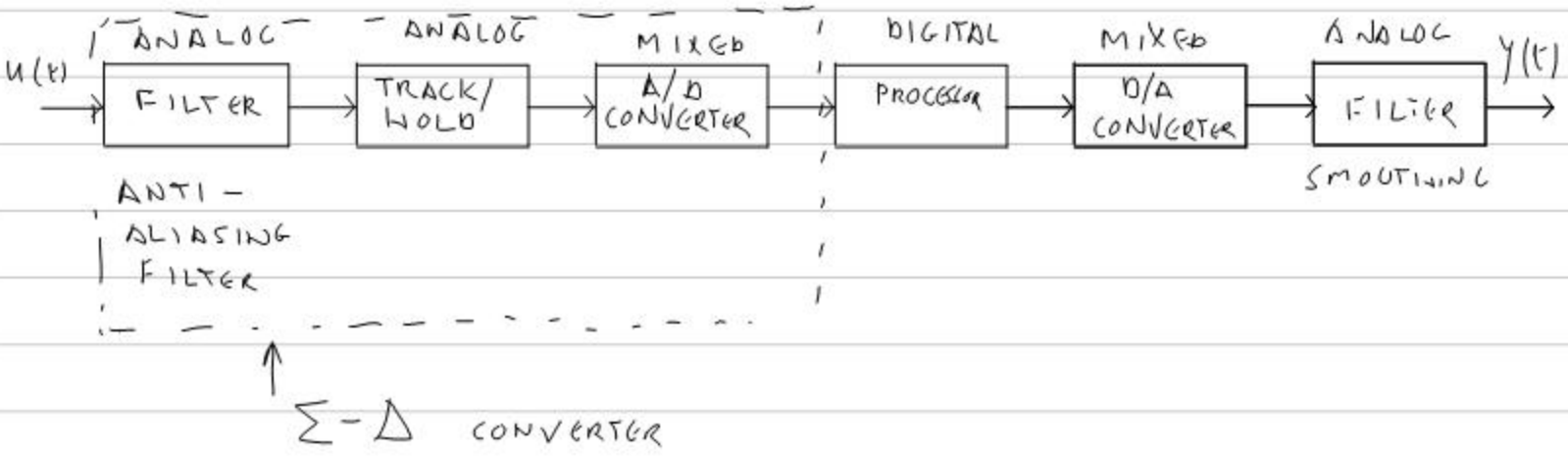
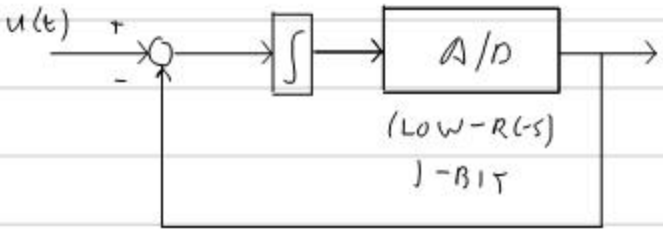
DSP System (Classical)



Σ-Δ Converter:



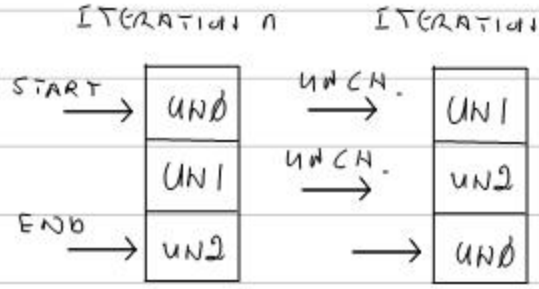
FIR Filter Implementation:

$$y_4 = h_0 u_4 + h_1 u_3 + h_2 u_2$$

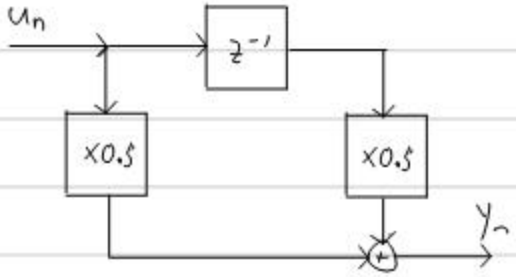
$$y_5 = h_0 u_5 + h_1 u_4 + h_2 u_3$$

Pseudocode:

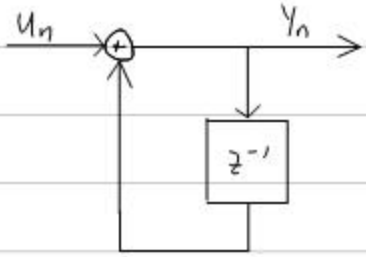
```
LOOP FOREVER: { READ UN0 ;
    YN = h0*UN0 + h1*UN1 + h2*UN2;
    WRITE YN;
    UN2 = UN1;
    UN1 = UN0;
}
```



EXAMPLES: ① MOVING - AVERAGE FILTER :



② IIR · DIGITAL INTEGRATOR.



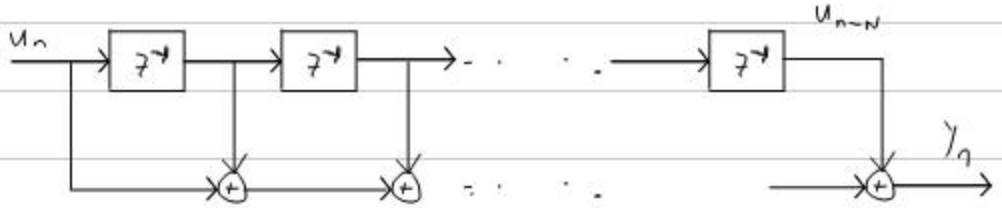
INPUT: $(u_0, u_1, u_2, \ldots)$

OUTPUT, ASSUMING ZERO INITIAL CONDITIONS: $(y_{-1} = 0)$

$$y_0 = u_0 + y_{-1} = u_0$$
$$y_1 = u_1 + y_0 = u_1 + u_0$$
$$y_2 = u_2 + y_1 = u_2 + u_1 + u_0$$

LONG MOVING-SUM FILTER:

$$y_n = u_n + u_{n-1} + \cdots + u_{n-N} \qquad (\text{E.G., } N = 30)$$



ANOTHER WAY:

$$y_{n+1} = u_{n+1} + u_n + \cdots + u_{n-N+1}$$

$$= u_{n+1} + y_n - u_{n-N}$$

OR $\qquad y_n = u_n + y_{n-1} - u_{n-N-1}$

BLOCK: