Example 5.12

Q: ripple-free

$$G(s) = \frac{1}{(s+1)(s+10)} \qquad T = 0.1$$

Solution

硬算

$$G_{ZAS}(z) = (1 - z^{-1})\, Z\left\{\frac{G(s)}{s}\right\}$$

$$= \frac{0.0035501(1+0.6945 z^{-1}) z^{-1}}{(1-0.9048 z^{-1})(1-0.3879 z^{-1})}$$

?

$$R(z) = \frac{1}{1-z^{-1}}$$

$$U(z) = G_{c1}(z) \frac{R(z)}{G_{ZAS}(z)}$$

$$= G_{c1}(z) \frac{(1-0.9048 z^{-1})(1-0.3879 z^{-1})}{0.0035501(1+0.6945 z^{-1}) z^{-1} (1-z^{-1})}$$

55 ? 精度

$$= G_{c1}(z) \frac{281.6822 (1-0.9048 z^{-1})(1-0.3879 z^{-1})}{0.0035501(1+0.6945 z^{-1}) z^{-1} (1-z^{-1})}$$

no integrate

type 0 system must have input to steady.

$k \geq n$ 时, $u(k)$ should be nonzero ?

But $e(k) = 0$ for $k \geq n$.

deadbeat

For $n = 2$ $E(z) = e_0 + e_0 z^{-1}$? (5.14)

$E(z) = \frac{1}{C(z)} U(z)$?

$$= \frac{G_{cc}(z)\, 281.6855\,(1-0.9048z^{-1})(1-0.3879z^{-1})}{C(z)(1+0.6945z^{-1})z^{-1}(1-z^{-1})} \quad (5.15)$$

for achieve $E(z)$ in 5.14

$C(z)$ must have an integrator to

cancel the factor $(1-z^{-1})$?

while $G_{cc}(z)$ shoud cancel

the other factor in 5.15 ?

→ prove $C(z)$ cancel numerator in 5.15 ?

$G_{cc}(z) = k \times z^{-1}(1+0.6945z^{-1})$?

imposing $G_{cl}(1) = 1 \quad k = 0.5901$?

$$\cancel{C(z) = \frac{1}{G_{ZAS}(z)}\left[\frac{z^{-k}}{1-z^{-k}}\right]}$$

不能用这个，不满足 all pole and zero in the circle

$$= \frac{(1-0.9048z^{-1})(1-0.3679z^{-1})}{0.0035501(1+0.6945z^{-1})z^{-1}}\left[\frac{z^{-1}}{1-z^{-1}}\right]$$

$G_{cl}(z) \neq z^{-k}$

$G_{cl}(z) = 0.5901\, z^{-1}(1+0.6945z^{-1})$

$$C(z) = \frac{1}{G_{ZAS}(z)}\,\frac{G_{cl}(z)}{1-G_{cl}(z)}$$

$$= \frac{281.6822(z-0.9048)(z-0.3679)}{(z+0.6945)}\,\frac{0.5901z^{-1}(1+0.6945z^{-1})}{1-0.5901z^{-1}(1+0.6945z^{-1})}$$

$$= \frac{281.6822(z-0.9048)(z-0.3679)}{\cancel{(z+0.6945)}}\,\frac{0.5901\cancel{(z+0.6945)}}{z^2-0.5901(z+0.6945)}$$

$z^2 - 0.5901z - 0.4098$

$(z-1)(z+0.4098)$

$$= \frac{166.2207(z-0.948)(z-0.3679)}{(z-1)(z+0.4098)}$$