Encoding Audio with DFT Quiz

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December 2, 2020

1 Sampling Theorem

What is the minimum sampling frequency required to perfectly construct the following functions in discrete time? a) $f(x) = \cos(10x)$ b) $f(x) = \cos^2(18x)$ b) $f(x) = \sin^2(22x + 9)$ b) $f(x) = \sin(10x)$

2 Deriving Euler's Equations

Prove that $\sin(x) = \frac{e^{ix} - e^{-ix}}{2i}$, $\cos(x) = \frac{e^{ix} + e^{-ix}}{2}$

3 DFT

Sketch the Magnitude response of the following equations:
a) $f(x) = \cos(x)$ b) $f(x) = \cos(12x)$ d) $f(x) = e^{i3}\cos(12x)$

4 More DFT

What function $x(n)$ gives us the following magnitude response $F(\omega)$?

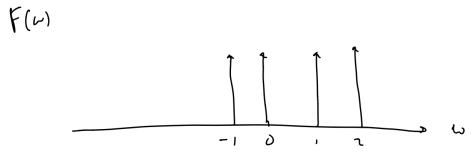

Figure 1: Problem 4

5 STFT

Sketch the STFT of $x(t), 0 \leq t < 15$ where $x(t)$ is defined as the following peicewise:

$$x(t) = \begin{cases} 2\cos(2t) & 0 \leq t < 5 \\ 2\cos(6t) & 5 \leq t < 10 \\ 2\cos(21t + 1) & 10 \leq t < 15 \end{cases}$$

6 Encoding Audio with DFT Part 1

How can we use DFT to learn about hidden features in an audio signal?

7 Encoding Audio with DFT Part 2

Describe a possible classification algorithm that incorporates Fourier features of the signal.

8 Symmetry of Real Valued Continuous Signals in the Frequency Domain

If we have a real valued continuous time signal, it's magnitude spectrum should be symmetric about what axis?

9 Discrete Time Periodic Functions

If a discrete time signal is both real valued and periodic where in the signal will we see symmetry?

10 Decibels and the Magnitude Spectrum

What is one Advantage of using decibels to measure the magnitude spectrum of a signal?