# SIGNAL RECOVERY: Sensors, Signals, Noise and

# **Information Recovery**

http://home.deib.polimi.it/cova/



SSN - Objectives

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## GOALS

- We deal with electronic techniques for recovering sensor signals from noise
  - Main goal :

#### not just to know and properly describe techniques and instruments

but rather

to gain a good insight in the problems and in the approaches developed.

- Shun the approach where sensors and electronics are designed and employed just following recognized rules and standard procedures
- We wish to evaluate the solutions and understand the reasons of choices and decisions, critically highlighted by

a) the physics of phenomena involved

b) the principles of signal and noise processing

c) the actual performance of the available devices.



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# GOALS

- We have to clearly distinguish intrinsic limitations and contingent limitations: intrinsic limitations are set by laws of nature and cannot be overcome contingent limitations are due to the state of the art and can be overcome by the technological progress.
- Be aware that **different technological implementations** may rely on the **same idea** and that the **evolution in technology** unceasingly stimulates **new ideas**
- To gain insight means to move at the pace of progress in science and technology and be able to contribute to it.



### FORMALISM AND INSIGHT

In a Math class, the Professor showed that:

$$\lim_{x \to 8} \frac{1}{x - 8} \to \infty$$

Then he picked a student that followed with attention and asked

$$\lim_{x \to 5} \frac{1}{x-5} \to ?$$

and the answer was

$$\lim_{x \to 5} \frac{1}{x-5} \to \mathbf{n}$$

Well, this is just a joke, not observed in reality ...

... but examples similar to this occur in real courses !



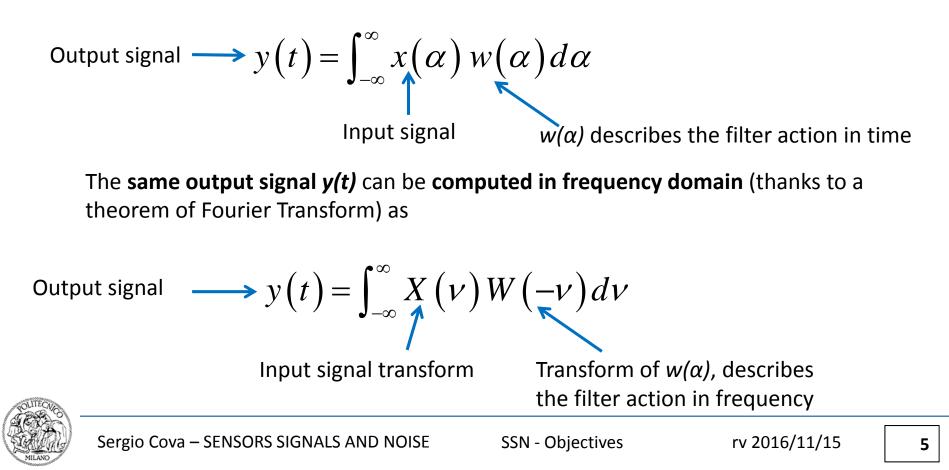
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### FORMALISM AND INSIGHT

Examples in real cases are not infrequent, let us report just one:

#### **1. WHAT WAS EXPLAINED**

The output **signal y**(**t**) of a filter at time t can be **computed in time domain as** 



### FORMALISM AND INSIGHT

#### 2. WHAT SOMEONE MEMORIZED

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In the time domain it is
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