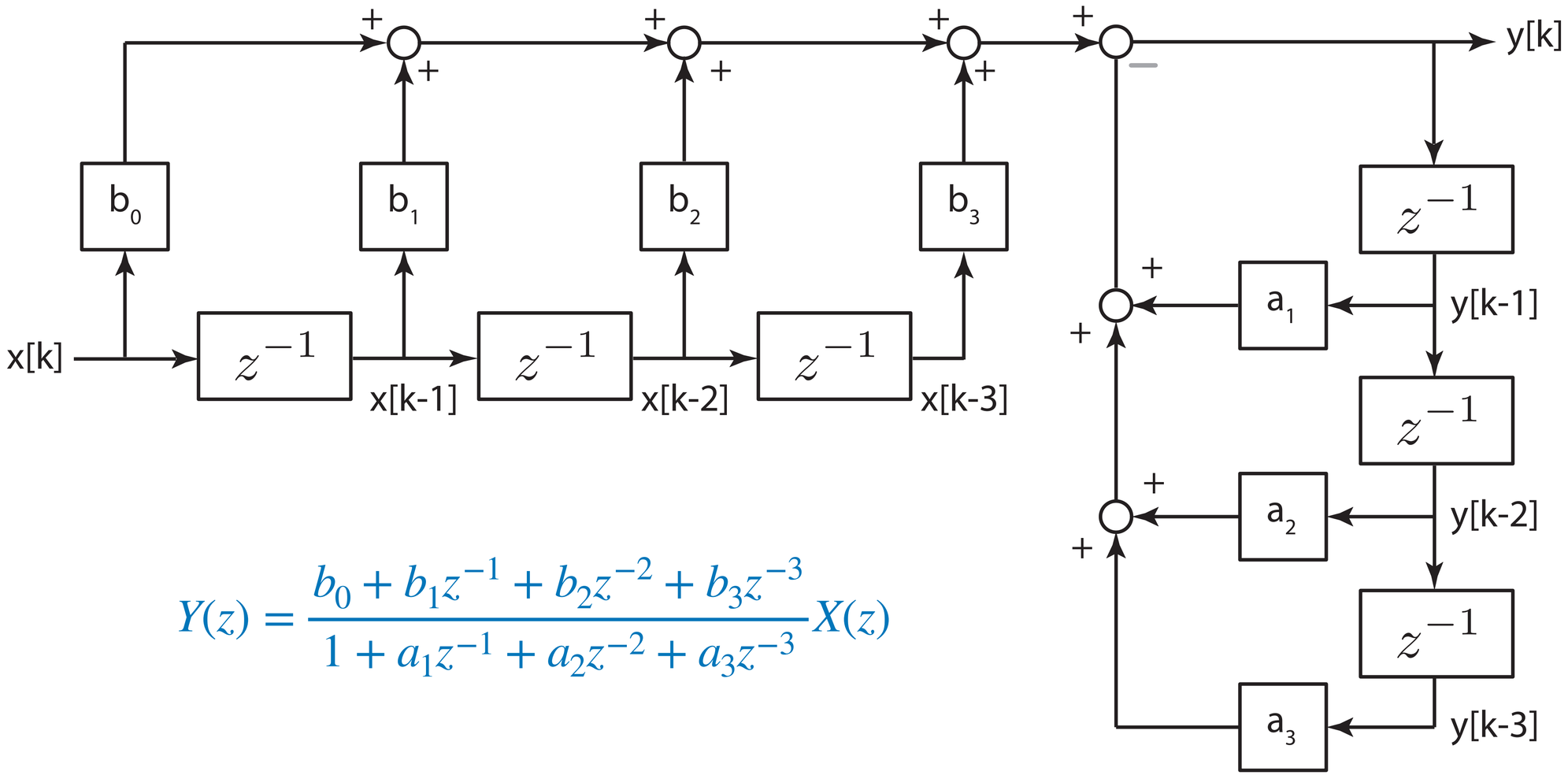
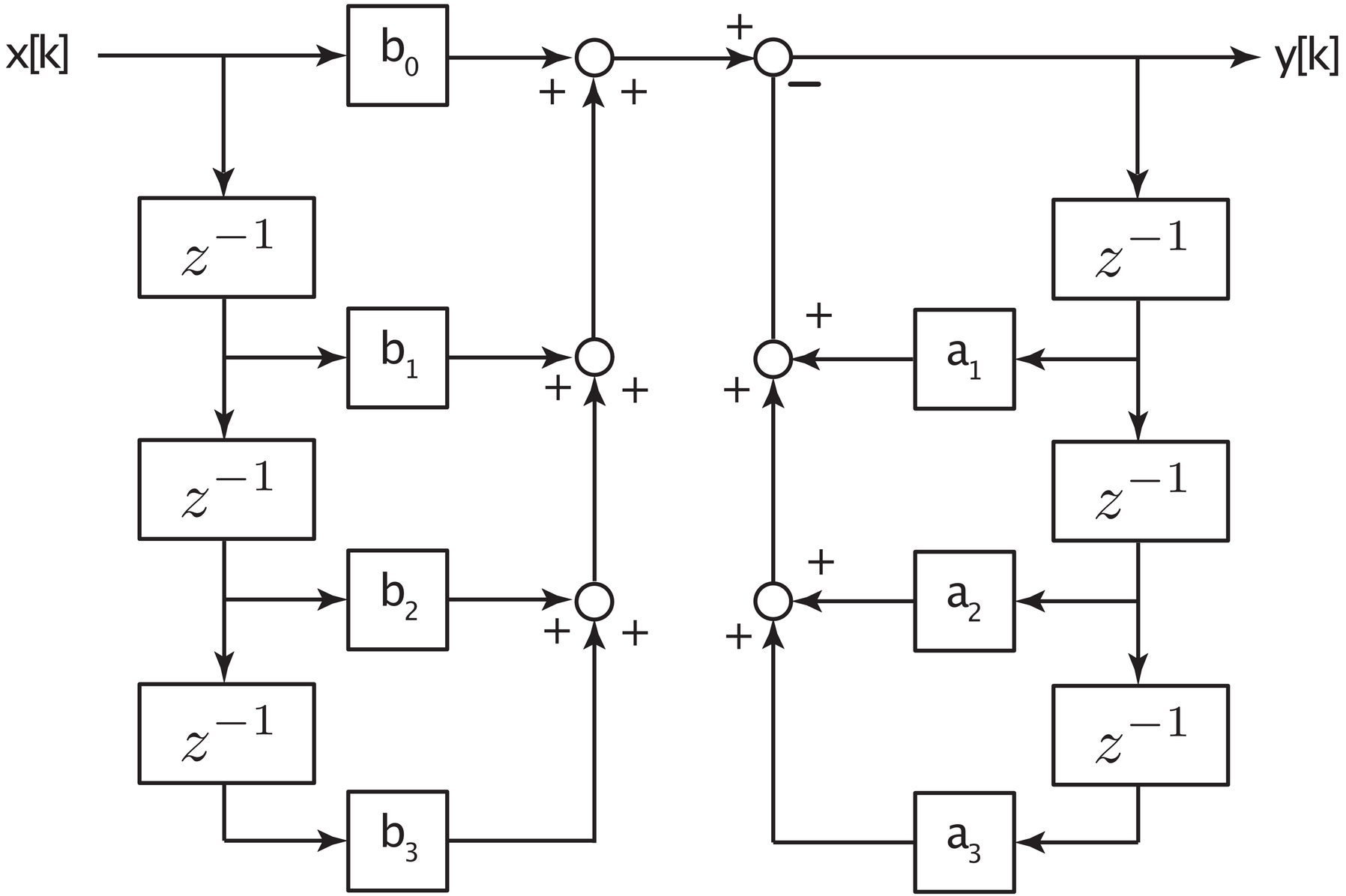
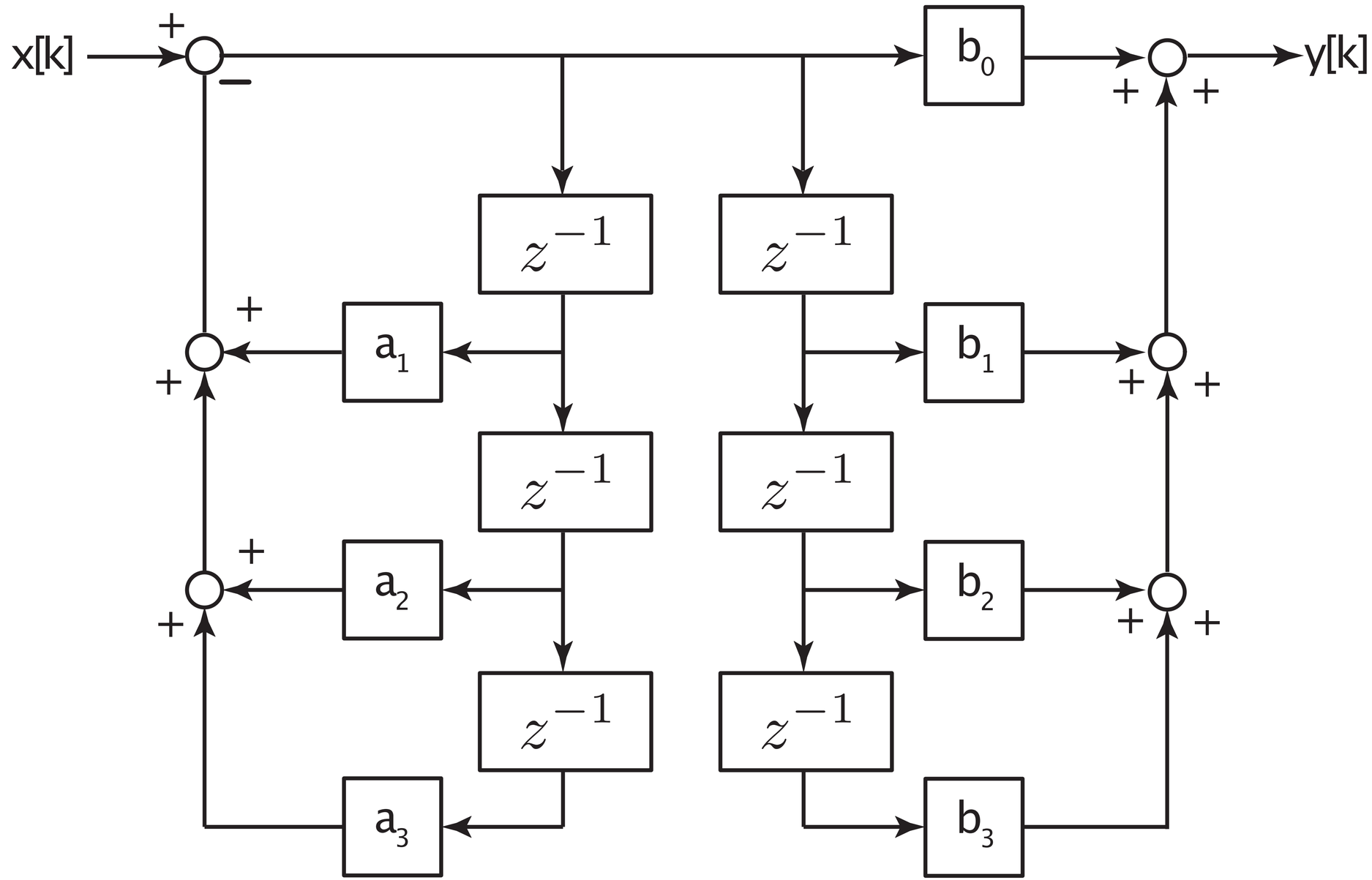
Direct Programming (non-minimal)

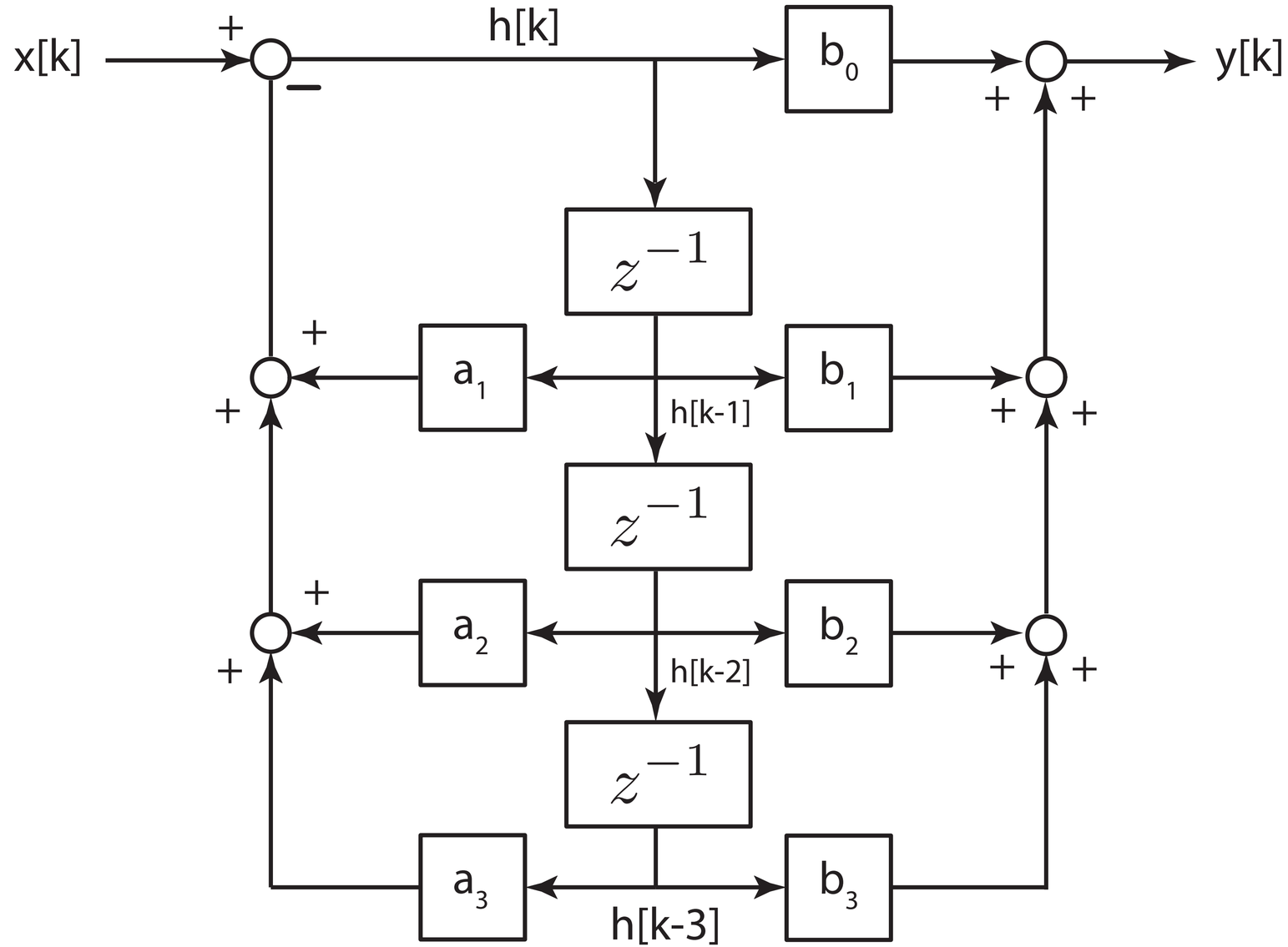


$$Y(z) = \frac{b_0 + b_1 z^{-1} + b_2 z^{-2} + b_3 z^{-3}}{1 + a_1 z^{-1} + a_2 z^{-2} + a_3 z^{-3}} X(z)$$


x[k]
b0
+
+
+
+
y[k]
z−1
b1
a1
z−1
z−1
b2
a2
z−1
b3
a3


x[k]
+
−
b0
y[k]
+
+
+
z−1
z−1
+
a1
+
b1
+
+
z−1
z−1
+
a2
+
b2
+
+
z−1
z−1
a3
b3

Standard Programming / Canonical Realization I



Canonical Realization II

$$Y(z) = \frac{b_0 + b_1 z^{-1} + b_2 z^{-2} + b_3 z^{-3}}{1 + a_1 z^{-1} + a_2 z^{-2} + a_3 z^{-3}} X(z)$$

$$Y(z) = b_0 X(z) + z^{-1} \left\{ \left(b_1 X(z) - a_1 Y(z) \right) + z^{-1} \left[\left(b_2 X(z) - a_2 Y(z) \right) + z^{-1} \left(b_3 X(z) - a_3 Y(z) \right) \right] \right\}$$

Canonical Realization II