Radar System Laboratory

A.A. 2022/2023

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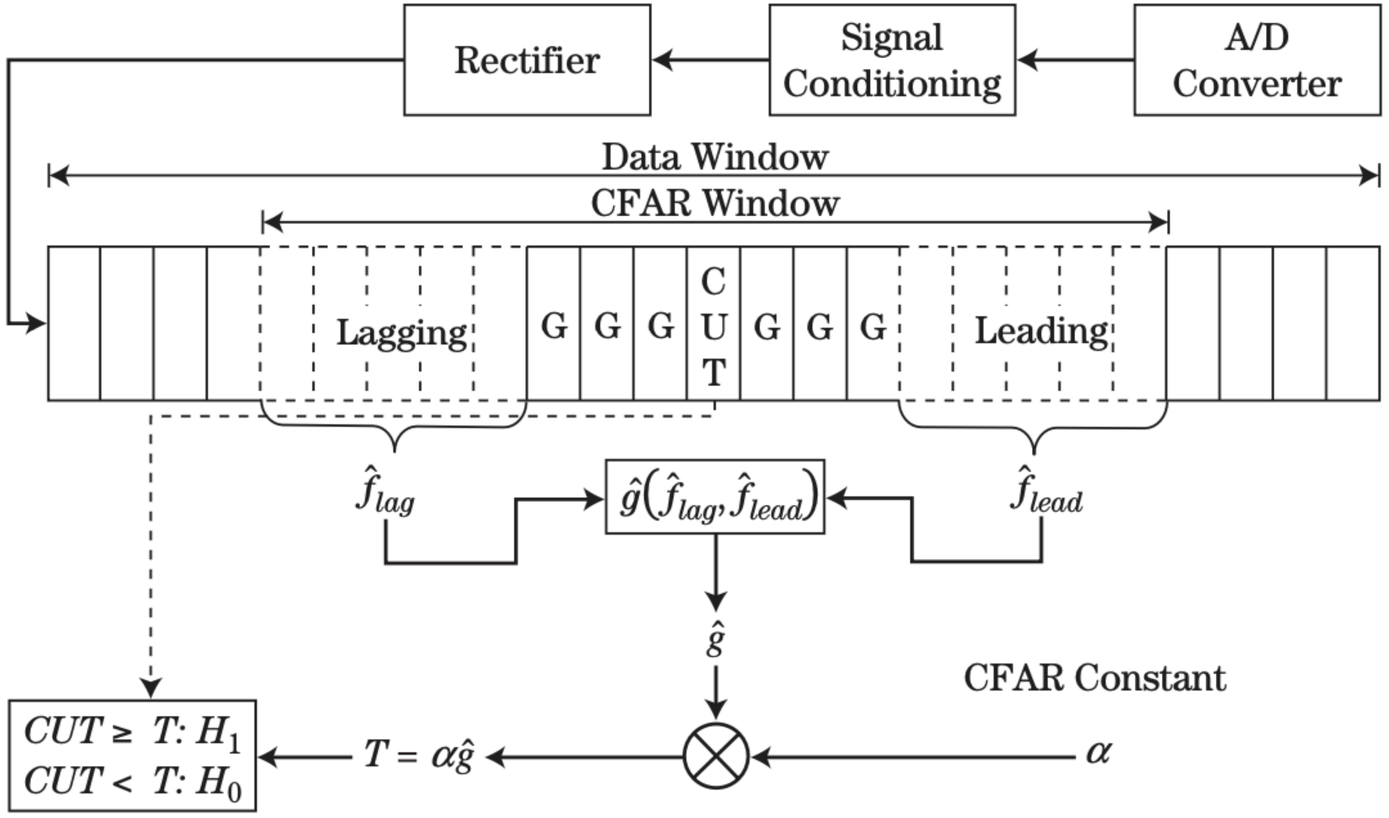

CFAR detectors estimate statistics of the interference from radar measurements and adjust the detector threshold to maintain a constant false alarm rate.

$$T = \alpha(P_{FA}) \cdot \hat{g}$$

Richards, M.A. and Scheer, J.A. and Scheer, J. and Holm, W.A. "Principles of Modern Radar: Basic Principles, Volume 1". Institution of Engineering and Technology (2010), ISBN 9781891121524

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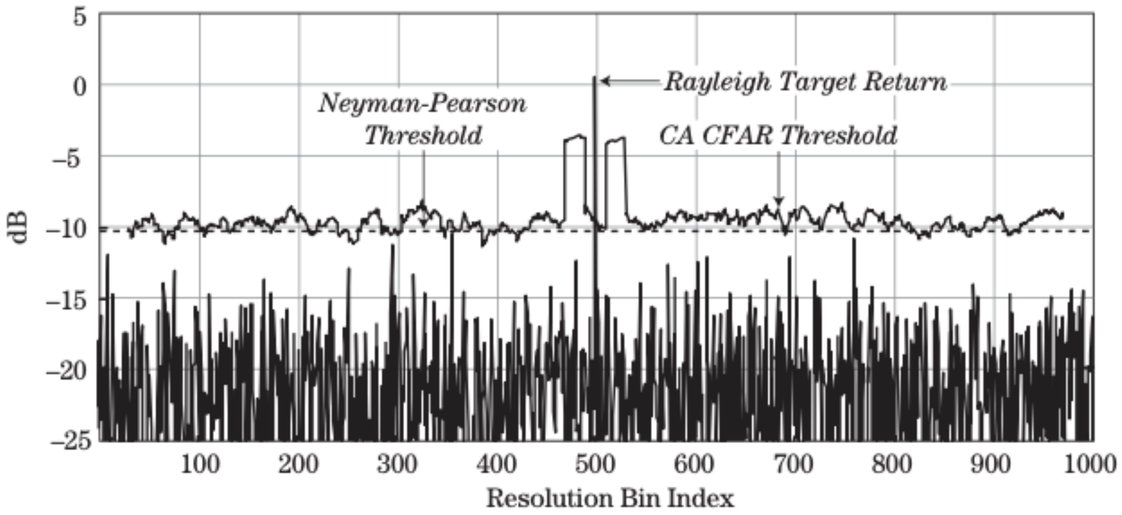
Cell Averaging (CA) CFAR



$$T = \alpha_{CA}(P_{FA}) \cdot \hat{g_{CA}}(z)$$

$$\alpha_{CA}(P_{FA}) = N\left[P_{FA}^{-1/N} - 1\right]$$

$$\hat{g_{CA}}(z) = \frac{1}{N}\sum_{n=1}^{N} z_n$$

CA-CFAR's performance may degrade significantly in presence of interfering targets and clutter boundaries.

Richards, M.A. and Scheer, J.A. and Scheer, J. and Holm, W.A. "Principles of Modern Radar: Basic Principles, Volume 1". Institution of Engineering and Technology (2010), ISBN 9781891121524

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Greatest-Of (GO) CFAR

$$T = \alpha_{GO}(P_{FA}) \cdot \hat{g_{GO}}(z)$$

GO-CFAR reduces clutter edge false alarms.

$$\hat{g_{GO}}(z) = \max\left(\sum_{n=1}^{N/2} z_n, \sum_{n=N/2+1}^{N} z_n\right)$$

$$P_{FA-GO} = 2\left(1+\alpha_{GO}\right)^{-N/2} - 2\sum_{k=0}^{N/2-1}\binom{N/2+k-1}{k}\left(2+\alpha_{GO}\right)^{-(N/2+k)}$$

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Smallest-Of (GO) CFAR

$$T = \alpha_{SO}(P_{FA}) \cdot \hat{g_{SO}}(z)$$

SO-CFAR addresses mutual target masking.

$$\hat{g_{SO}}(z) = \min\left(\sum_{n=1}^{N/2} z_n, \sum_{n=N/2+1}^{N} z_n\right)$$

$$P_{FA-SO} = 2\left(2+\alpha_{SO}\right)^{-N/2} \sum_{k=0}^{N/2-1} \binom{N/2+k-1}{k} \left(2+\alpha_{SO}\right)^{-k}$$

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```
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```

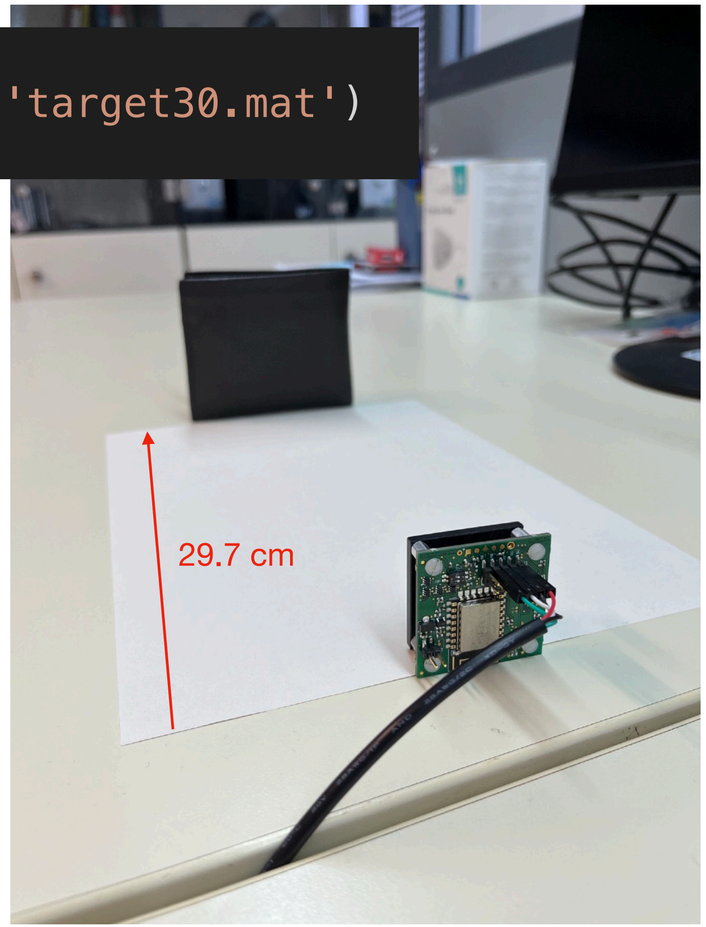


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