1 Introduction

The Discrete Fourier Transform (DFT) is a mathematical technique used to transform a sequence of complex or real numbers (typically samples of a signal, in this document we use complex number because we're on 2D plane) from the time domain into the frequency domain. Unlike the continuous Fourier Transform, which is applied to continuous signals, the DFT is applied to discrete signals, which are often obtained by sampling continuous signals at regular intervals (and it's programable).

2 Mathematical Definition

The Discrete Fourier Transform c (coef) of a list of points p is defined as:

$$c_k = \frac{1}{n} \sum_{w=0}^{n-1} p_w e^{\frac{-i2\pi wk}{n}} \tag{1}$$

where c_k $(0 \leq k < n)$ is the coef representation of points p_w $(0 \leq w < n)$. The inverse Fourier Transform is given by:

$$p_w = \sum_{k=0}^{n-1} c_k e^{\frac{i2\pi wk}{n}} \tag{2}$$

3 Interpolation

Idea same as numpy: here

4 Discrete Time

We'll convert continuous time 0 to $interp :: CIRCLE_TIME$ to num_circle discrete points $\frac{2\pi w}{n}$ $(0 \leq w < n)$.