Discrete Fourier Transform for Dummies

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Abstract. *blalball*

1. Introduction

2. 1D DFT Definition

$$F(u) = \sum_{x=0}^{M-1} f(x)e^{-j2\pi ux/N} \tag{1}$$

where $u = 0, 1, 2, \ldots, M-1$

$$f(x) = \frac{1}{M} \sum_{u=0}^{M-1} F(u)e^{j2\pi ux/N} \tag{2}$$

where $x = 0, 1, 2, \ldots, M-1$

3. 2D DFT Definition

$$F(k,l) = \frac{1}{MN} \sum_{m=0}^{M-1} \sum_{n=0}^{N-1} f(m,n)e^{-j2\pi(\frac{km}{M} + \frac{ln}{N})} \tag{3}$$

where $m = 0, 1, 2, \ldots, M-1$ and $n = 0, 1, 2, \ldots, N-1$

$$f(m,n) = \sum_{k=0}^{M-1} \sum_{l=0}^{N-1} F(k,l)e^{j2\pi(\frac{km}{M} + \frac{ln}{N})} \tag{4}$$

where $k = 0, 1, 2, \ldots, M-1$ and $l = 0, 1, 2, \ldots, N-1$