Agenda CENG 3315 April 11, 2022 DFT_FFT_DSPF Chapter 8

DFT_FFT_Videos

1_TLH_Chap11_DFT_FFT_edited.pdf

DFT_FFT_TLH_Chapter11

DFT_ FFT Tutorial_References.pdf

Discrete Fourier Transform - Simple Step by Step 10:34
Easy explanation of the Fourier transform and the Discrete Fourier transform, which takes any signal measured in time and extracts the frequencies in that signal.

https://www.youtube.com/watch?v=mkGsMWi_j4Q

725, 566 Views!! 10:34

He takes 8 samples of a 1 Hz sine wave 1sin(2π1t) – so N=8, Ts=1/8 sec, NTs= 8(1/8) = 1 Hz. We expect frequencies spaces at 1Hz apart. In the result we might we expect
Fk = { 0, 1, 0 , 0, 0, 0, 0, 0} but the DFT yields { 0, -4j, 0 , 0, 0, 0, 0, 4j} AS EXPECTED.

However – **Fmax** is 4 Hz because the sampling rate is 8 s/s, so the 4j term is the negative

1 Hz frequency. Combining as a sine result with inverse Euler, we have
Fk1 = { 0, 8, 0, 0, 0} from 0 to 4 Hz. The j in the DFT indicates a pi/2 phase shift.
To get the correct amplitude, we divide by N or
Fcorrect = (1/N) Fk1 = {0, 1, 0, 0} So this is a 1 Hz sine wave – Note as cosine we write
F(t) = 1 cos(2pi t + pi/2) = 1 sin(2pi t) as expected.

Sample a sine wave for 1 sec

8 points, spaces 1/8 sec apart NTs = 1 Hz

Show DFT – Valid only to 4 Hz

DFT_Problem_Session2_Ch8.pdf

DFT_Problem_Session_2

The Fast Fourier Transform:

NTS/FFT Basics: 7:26 282,803 Views

https://www.youtube.com/watch?v=UGUceuhSuUE

Applications of the FFT: FFT as "the most important numerical algorithm of our lifetime"

Learn about Fourier transforms, convolutions, neural networks, image processing, GPS, MRI scans, hearnin, etc, etc - Fourier does it all. (Michel 12:31)

FFT "the most important numerical algorithm of our lifetime"

This video presents 3 applications of the Fast Fourier Transform (FFT) and hints at many more. Gilbert Strang described FFT as "the most important numerical algorithm of our lifetime". The video features Assistant Professor Michael Kapralov of the IC School at EPFL. 12:31

https://www.youtube.com/watch?v=aqa6vyGSdos

Learn about Fourier transforms, convolutions, neural networks, image processing, GPS, MRI scans, hearnin, etc, etc - Fourier does it all.

FFT basic concepts 7:26

Basic concepts related to the FFT (Fast Fourier Transform) including sampling interval, sampling frequency, bidirectional bandwidth, array indexing, frequency bin width, and Nyquist frequency. Note: He uses fs as the sampling rate. dF = 1/(NTs) https://www.youtube.com/watch?v=z7X6jgFnB6Y

Try it with a real scope:
Tony and Ian from Tektronix present a FFT Tutorial (Fast Fourier Transform) covering what is FFT, an explanation of the FFT function as well as different FFT applications. They explain how the FFT works with a FFT example and show an oscilloscope demo to demonstrate how helpful the FFT can be. 6:29
https://www.youtube.com/watch?v=zKKGA30bHG0&feature=youtu.be

FFT Tutorial TI

598,640 views •May 17, 2012 6:29

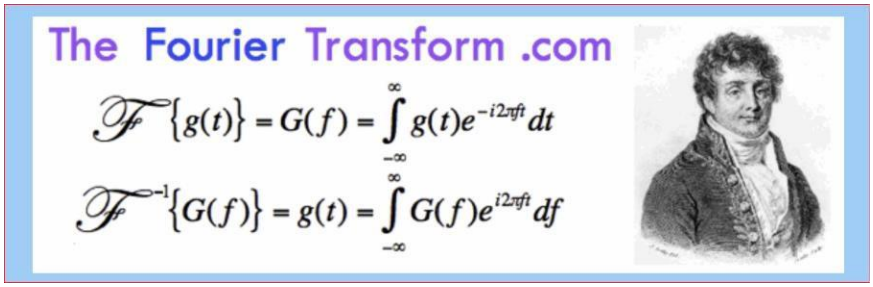
Tony and Ian from Tektronix present a FFT Tutorial (Fast Fourier Transform) covering what is FFT, an explanation of the FFT function as well as different FFT applications. They explain how the FFT works with a FFT example and show an oscilloscope demo to demonstrate how helpful the FFT can be.

3_ExamplesProblemSession1_Ch8

DFT_Problem_Session1

FourierPresentation2_FS_FT_DFT_TlH.pdf

FourierPresentation2



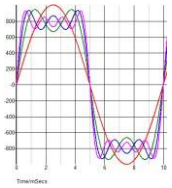


Image processing | Digital Signal Processing
9,477 views Aug 23, 2014 17:03
2D Convolution