DT Pulse Function Pairs (1B)

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Please send corrections (or suggestions) to youngwlim@hotmail.com.

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Fourier Transform Types

Discrete Time Fourier Series

DTFS

$$X[k] = \frac{1}{N} \sum_{n=0}^{N-1} x[n]\, e^{-j(2\pi/N)kn} \quad \Leftrightarrow \quad x[n] = \sum_{k=0}^{N-1} X[k]\, e^{+j(2\pi/N)kn}$$

Discrete Fourier Transform

DFT

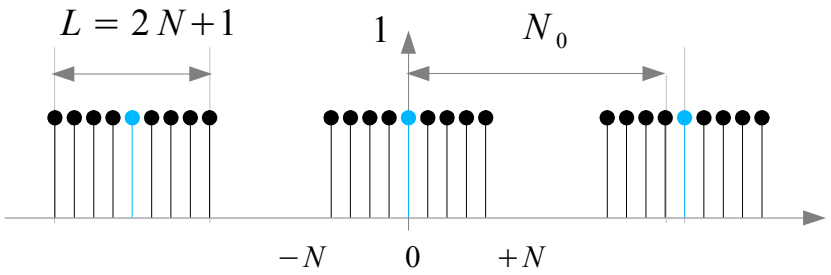
$$X[k] = \sum_{n=0}^{N-1} x[n]\, e^{-j(2\pi/N)kn} \quad \Leftrightarrow \quad x[n] = \frac{1}{N} \sum_{k=0}^{N-1} X[k]\, e^{+j(2\pi/N)kn}$$

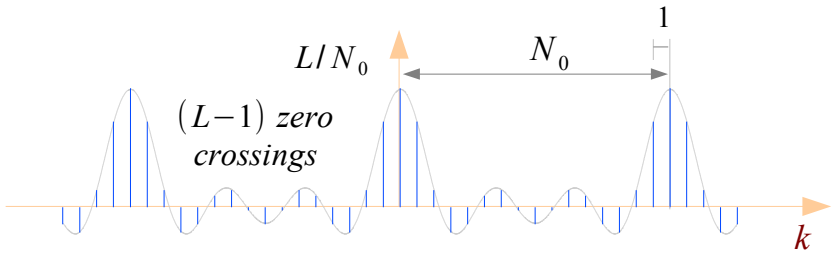
Discrete Time Fourier Transform

DTFT

$$X(e^{j\hat{\omega}}) = \sum_{n=-\infty}^{+\infty} x[n]\, e^{-j\hat{\omega}n} \quad \Leftrightarrow \quad x[n] = \frac{1}{2\pi} \int_{-\pi}^{+\pi} X(e^{j\hat{\omega}})\, e^{+j\hat{\omega}n}$$

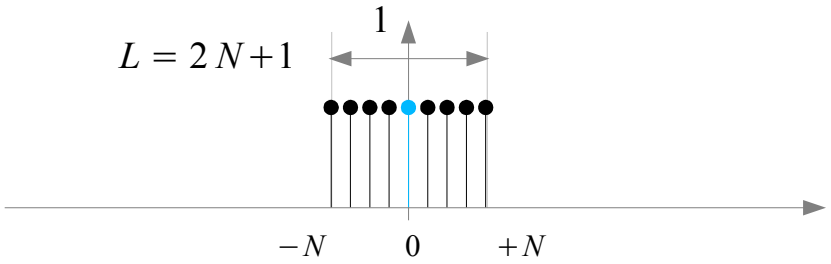
DTFS and DTFT

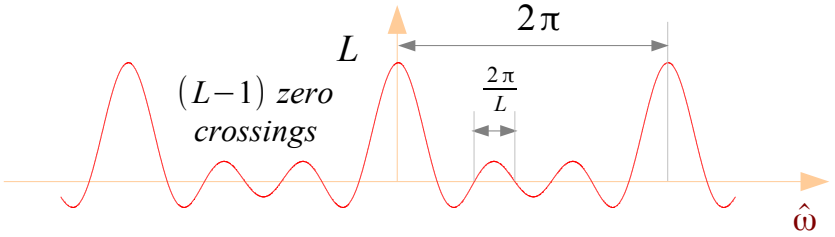




DTFS (Discrete Time Fourier Series)

$$X[k] = \frac{1}{N_0}\frac{\sin(\pi L k/N_0)}{\sin(\pi k/N_0)} = \frac{L}{N_0}\cdot \mathbf{drcl}(k/N_0,\ L)$$





DTFT (Discrete Time Fourier Transform)

$$X(e^{j\hat{\omega}}) = \frac{\sin(\hat{\omega}L/2)}{\sin(\hat{\omega}/2)} = L\,D_L(e^{j\hat{\omega}}) = L\cdot \mathbf{diric}(\hat{\omega},\ L)$$

References

[1] http://en.wikipedia.org/
[2] J.H. McClellan, et al., Signal Processing First, Pearson Prentice Hall, 2003
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[4] C. Langton, http://www.complextoreal.com/chapters/fft1.pdf
[5] M. J. Roberts, Fundamentals of Signals and Systems