analog in nature so Convert (D to A) DAC is used

Reconstruction Filter → O/P of DAC is analog that means contain countinous signal. But it may contain high freq components, these are unwanted. To remove these components, reconstruction filter is used.

- Advantages of Digital over Analog Signal Processing →

Versatility → digital systems can be reprogrammed for other applications.

Repeatability → digital systems can be easily duplicated systems does not depends upon component tolerance & temperatures.

- Simplicity → easy to built any digital system as compared to analog.

Accuracy → In case of analog system analog components like resistor, capacitor & inductor are used. Tolerance of these components reduce accuracy. while in case of DSP much better accuracy is obtained.

Remote Processing → Analog signals are difficult to store bcz of pros like noise & distortion. while digital signal can be easily stored on storage like magnetic tapes, discks etc. As compare to analog digital signal can be easily transposed. So remote processing of signal can be easily done.

Implementation of algorithms → Mathematical processing algorithms can be easily implemented in case of DSP but such algorithms are difficult to implement in analog

Easy upgradation → Bcoz of use of software DSP systems can be easily upgraded

Compatibility → All applications needs standard H/W. Thus opn of DSP System mainly depends on S/W. Hence universal compatability is possible compared to Analog

Cheaper → In many applications digital systems are cheaper than Analog

Disadvantages of digital over Analog signal Processing →

System Complexity → DSP systems use convertors like ADC & DAC. ↑ System complexity [Note Paractical samplers 10MHz available but if S/w Rs sampling not Possible]

Bandwidth limitations → In case of DSP if I/P signal having wide BW then it demands for high speed. Bcoz to avoid aliasing effect, the sampling rate should be twice the BW. This is practical limitation in the speed of processor

Power Consumption → A typical DSP chip contains more than 4 lakh transistors. So power dissipation is more.

cost → For small applications DSP systems are expensive compared to analog system.

Comparison b/w digital & Analog Signal Processing

Digital Signal processing	Analog signal processing
1. More versatile	Less versatile
2. More repeatability	Less repeatability
3. More accuracy	Less accuracy
4. Easily stored	Difficult to store
5. Mathematical processing easily implemented	Difficult to implement mathematical processing
6. upgradation easy done	difficult to upgrade
7. Universal compatibility is possible	not possible
8. More system complexity	Less system complexity
9. More power consumption	Less power consumption

Applications of DSP →

	Field where used
1. Image processing →	Pattern recognition Robotic vision Image enhancement
2. Instrumentation & control →	Noise reduction Data Compression
3. Speech / Audio →	Speech recognition, synthesis eq ualisation
4. Bio-medical →	Scanner, ECG analysis, Patient Monitoring
5. Telecomm →	Echo Cancellation, data comm.
6. Military →	Sonar, Radar processing, secure comm.
7. Consumer application →	Digital Audio & video, television & music systems.
8. Industrial app → Power line monitors	9. Automotive app → Cellular phone