Lec01 : Introduction

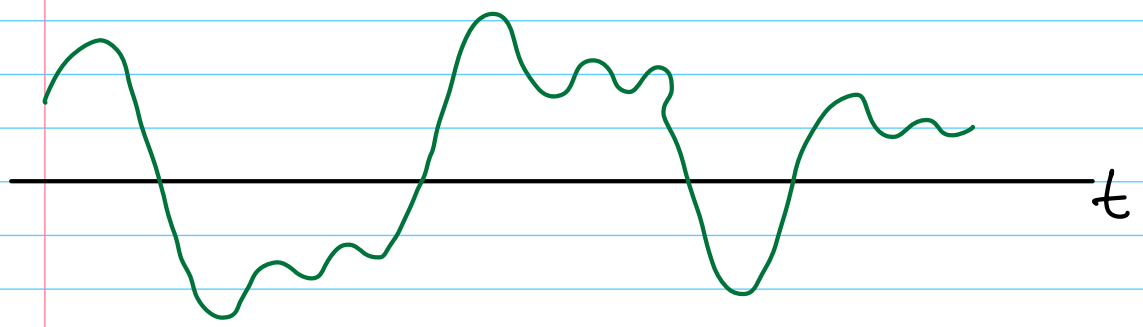
Signal's, an informal definition, are function's of one or more independent variable. Typically carry some kind of information's.

System's in our setting would typically be used to process signal's.

Ex: Speech signal (Air pressure as function of time)

Continuous Time signal (one dimentional)

$x(t)$:- signal, function of time



Signal's can ofcourse multi dimentional

and they may or may not have independent variable's.

EX: Image's, Signal's we can think of as brightness (horizontal, vertical)

two dimentional signal.

⇒ The independent variable's would typically be continuous, but not time variable's

* Simply for convenience, we will have a tendency to refer to the independent variable when we talk about signal's as time variables, whether or not they really do Represent time.

J.B.J Fourier, Perhaps more than anyone else, is responsible for the elegance & Beauty of lot of concepts.

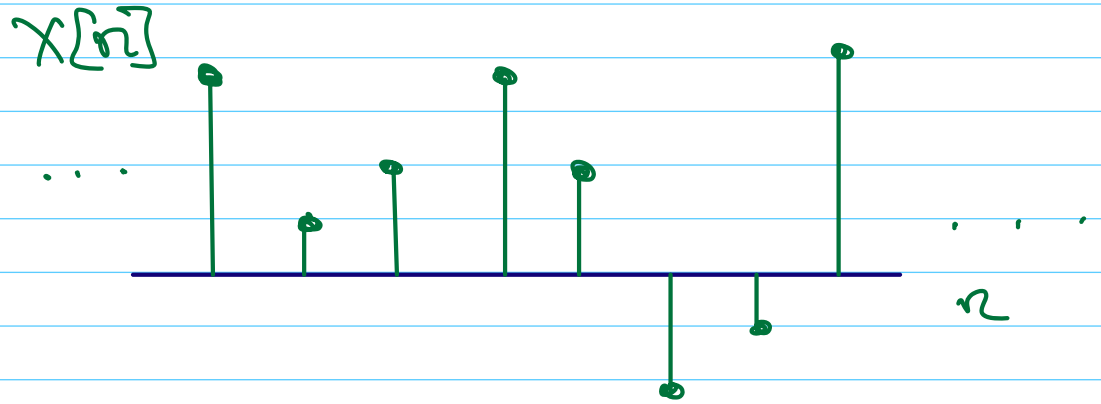
⇓

Image is a signal as a function of Brightness with horizontal & vertical Spatial variable's.

* our focus is restricted to 1-D signal's. we will use 2-D signal's especially images very often to illustrate variety of concept's

⇒ Speech, Images are Continuous Time signal's, because they are function's of continuous variable's

Discrete – Time



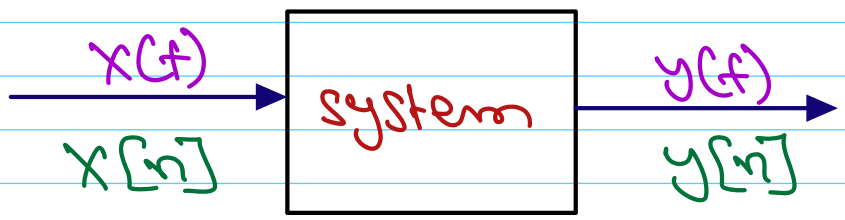
in Discrete time the signal is a function of an integer variable

Ex: Economic time series, Stock market analysis.

Multi Dimensional Discrete-time-Signal

$x[n, m]$ function of two integer variable.

System's Basically Processes the signal



in general term's, system's are very hard to deal with because they are defined very Broadly & generally, and dealing with system's and analyzing them, what we will do is an attempt to exploit some very specific, and see useful system Properties

System's

Linear , time-invariant

NON-Linear , time-varying

focus will be on Linear, time-invariant system's.

* Brief glimpse of some of the kind of thing's system's can do

Interconnection's of System's

1. Series
2. Parallel
3. feed BACK interconnection's

(very interesting Important & useful Major topic at the end of the course.

⇒ in a situation where we have Basically unstable system, feed BACK is often used to Stabilize the system.

* there are several domain's, two in Particular that we will find convenient for the analysis and representation of signal's and System's

1. Time Domain

$x(t)$

$x[n]$

② Frequency domain

Fourier transform

Laplace transform

Z- Transform (discrete time counter part of Laplace)

Ex: A note being played

① time domain representation would be how the sound pressure in function of time.

② freq domain representation would be correspond to the representation of freq content of the note.