Effect of feedback on impedance

normally $V = Z I \quad e^{+j\omega t}$

$$\frac{1}{Z} = \frac{1}{R} + j\omega C + \frac{1}{j\omega L}$$

delay τ (a number)

$$I \to I - V(t-\tau) I$$

$$V(\omega) = Z(\omega)\left\{ I(\omega) - I V(\omega) e^{-j\omega\tau} \right\}$$

$$V(\omega)\left\{ 1 + I Z e^{-j\omega\tau} \right\} = Z(\omega) I(\omega)$$

$$V(\omega) = \frac{Z(\omega)}{1 + I Z(\omega) e^{-j\omega\tau}} I(\omega)$$

$$= Z_{eff}(\omega) I(\omega)$$

$$\frac{1}{Z_{eff}} = I e^{-j\omega\tau} + \frac{1}{R} + j\omega C + \frac{1}{j\omega L}$$

if $\tau = 0$ $\quad I + \frac{1}{R}$ is new shunt impedance