PROS AND CONS OF DSP

Advantages:

• Robustness:

- Signal levels can be regenerated. For binary signals, the zeros and ones can be easily distinguished even in the presence of noise as long as the noise is small enough. The process of Regeneration make a hard decision between a zero and a one, effectively stripping off the noise.
- Precision not affected by external factors. This means that one gets the results are reproducible.

• Storage capability:

- DSP system can be interfaced to low-cost devices for storage. The retrieving stored digital signals (often in binary form) results in the regeneration of clean signals.
- allows for off-line computations

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Flexibility:

- Easy control of system accuracy via changes in sampling rate and number of representation bits.
- Software programmable ⇒ implementation and fast modification of complex processing functions (e.g. self-tunable digital filter)

• Structure:

- Easy interconnection of DSP blocks (no loading problem)
- Possibility of sharing a processor between several tasks

Disadvantages:

• Cost/complexity added by A/D and D/A conversion. quantization noise to the signal.

• Input signal bandwidth is technology limited.

• Quantization effects. Discretization of the levels adds

• Simple conversion of a continuous-time signal to a binary stream of data involves an increase in the bandwidth required for transmission of the data. This however can be mitigated by using compression Techniques. For instance, coding an audio signal using MP3 techniques results in a signal which uses Much less bandwidth for transmission than a WAVE file.

D/A converter:

This operation can also be viewed as a two-step process, as illustrated in Figure 1.6.

Pulse train Generator Interpolator $y(t)$ $y[n]$ $\hat{y}(t)$

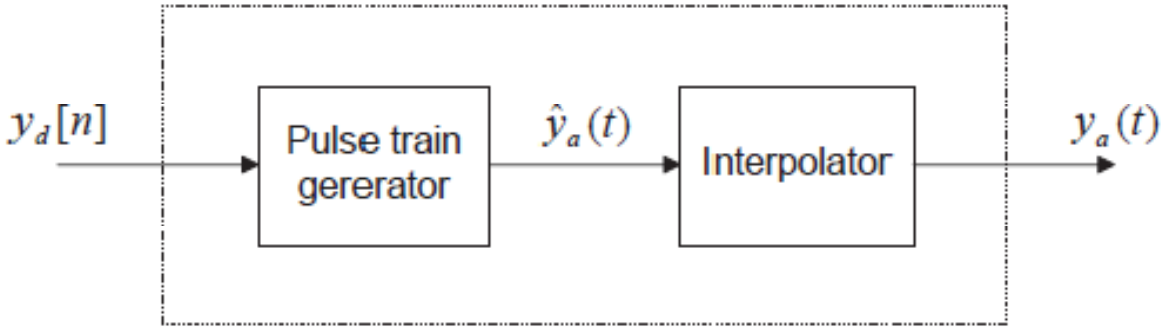

Fig:D/A Conversion

• Pulse train generator: in which the digital signal $y_d[n]$ is transformed into a sequence of scaled, analog Pulses.

• Interpolator: in which the high frequency components of $\hat{} y_a(t)$ are removed via low-pass filtering to Produce a smooth analog output $y_a(t)$.

This two-step representation is a convenient mathematical model of the actual D/A conversion, though, in Practice, one device takes care of both steps.

Applications of DSP:

Typical applications:

• Signal enhancement via frequency selective filtering

• Echo cancellation in telephony:

- Electric echoes resulting from impedance mismatch and imperfect hybrids.
- Acoustic echoes due to coupling between loudspeaker and microphone.

• Compression and coding of speech, audio, image, and video signals:

- Low bit-rate codecs (coder/decoder) for digital speech transmission.
- Digital music: CD, DAT, DCC, MD,...and now MP3
- Image and video compression algorithms such as JPEG and MPEG

• Digital simulation of physical processes:

- Sound wave propagation in a room
- Baseband simulation of radio signal transmission in mobile communications

• Image processing:

- Edge and shape detection
- Image enhancement