



# Introduction to sensing technology

**Notes about sensing in  
mechatronics systems**

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## 1 Objectives

2. Basic concepts
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**This lecture is focused on**

Role of sensors to perceive the environment

Common functional parts and applications of sensor modules

Relevant sensors included in GEMS project prototype

**This lecture is not focused on**

Physical or chemical nature of sensors

Fabrication process of sensors

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# Basic concepts (I)

## Relevance of senses in human beings

Do you remember the Blind man's bluff game ?

### Senses

- allow to perceive and interact with world.
- are vital for human perception and cognition.

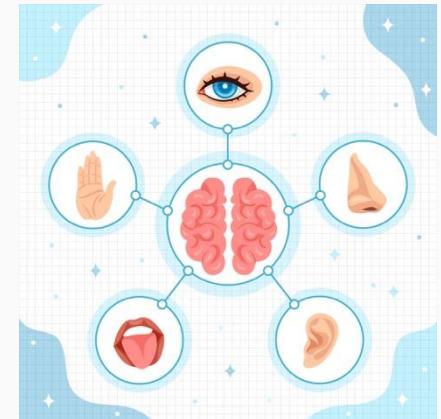


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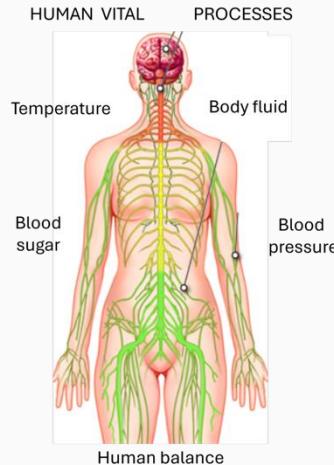
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# Basic concepts (II)

Living beings: reference for robotics

Human beings self-regulate vital processes through  
internal sensors

Robotics try to imitate biological sensor systems



Work by Cenveo



# **Basic concepts (III)**

## **Definition**

Sensor: device that helps to detect any change in a physical quantity

Activities: observe, process and present

## **A sensor should**

Be sensitive to the main measured property but insensitive to others

Not influence on the property it is measuring

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# Sensor classification (I)

## **Proprioceptive vs exteroceptive**

Proprioceptive: measures variables internal to the system

Exteroceptive: measures variables external to the system

## **Active vs passive**

Active: emits energy and measures its response

Passive: detects natural phenomena without emitting energy

# Sensor classification (II)

## Analog vs digital

Analog: produces continuous time and level signals

Digital: produces discrete time and level signals

# Sensors in mechatronic

Sensors allow robots and mechatronics  
to perceive and interact with the world  
in a natural and intuitive way.



# Examples of sensors devices and modules



# GEMS sensors



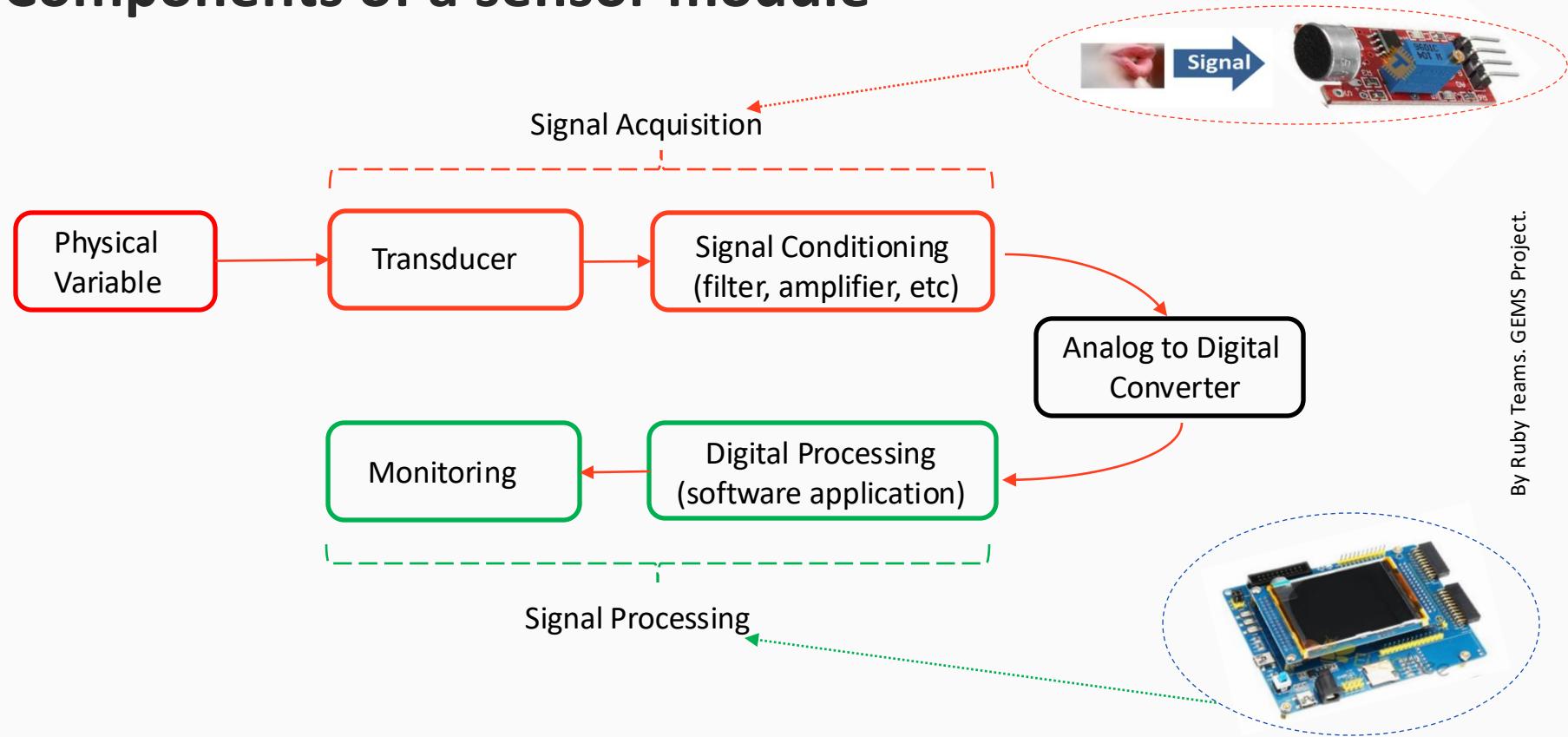
GEMS prototype

Card	Variable Sensed	Device
Ruby	<ul style="list-style-type: none"><li>- Sound (microphone device)</li></ul>	ABM-713-RC  <a href="#">[Ref]</a>
Diamond	<ul style="list-style-type: none"><li>- Distance (ultrasonic board)</li></ul>	HC-SR04  <a href="#">[Ref]</a>

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# Components of a sensor module



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# Sensor module applications: monitoring

Personal wearables



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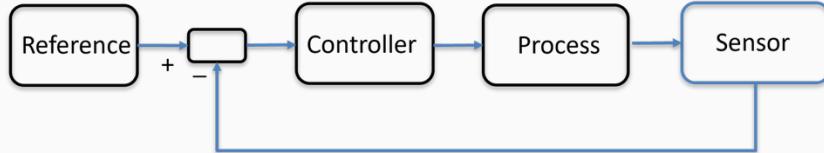
Maintenance tasks



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# Sensor module applications: automatic control

Key parts of feedback control systems



By Ruby Teams. GEMS Project.

Examples of sensors in cars

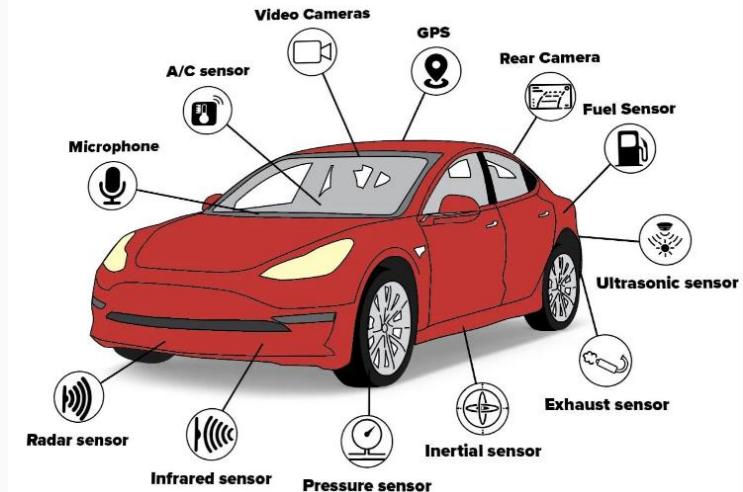


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# Conclusions

- Sensors are to mechatronics as senses are to human body.
- A sensor module integrates electronic subsystems:  
signal acquisition and signal processing.
- Sensor applications: monitoring and control.
- GEMS prototype includes sound and distance sensors.

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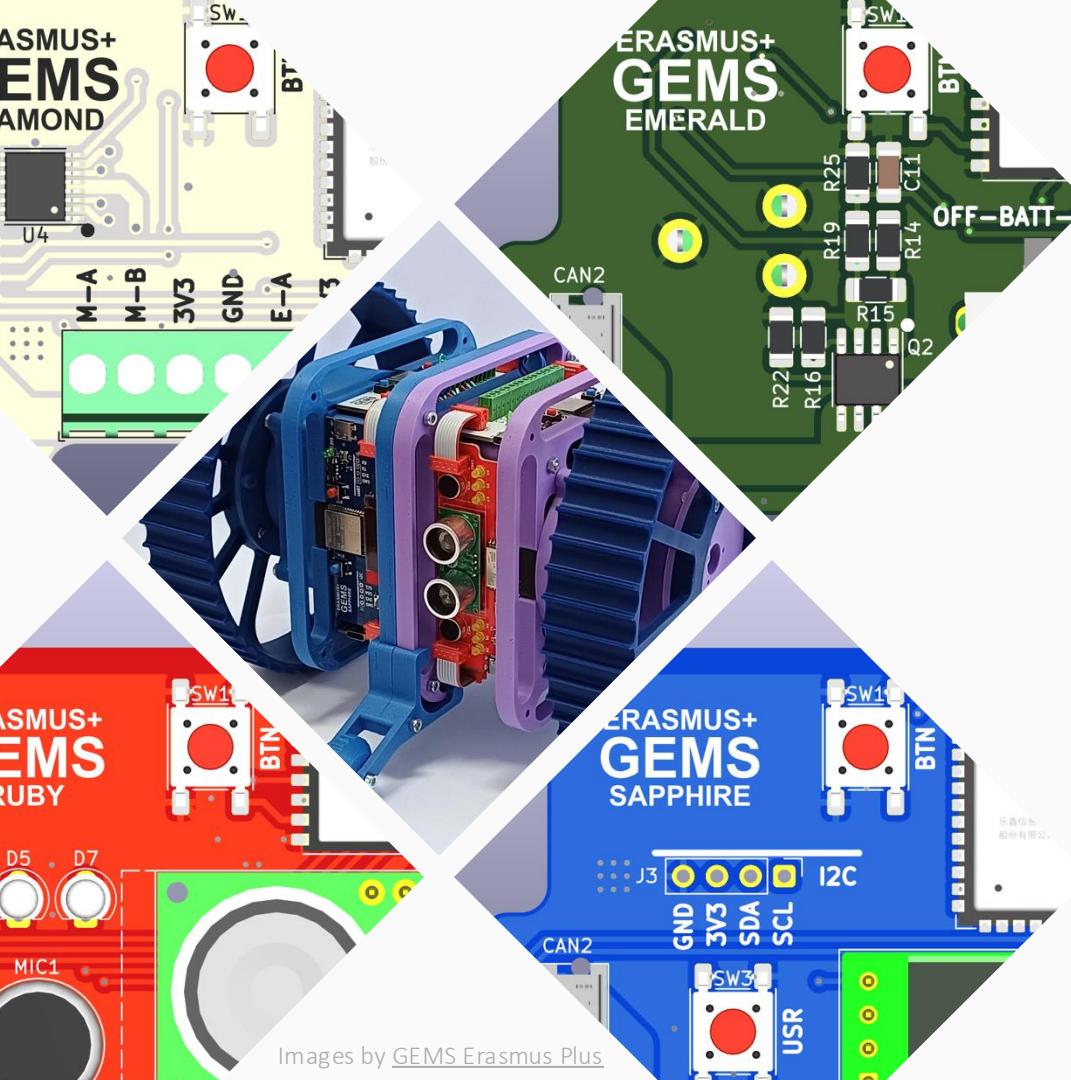
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