Discrete Time Systems:Overview

- The difference equation, the impulse response and the system function are equivalent characterization of the input/output relation of a LTI Discrete-time systems.

- LTI system can be modeled using :

  1. A Difference/Differential equation, y(n) = *x*[n] + *x*[n-1] + …

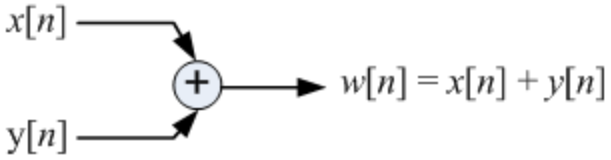
  2. Impulse Response, h(n)

  3.Transfer Function, H(z)

- The systems that are described by the difference equations, can be represented by structures consisting of an interconnection of the basic operations of addition, multiplication by a constant or signal multiplication, delay and advance.

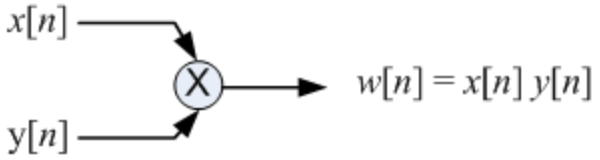
- The Adder, Multiplier, Delay & Advance is shown below:

1. Adder :

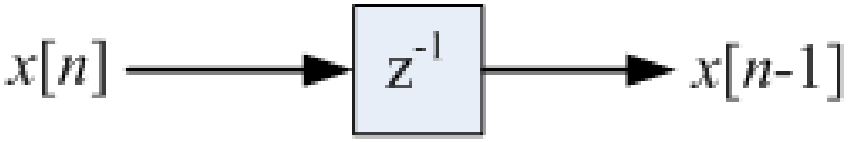


2. Multiplier :

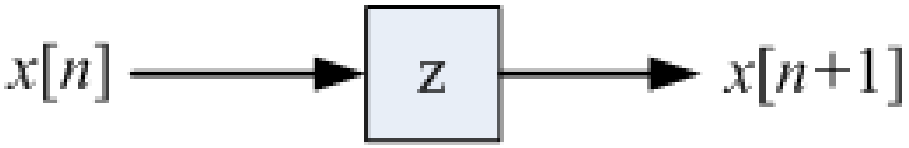
Modulator:



3. Delay :



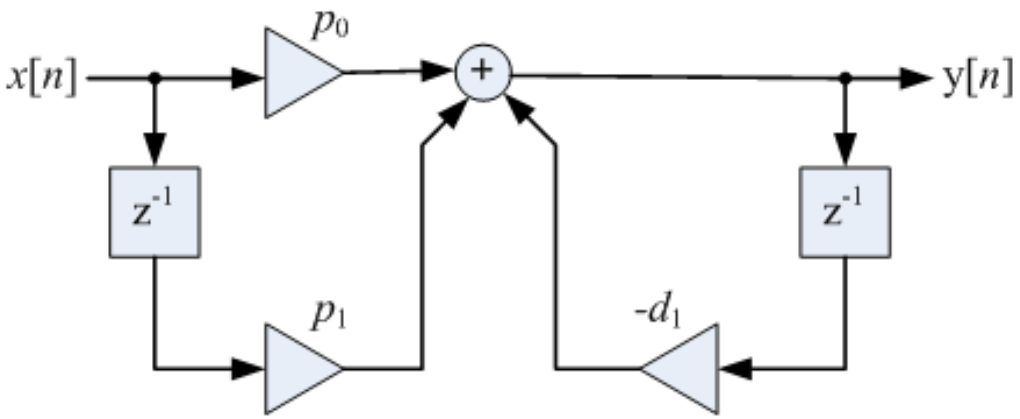
4. Advance :



- Consider a first-order causal LTI IIR digital filter described by

  $y[n] = -d_1 y[n\text{-}1] + p_0 x[n] + p_1 x[n\text{-}1]$

The block diagram representation is



- The implementation of LTI system can be realized in terms of **Block Diagram** and **Signal Flow Graph**.
- The LTI system can be represented in 2 manner :

  a. Block Diagram

  b. Mathematical Model