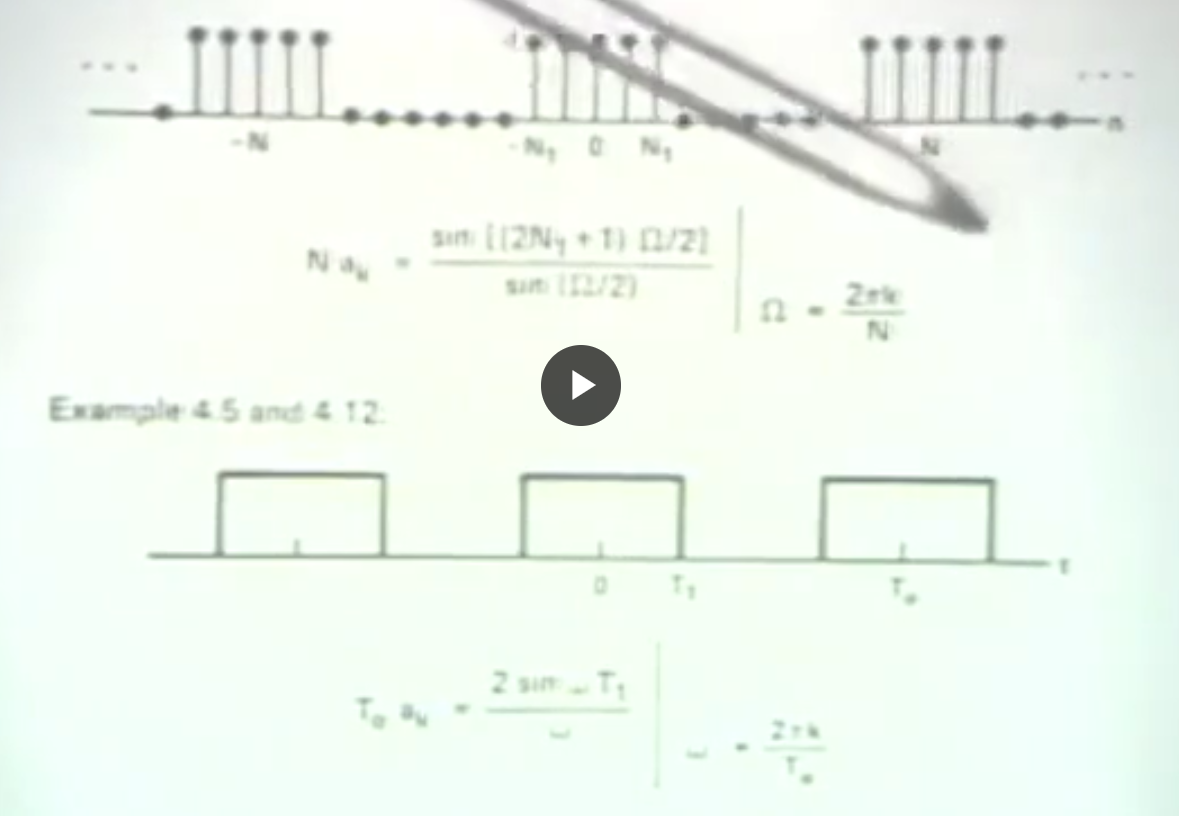
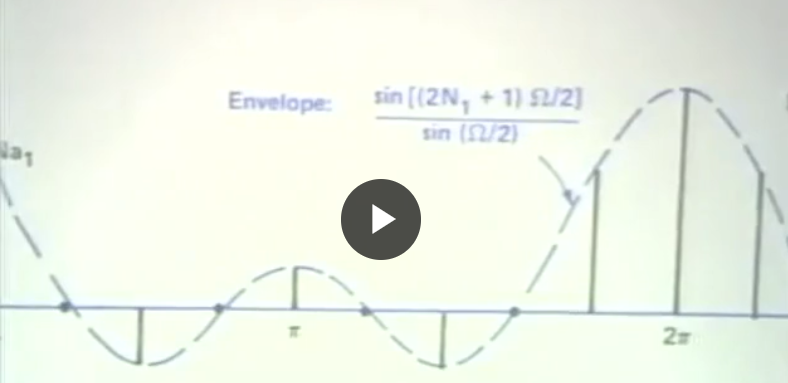
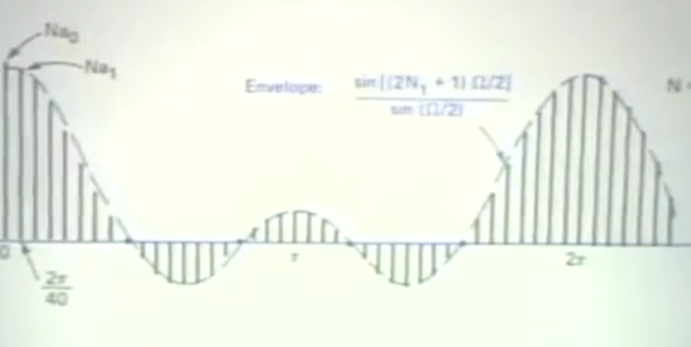
离散时间和连续时间的傅里叶级数的coefficients 是一种sample



当N不断增加时候,N\*ak取得到的点越来越多.

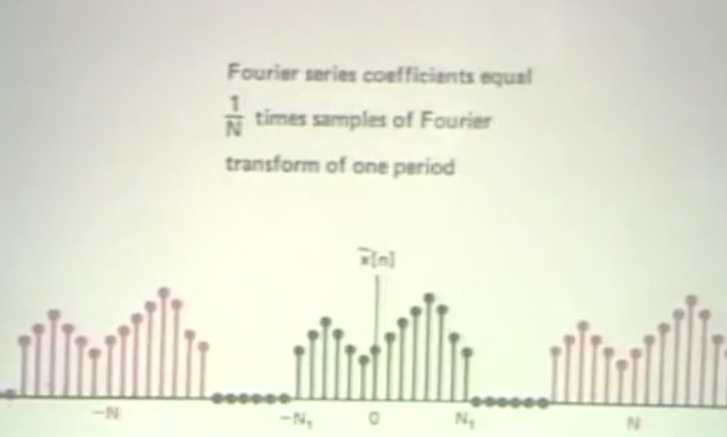


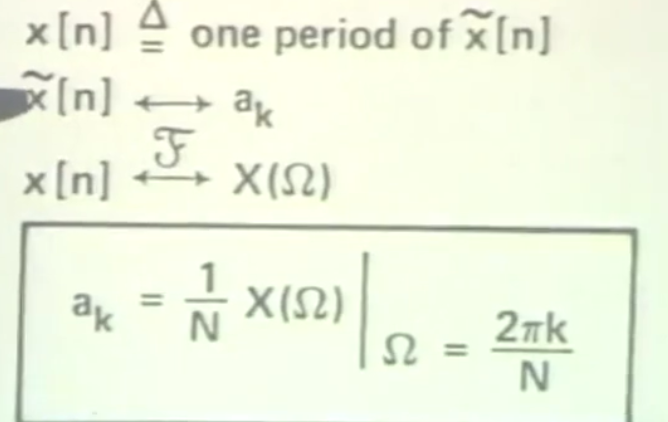




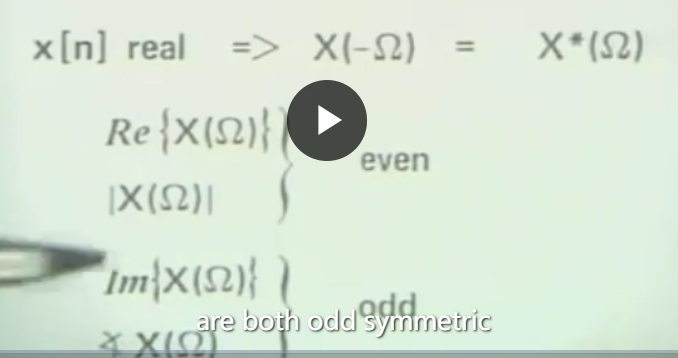
T越来越大， N\*ak就变连续了

离散的sample



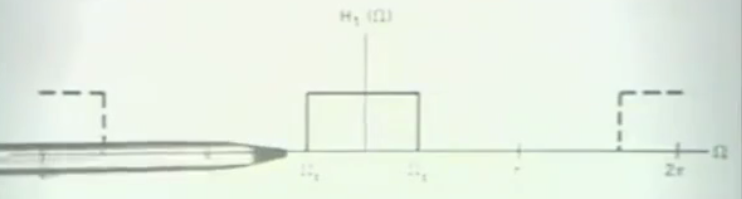


X[n]是real的话,DTFT的一些性质



离散信号的

的低通滤波器，以2pi重复，因为x(omega)也是以2pi重复



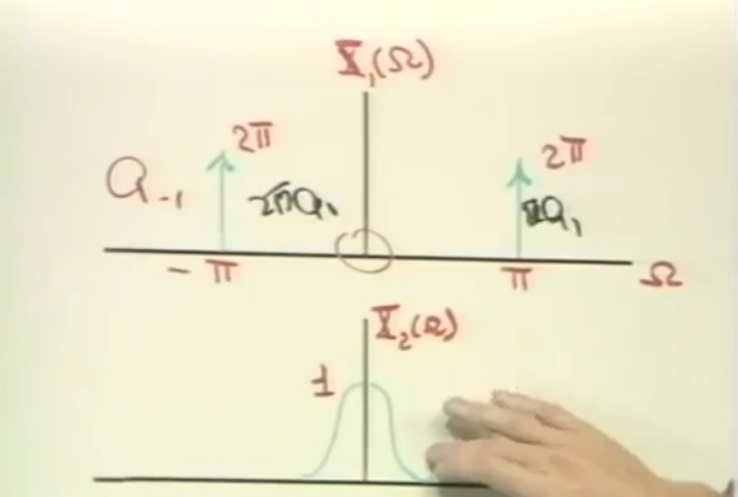
但是连续信号的话，只需要有中间一个bandwidth就可以了

Modulation property

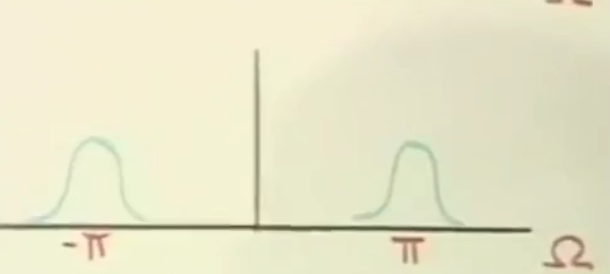
X1[n] = (-1)^n = e^(-j\*pi\*n)

X1[n] times x2[n] ---🡪Fourier x1[w] \* x2[w]

这图中pi是最快的频率,0 是最慢的



Recall you convolve something with an impulse chain as this is, that simply responds to take something , replacing it at the position of each of the impulses

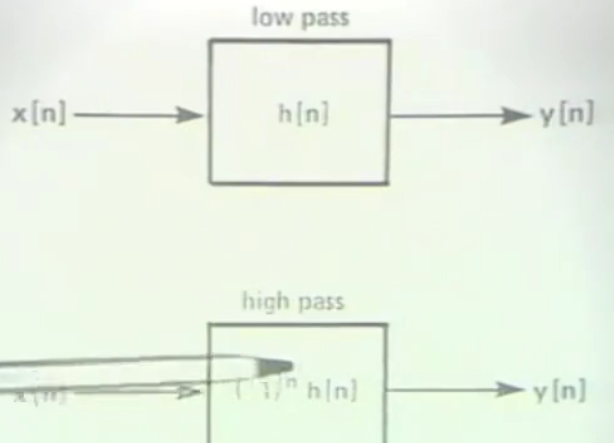


This tells us a important useful interesting fact.

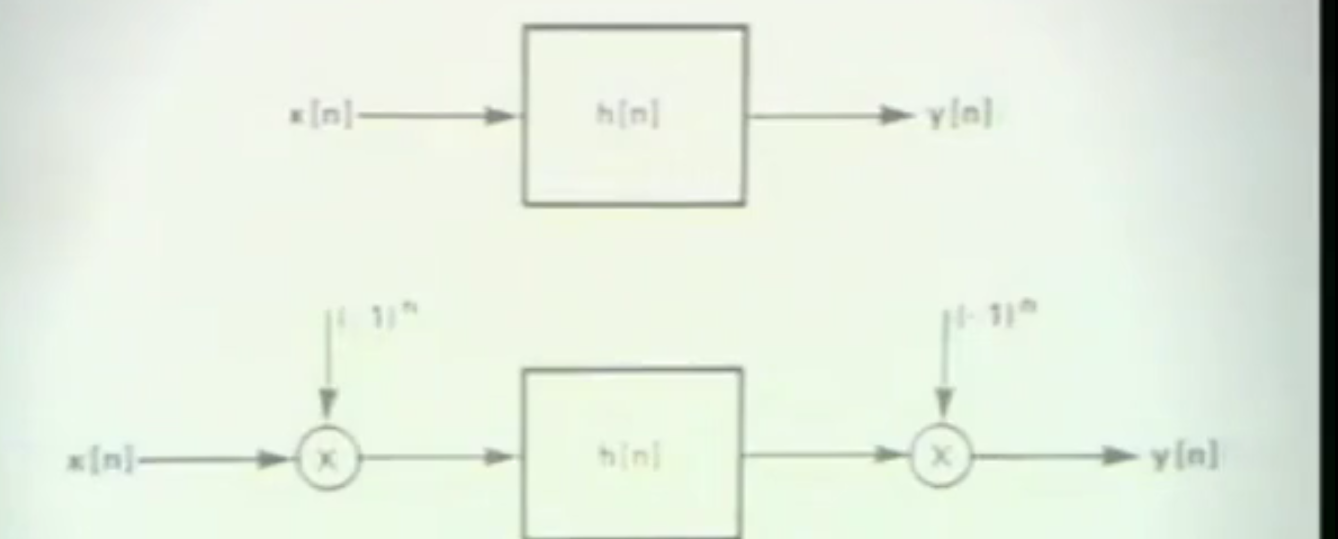
What it says is, if I have a signal with certain spectrum, if I multiply that signal by (-1)^n, means I alternate the signs. The it takes the low frequency moves it up to high frequency, and will incidentally take the high frequency and moves to low frequency

In other words, it shift the spectrum of x2 by pi

Cause by times (-1)^n, we shift the spectrum by pi, so low pass becomes high pass.

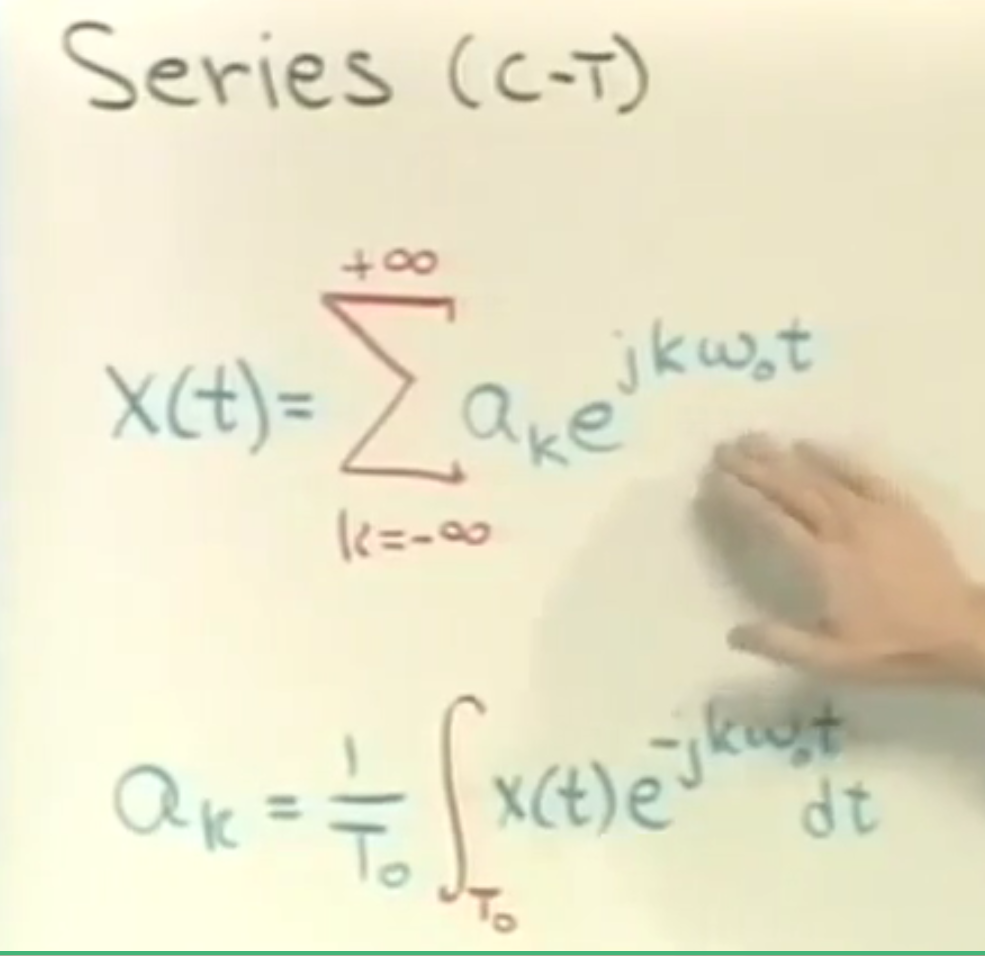
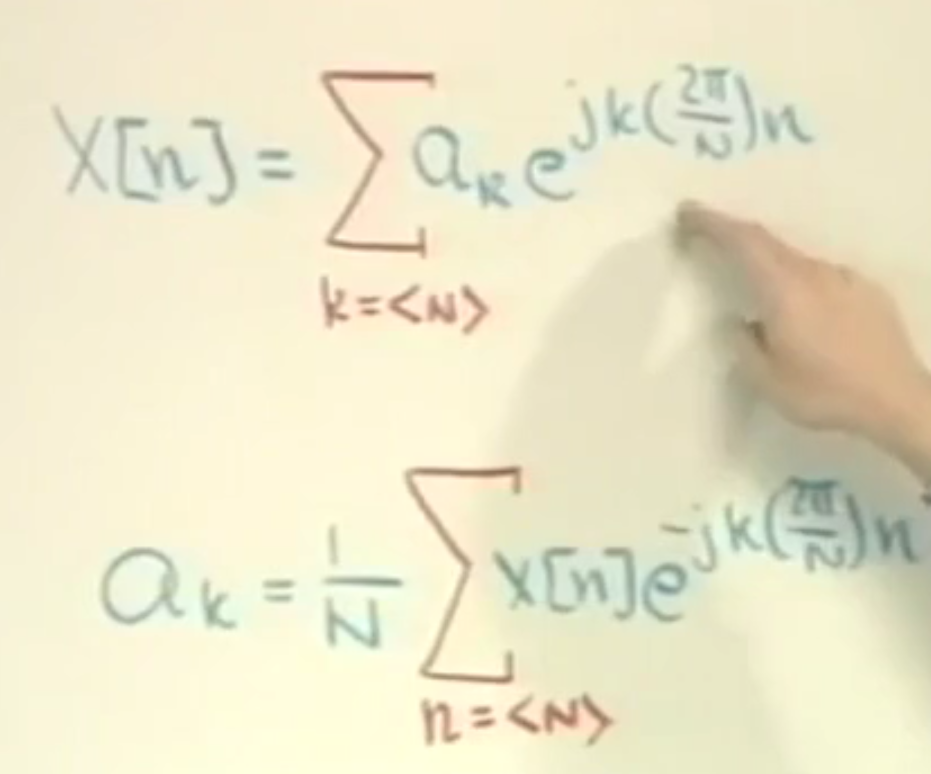


下图，illustrate if we have a fixed low pass filter, how to use it as a high pass filter.

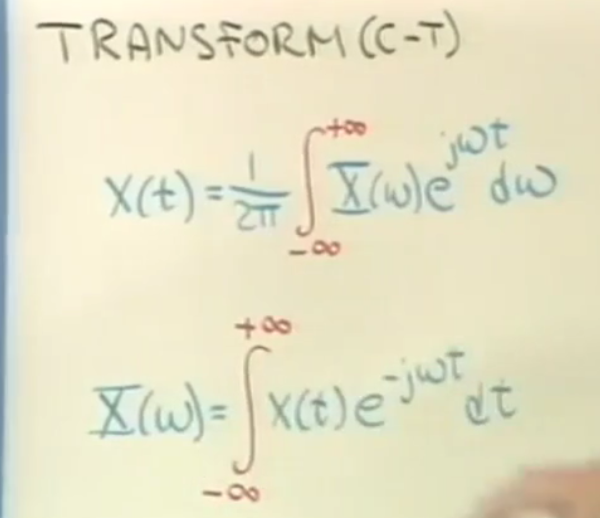
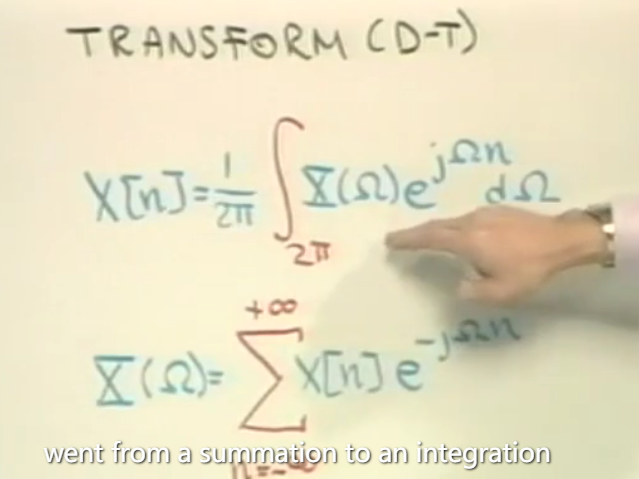


各种变换的总结

X(t)周期,无对偶 x[n]周期 对偶

X(t)和X(w)非周期，对偶 x[n] 非周期无对偶

对偶还有重要的一点

图1中的x(t)是连续周期函数,而ak是非周期序列

图3,x[n]是非周期的,x(omage)是连续周期的

从中观察 可以看到ak和x[n]是有duality的