UNIT-1

(Lecture-1)

Realization of Digital Systems: Introduction

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Introduction

- The convolution sum description of an LTI discrete-time system can, in principle, be used to implement the system
- For an IIR finite-dimensional system this approach is not practical as here the impulse response is of infinite length
- Here the input-output relation involves a finite sum of products:

$$y[n] = -\sum_{k=1}^{N} d_k y[n-k] + \sum_{k=0}^{M} p_k x[n-k]$$

Introduction

- The actual implementation of an LTI digital filter can be either in software or hardware form, depending on applications
- In either case, the signal variables and the filter coefficients cannot be represented with infinite precision

Introduction

- However, a direct implementation of a digital filter based on either the difference equation or the finite convolution sum may not provide satisfactory performance due to the finite precision arithmetic
- It is thus of practical interest to develop alternate realizations and choose the structure that provides satisfactory performance under finite precision arithmetic

Introduction

- A structural representation using interconnected basic building blocks is the first step in the hardware or software implementation of an LTI digital filter
- The structural representation provides the key relations between some pertinent internal variables with the input and output that in turn provides the key to the implementation