IIR Lattice Structures

The system with system function $A_m(z)$ has the following difference equation

$$A_m(z) = \frac{F_m(z)}{X(z)}$$

$$\Rightarrow \quad y[n] = f_m[n] = \sum_{k=0}^{m} a_m[k]\, x[n-k]$$

$$\text{or} \quad y[n] = x[n] + \sum_{k=1}^{m} a_m[k]\, x[n-k]$$

The system with system function $\frac{1}{A_m(z)}$ has the DE representation

$$y[n] = -\sum_{k=1}^{m} a_m[k]\, y[n-k] + x[n]$$

$\Rightarrow$ Roles of $x[n]$ & $y[n]$ are reversed

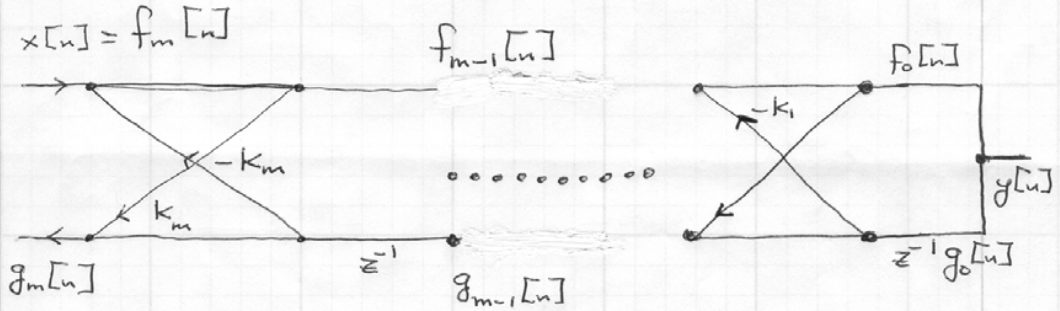
$\Rightarrow$ FIR lattice with input replaced by output will yield an IIR lattice

Lattice Equations

$$f_m[n] = f_{m-1}[n] + k_m g_{m-1}[n-1]$$
$$g_m[n] = g_{m-1}[n-1] + k_m f_{m-1}[n]$$

Reshaped lattice equations

$$f_{m-1}[n] = f_m[n] - k_m g_{m-1}[n-1]$$
$$g_m[n] = g_{m-1}[n-1] + k_m f_{m-1}[n]$$



- Corresponds to a all-pole lattice
- characterised by same set of reflection coefficients
- $B_m(z) = \frac{G_m(z)}{Y(z)} = z^{-m} A_m(z)$

  has the same all-zero form as in FIR lattice