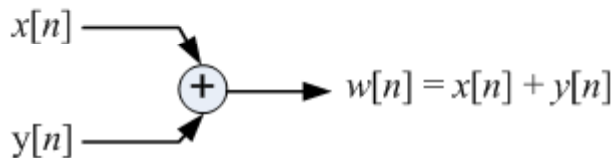


Discrete Time Systems: Overview

- 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, $y(n) = x[n] + x[n-1] + \dots$
 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:

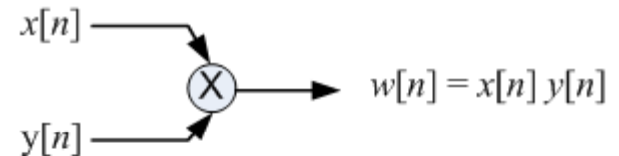
1. Adder :



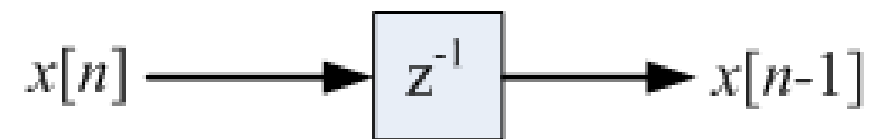
2. Multiplier :



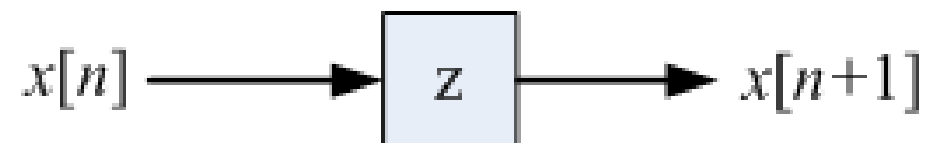
Modulator:



3. Delay :



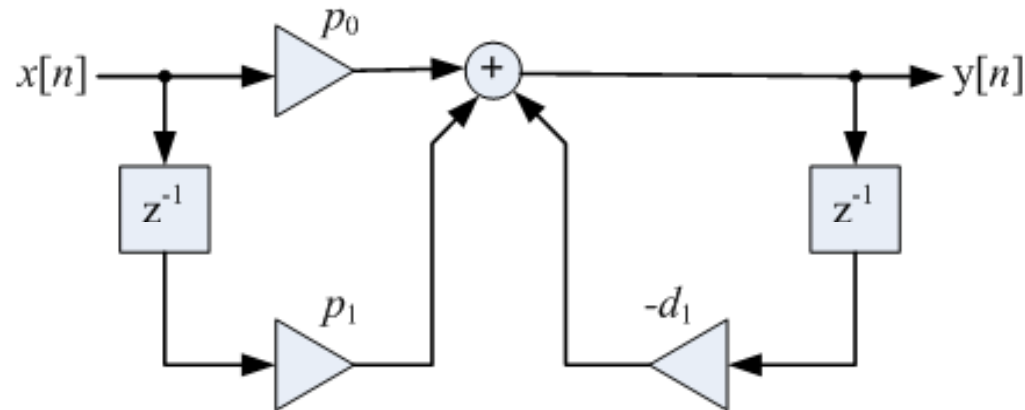
4. Advance :



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

$$y[n] = -d_1 y[n-1] + p_0 x[n] + p_1 x[n-1]$$

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