Aliasing

Note Title 4/27/2006

Time domain aliasing

Convolution → Convert to freq & process.

256 sample signal * 51 sample signal

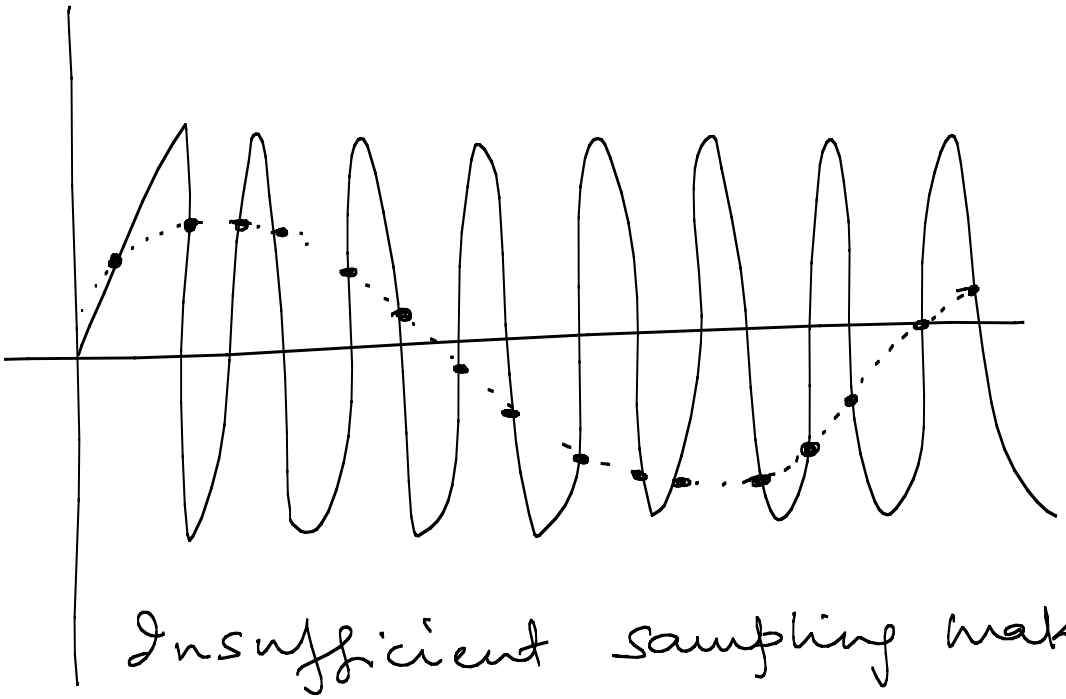
= 306 sample signal

Note ⇒ 256 sample signal has sine waves with maximum frequency of making 128 cycles over 256 samples

306 sample signal has sine wave that makes 153 cycles over 306 samples. Try capturing this sine wave with 128 samples. ∴ Sampling rate is not sufficient, less than 1 sample per half cycle.

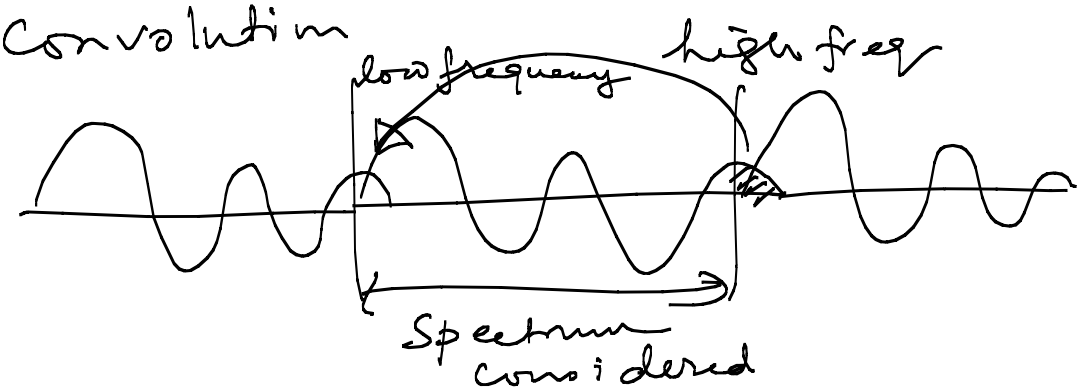
What happens?

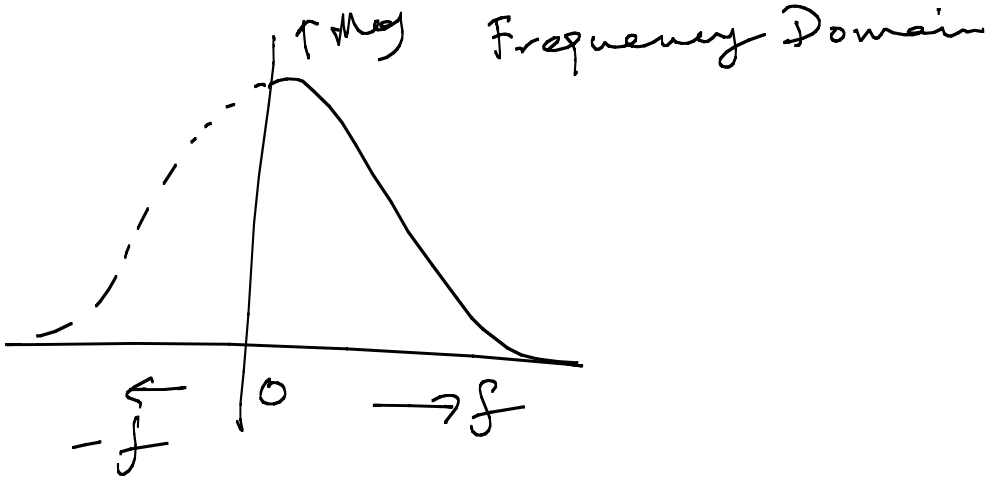
E.g



Insufficient sampling makes a highes frequency sine wave look like a lower frequency wave. This is called aliasing

Exactly what you saw in circular convolution





What are these negative frequencies?

Think of a Cosine wave

$A\cos(\theta)$ → Represents cosine waves in polar notation

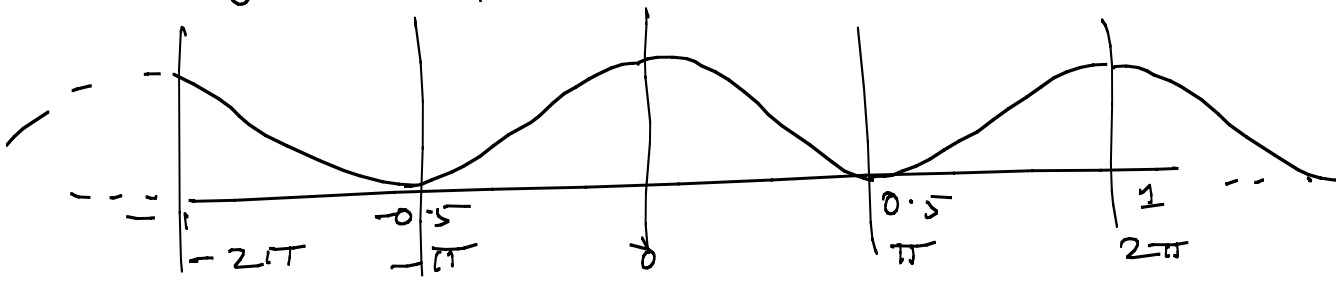
Now $A\cos(\theta) = A\cos(-\theta)$

∴ Same value A at $-\theta$

Also $A\cos(\theta) = A\cos(2\pi - \theta)$

Or infact any multiples of 2π.

∴ May repeats as follows :-



Repeats in such a way

that $Mag(f) = Mag(-f)$

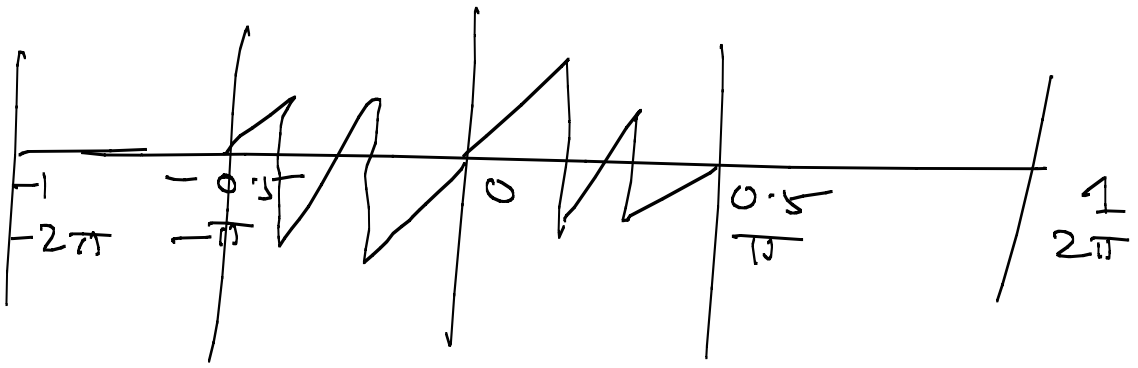
$\therefore$ This is an even signal.

Also note

$$\cos(\theta + \pi/4) = \cos(-\theta - \pi/4)$$

$\therefore$ The phase also repeats but such that

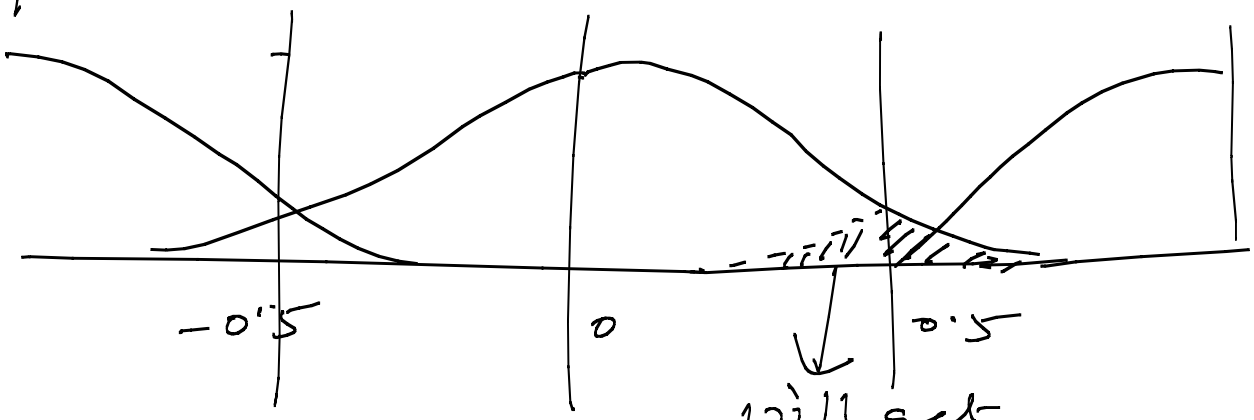
$$Ph(f) = -Ph(-f)$$



$\therefore$ Odd signal.

Now frequency domain aliasing. Say you convert to time domain & do some processing. And general frequency beyond 0.5

Eg.



will get folded & show up as high frequency

∴ This is also aliasing but different than time domain aliasing.

Some more properties