

**DFT FFT Videos**

1\_TLH\_Chap11\_DFT\_FFT\_edited.pdf

**DFT FFT TLH Chapter11**

**1. TLH CHAPTER 11 Examples 11-xx Finish UP DFT/FFT**

**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, hearinin, 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, hearinin, 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  $f_s$  as the sampling rate.  $dF = 1/(NT_s)$  <https://www.youtube.com/watch?v=zKKGa30bHG0>

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>



Some MATLAB examples

FourierPresentation2\_FS\_FT\_DFT\_TIH.pdf

## FourierPresentation2

The Fourier Transform .com

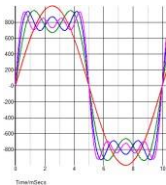

$$\mathcal{F}\{g(t)\} = G(f) = \int_{-\infty}^{\infty} g(t)e^{-i2\pi ft} dt$$
$$\mathcal{F}^{-1}\{G(f)\} = g(t) = \int_{-\infty}^{\infty} G(f)e^{i2\pi ft} df$$


Image processing | Digital Signal Processing

9,477 views Aug 23, 2014 17:03

2D Convolution and Image Compression

<https://www.youtube.com/watch?v=8pr-yrlXnmQ&t=518s>

## April 11 Previous

### 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](https://www.youtube.com/watch?v=mkGsMWi_j4Q)

725, 566 Views!! 10:34

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

**However** —  $F_{\max}$  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  $F_{k1} = \{0, 8, 0, 0, 0\}$  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

$F_{\text{correct}} = (1/N) F_{k1} = \{0, 1, 0, 0\}$  So this is a 1 Hz sine wave – Note as cosine we write

$F(t) = 1 \cos(2\pi t + \pi/2) = 1 \sin(2\pi t)$  as expected.

Sample a sine wave for 1 sec

## 8 points, spaces 1/8 sec apart $NT_s = 1$ 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>

FFT properties demonstration

17,400 views Oct 10, 2012 7:47 LabView Vis used.

### 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.

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### 3\_ExamplesProblemSession1\_Ch8

DFT Problem Session1

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