

Introduction to Digital Signal Processing (DSP)

Recent developments in digital computers open the way to this subject. The general block diagram of a DSP system is shown below:



The input $x(t)$ is an analogue signal (speech, video, ...).

1-pre sampling filter: the signal is first bandlimited (for antialiasingⁿ) using a LPF having cutoff f_{max} , where f_{max} is the maximum frequency content in $x(t)$ (to ensure that the highest frequency is within the bounds for which the signal can be recovered)

2-A/D converter : where the bandlimited analogue signal is converted into digital $x(nT_s)$ using an analogue to digital converter (A/D) that consists of:
a) a sampler converts the continuous time signal into discrete time signal (with sampling frequency $f_s \leq 2f_{max}$ according to Nyquist theorem, where $T_s = 1/f_s$)
b) a quantizer : assigning a binary value to the analogue samples.

3DSP: The digital signal (discrete) $x(nT_s)$ or simply written as $x(n)$ is applied to a digital computer with a suitable interface card(sound card, video card, ...). Now, inside this computer a program (high level or low level) is written to perform any sort of signal analysis to $x(n)$, like, linear or nonlinear amplification, convolution, correlation, digital filtering (LFP, HPF, BPF, BSF) and Fourier spectral analysis. The result of this processing is the digital signal $y(nT_s)$, or simply $y(n)$.

4D/A: This signal is then converted into analogue using a digital to analogue converter (D/A).

An Introduction To Digital Signal Processing With Mathcadr

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