Moving Target Indicators

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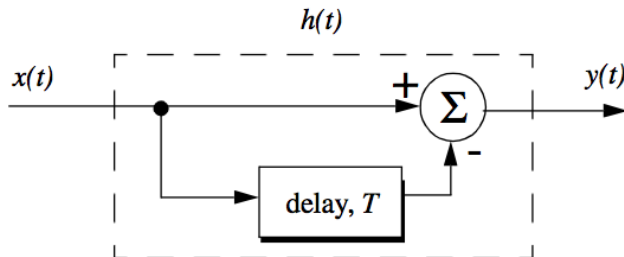April 25, 2014

Single Delay Line Cancelers

Figure: Single delay line canceler

Source: Bassem R. Mahafza. *Radar Systems Analysis and Design Using MATLAB®*. Chapman & Hall/CRC, 2000.

Single Delay Line Cancelers

$$h(t) = \delta(t) - \delta(t - T)$$
$$H(\omega) = 1 - e^{-j\omega T}$$
$$|H(\omega)|^2 = H(\omega)H^*(\omega)$$
$$= (1 - e^{-j\omega T})(1 - e^{j\omega T})$$
$$= 2(1 - cos\omega T)$$
$$= 4(sin(\omega T/2))^2$$

Source: Bassem R. Mahafza. *Radar Systems Analysis and Design Using MATLAB*®. Chapman & Hall/CRC, 2000.
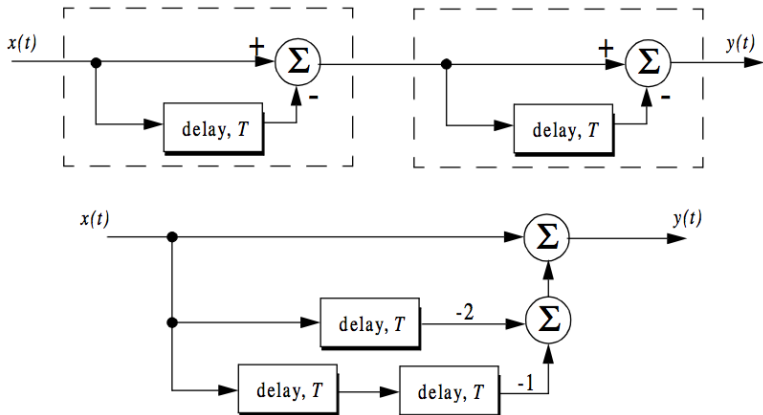
Double Delay Line Cancelers

Figure: Two configurations for a double delay line canceler

Source: Bassem R. Mahafza. *Radar Systems Analysis and Design Using MATLAB®*. Chapman & Hall/CRC, 2000.

Double Delay Line Cancelers

$$h(t) = \delta(t) - 2\delta(t - T) + \delta(t - 2T)$$
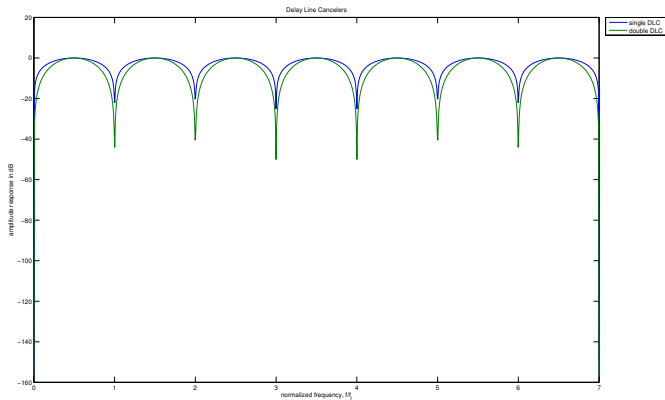$$|H(\omega)|^2 = |H_1(\omega)|^2 |H_1(\omega)|^2$$
$$where \ |H_1(\omega)|^2 = 4(sin(\omega T/2))^2$$
$$|H(\omega)|^2 = 16\left(sin\left(\omega\frac{T}{2}\right)\right)^4$$

Source: Bassem R. Mahafza. *Radar Systems Analysis and Design Using MATLAB®*. Chapman & Hall/CRC, 2000.
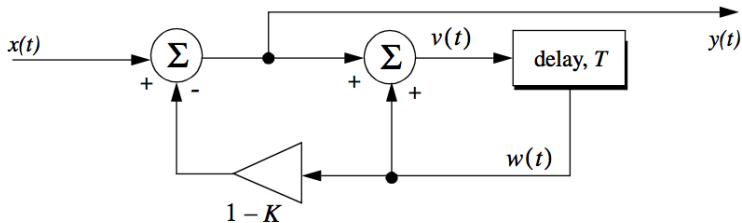
Delay Line Cancelers

Delay Lines with Feedback

Figure: MTI recursive filter

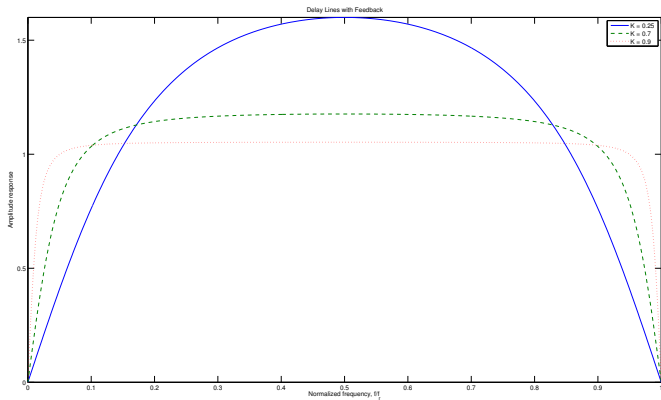Source: Bassem R. Mahafza. *Radar Systems Analysis and Design Using MATLAB®*. Chapman & Hall/CRC, 2000.

Delay Lines with Feedback

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

$$|H(z)|^2 = \frac{(1 - z^{-1})(1 - z)}{(1 - Kz^{-1})(1 - Kz)}$$

$$= \frac{2 - (z + z^{-1})}{(1 + K^2) - K(z + z^{-1})}$$

$$\left|H(e^{j\omega T})\right|^2 = \frac{2(1 - cos\omega T)}{(1 + K^2) - 2Kcos(\omega T)}$$

Source: Bassem R. Mahafza. *Radar Systems Analysis and Design Using MATLAB*®. Chapman & Hall/CRC, 2000.
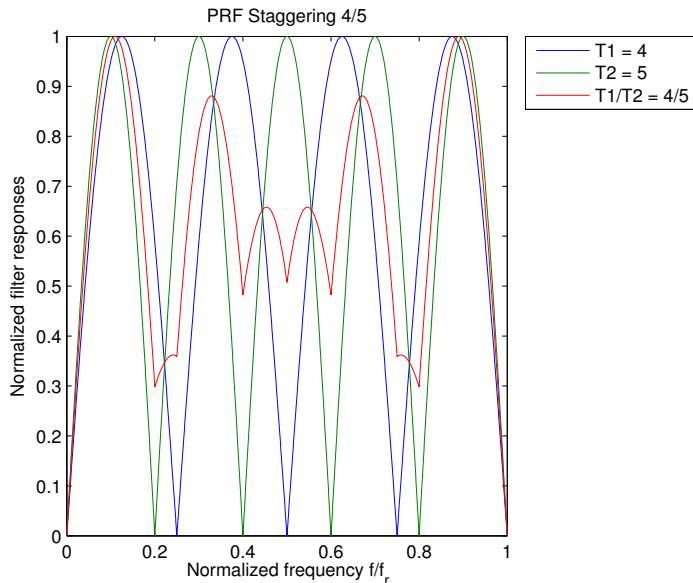
Delay Lines with Feedback

Source: Bassem R. Mahafza. *Radar Systems Analysis and Design Using MATLAB*®. Chapman & Hall/CRC, 2000.

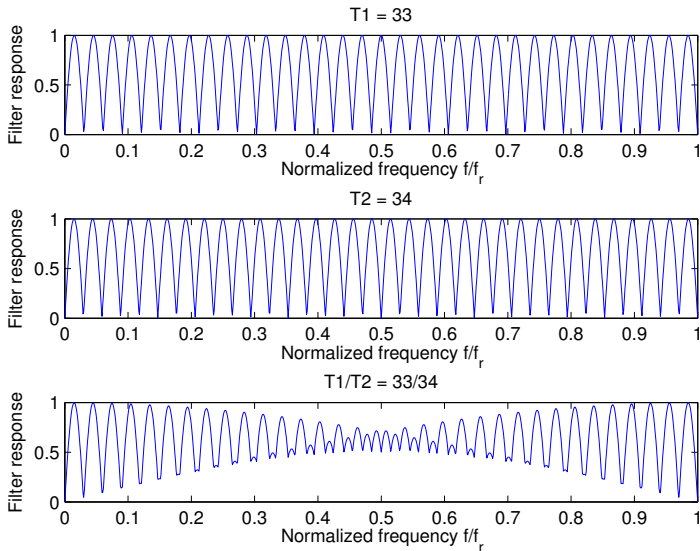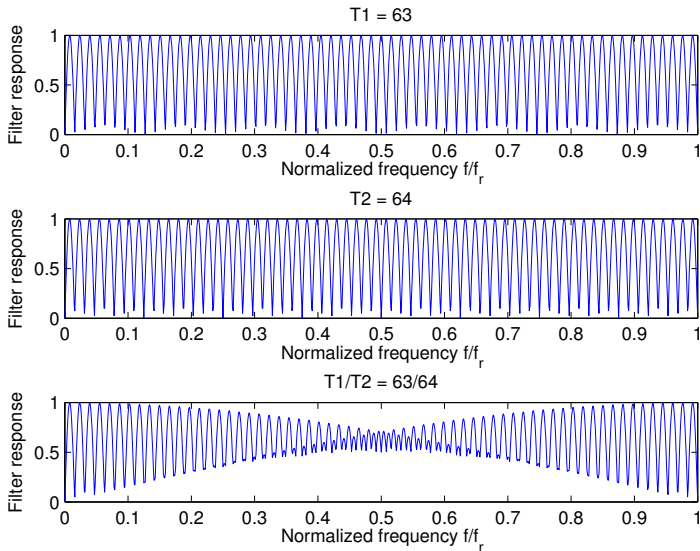# PRF Staggering 4/5

PRF Staggering 4/5

Source: Bassem R. Mahafza. *Radar Systems Analysis and Design Using MATLAB®*. Chapman & Hall/CRC, 2000.

PRF Staggering 33/34

PRF Staggering 63/64

References

- Merrill I. Skolnik. *Introduction to Radar Systems.* McGraw-Hill, 2001.
- Bassem R. Mahafza. *Radar Systems Analysis and Design Using MATLAB®.* Chapman & Hall/CRC, 2000.

Thanks