ECEN313-ECE231: Signals and Systems

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Package Loading

Some functions are not built in Octave, in order to use them they have to be imported or loaded. Such functions are defined within the package name which can be loaded by the instruction

>pkg load **package_name**

One of the functions we are going to use in this lab is the triangular function name tri(t) which is defined as,

$$\mathrm{tri}(t) = \begin{cases} 1 - |t| & |t| \leq 1 \\ 0 & |t| > 1 \end{cases}$$

> pkg load signal   %load the package named signal

Convolution

Convolution is achieved using the discrete time convolution function conv(x,y). if the length of the vectors x and y are respectively, nx and ny, then the conv(x,y) vector will have length nx+ny. If we assume our time reference is 0 then the vector y=conv(x,y) will start from 0 till index nx+ny-1.

Convolution of the continuous time signal is treated as an approximation of the integral:

$$y(t) = \int_{-\infty}^{\infty} x(\tau)h(t-\tau)d\tau$$

$$y[n] = y(nT) \approx T \sum_{k=-\infty}^{\infty} x(kT)h(nT-kT)$$

$$y[n] = T \sum_{k=-\infty}^{\infty} x[k]h[n-k] = Tx[n] * y[n]$$

So, the output y[n] is the sampled continuous y(t) at nT where T is the sample interval, and the convolution x[n]*y[n] is the discrete convolution.

Example 1

Let x[n]=u[n-1]-u[n-6] and h[n]=tri($\frac{n-6}{4}$)

a- Plot in the 1^{st} graph of figure 1 x[n].
b- Plot in the 2^{nd} graph of figure 1 h[n].
c- Plot in the 3^{rd} graph of figure 1 y[n].
   Use range: nx=[-2:8], nh=[0:12], and ny= [nx(1)+nh(1):nx(end)+nh(end)]'
   Hint: use tringularPulse in matlab which is named **tripuls()** in the package signal. To import a package in Octave use:
   pkg load **package_name**
   For our case the package name is **signal**.

Example 2

Consider the following input with its response:

x(t)=tri(n.ts)

h(t)=tri(n.ts)

a- Plot y(t)=x(t)*h(t)
   Use range: nx=[-100:99]', nh=nx, ny= [nx(1)+nh(1):nx(end)+nh(end)]'
   ts=0.01