Lecture - 02

Saturday, 27 November 2021 8:27 AM

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Lecture 02

Network, Signals & Systems

Introduction (Lecture 2)

NeSS - Monsoon 2021

Information carrying entities

Study of Signals in NeSS

Q. How to represent signals ?

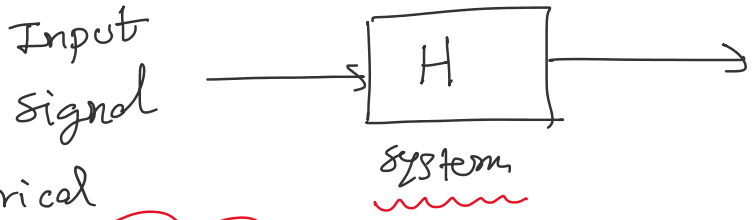
$f(t) \longleftrightarrow$

★ Expressing signals using some basic signals.

we study various system representations

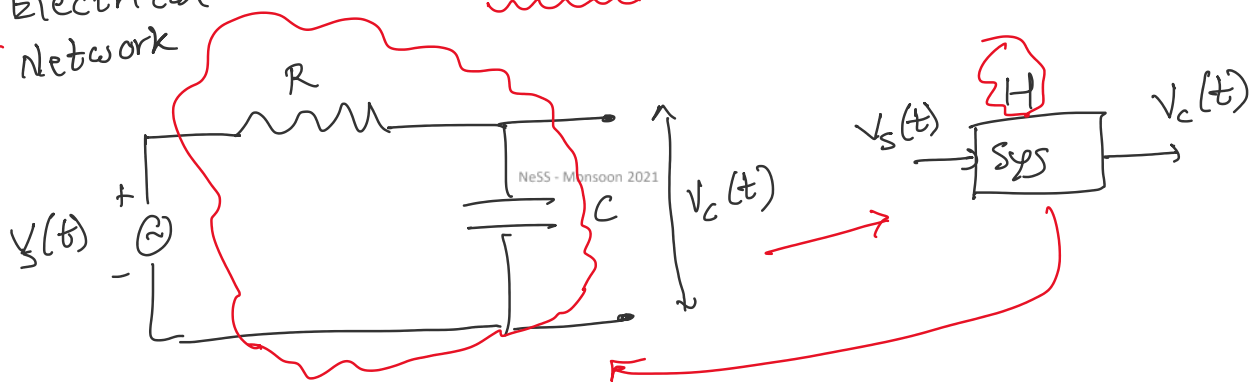
Study of Systems in NeSS

Entities which process signals.



Black Box system representation

Ex. Electrical Network



Scope of NeSS (continued…)

- Linear systems
  - Modeling – analysis – design paradigm
- Role of mathematics
- Generality of ECE subjects
  - Signals & Systems example – CD & CD player

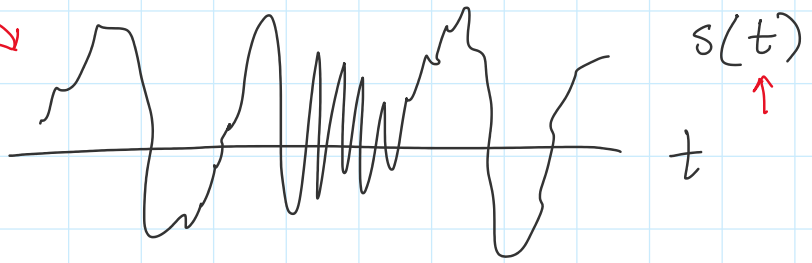
* signals stored in CD
* system CD player — convert signals in CD into audio waves

Signals

- Independent vs dependent variable
- Classification of signals
- Sinusoids
- Fourier series representation
- Complex numbers overview – tutorial?

Ex. audio signal (1D signal)

(1) signal : $y(t) = s(t)$

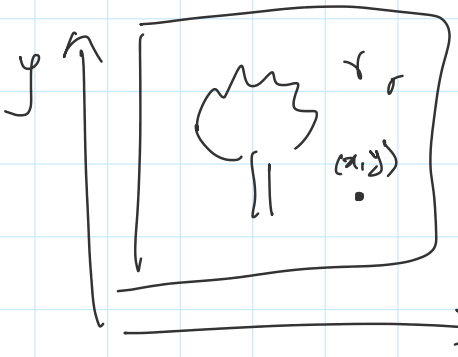


Two channels
$s_L(t)$ & $s_R(t)$

time - independent variable
$s(t)$ - dependent variable.

(2) Ex. Image.

Color image – 3 channels



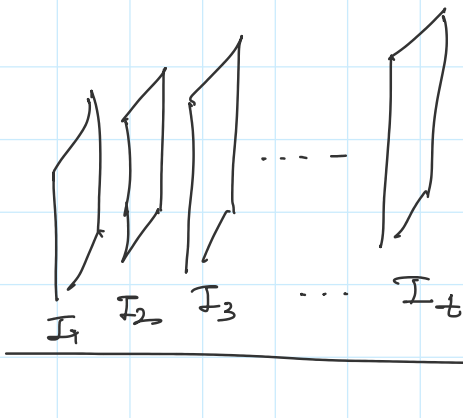
$I(x,y)$

2D signal.

(3) Ex. Video

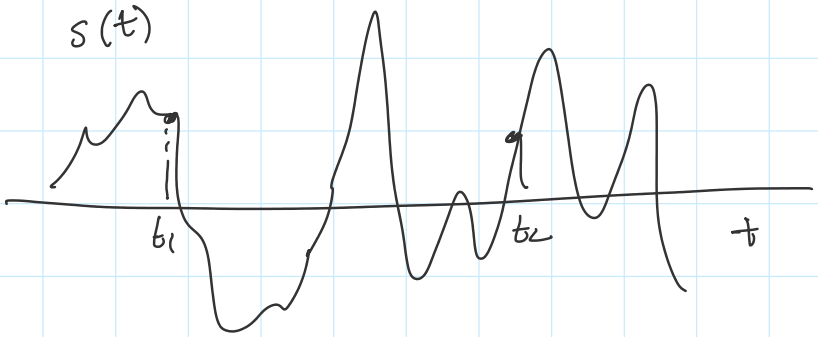
$t_1 \rightarrow I_1$

$t_2 \rightarrow I_2$



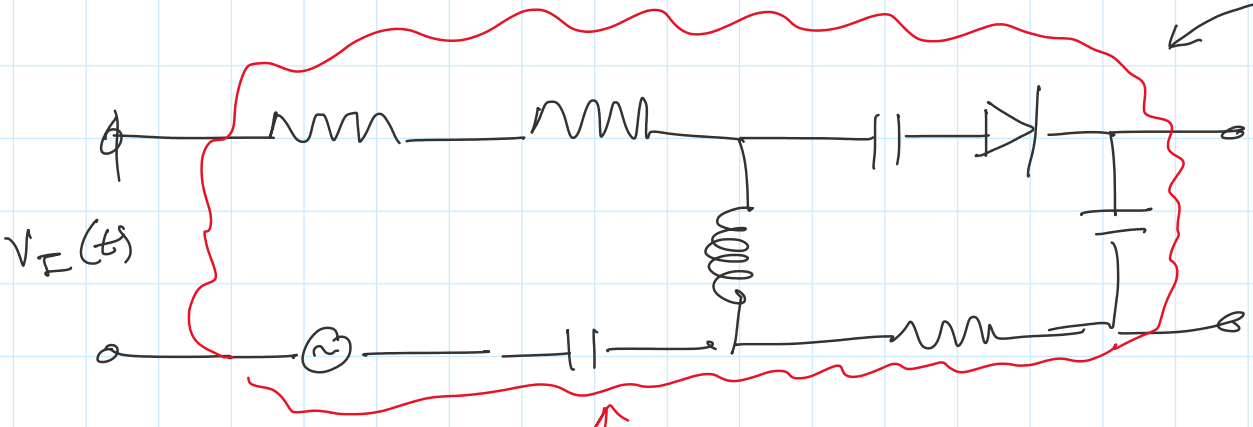
$V(t,x,y)$

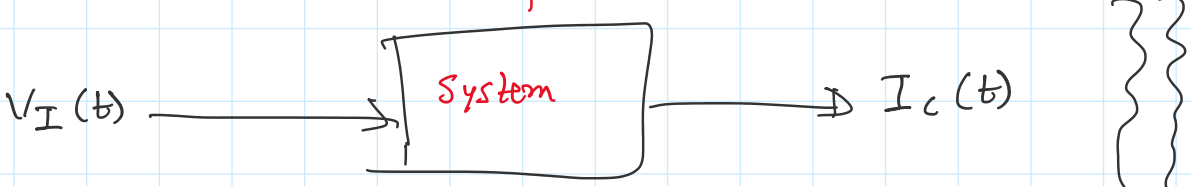
3D signal.

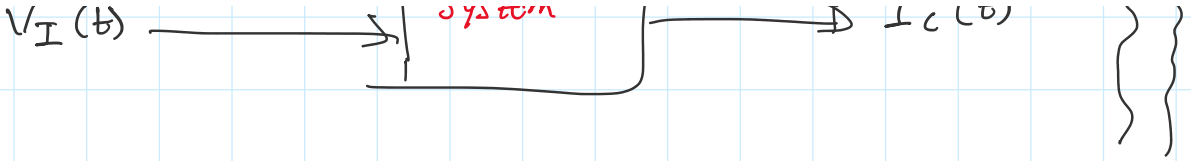


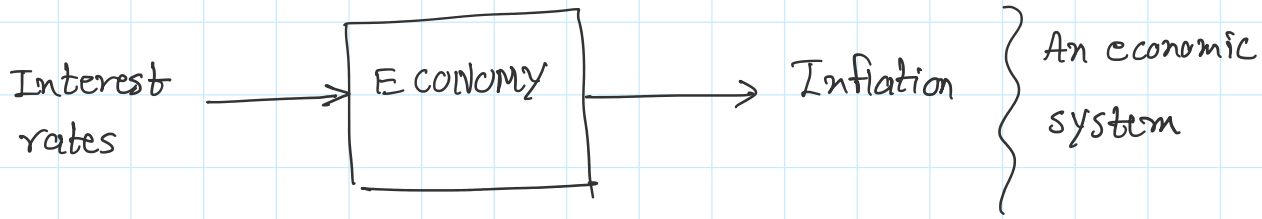
$p(t_1,t_2) = s(t_1)s(t_2)$

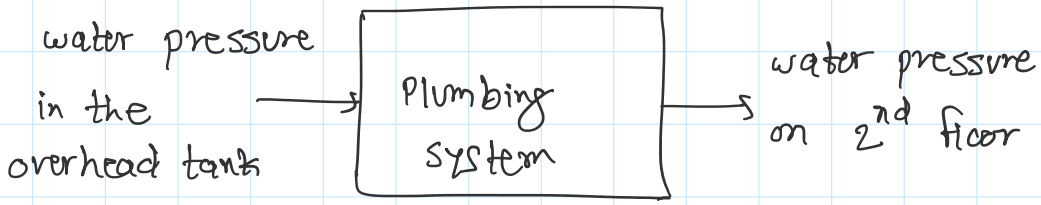
Electrical Network Example






$V_I(t)$
System
$I_C(t)$


Interest rates
ECONOMY
Inflation
An economic system


water pressure in the overhead tank
Plumbing system
water pressure on 2nd floor