

DYNAMICS and CONTROL

MODULE I Systems and Signals Examples

Presented by

Pedro Albertos

Professor of Systems Engineering and Control - UPV



Modules:

- Examples of systems and signals
 - Dynamic systems
 - Feedback
- Models of systems and signals
- Controlled systems: properties
- Control systems design
- Control benefits
- Topics to study

System Dynamics

- It means history
- The present behavior depends on the past actions
- Not necessarily implies movement

Control

- Select the actions to get a desired behavior
- Design a controller to generate these actions
- Tune the controller properties if there are changes

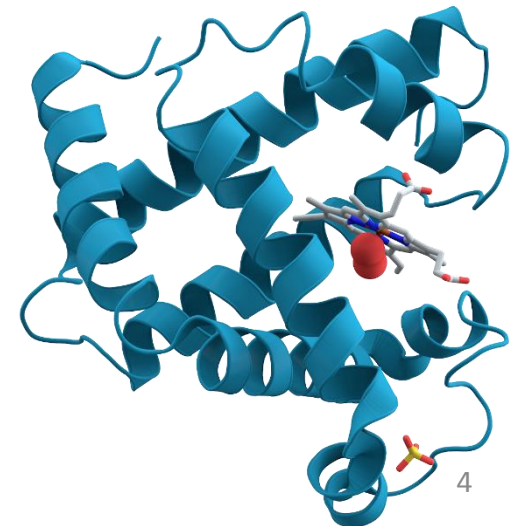
Control appears in 99% of the industrial applications



But also in Nature ...



and life!



Control is everywhere

- *Try to get up*
- *Try to touch your nose*
- *Catch an object*
- *Keep a pen in your finger*

... and feedback is the key!

- *Natural systems*
- *Artificial systems*
- *Combined systems*

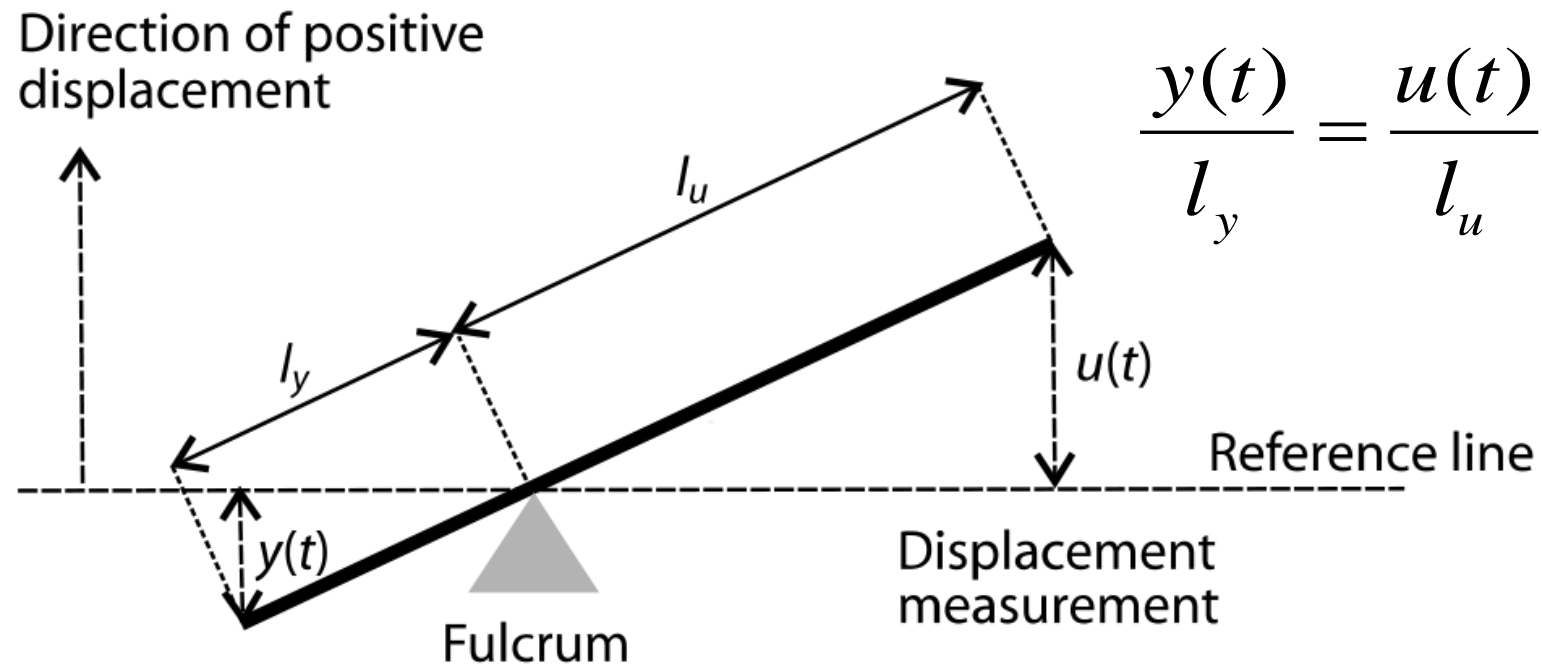
... EVERYWHERE!!!

Dynamic System

- A system is composed by components
- The information flows among them ...
and in connexion to the environment.

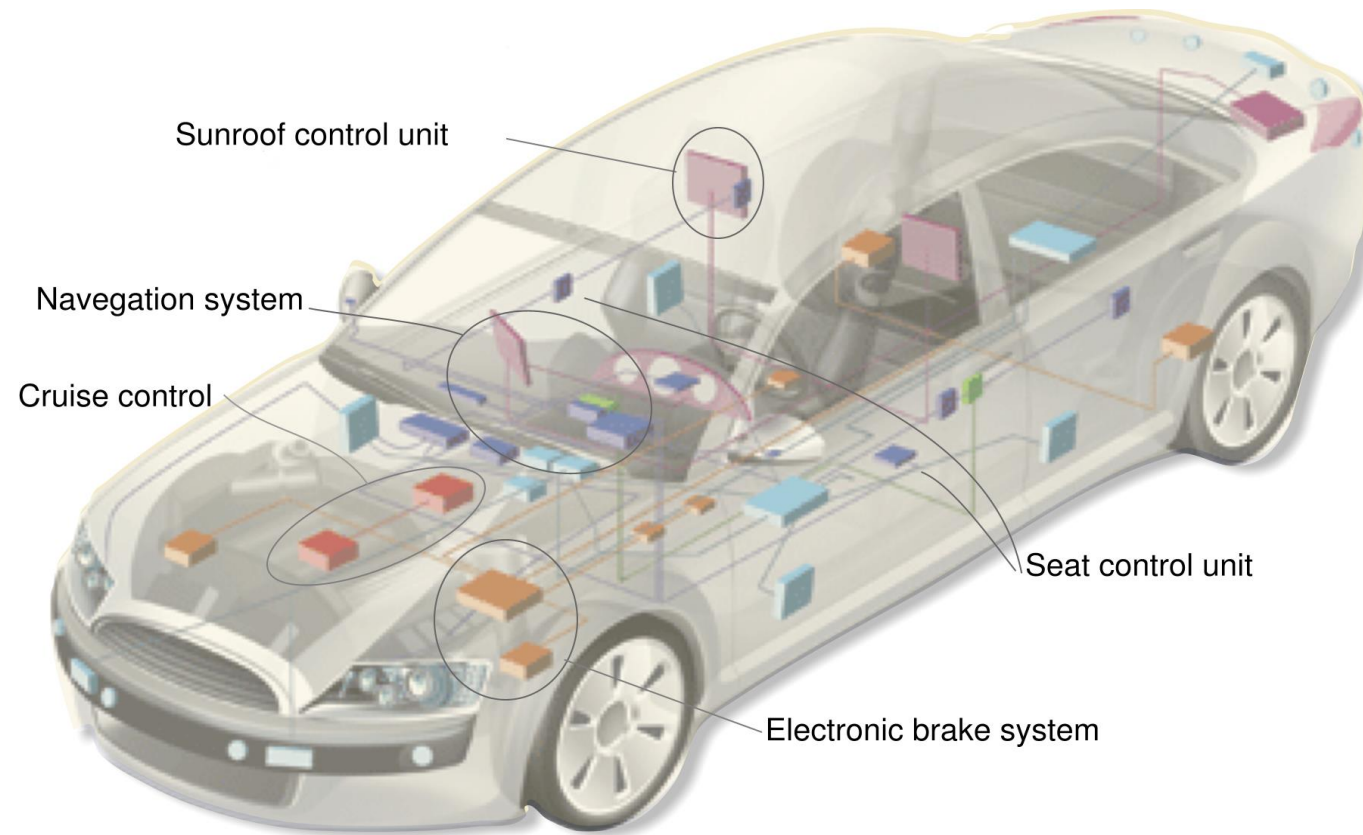
Consider a balance

Balance



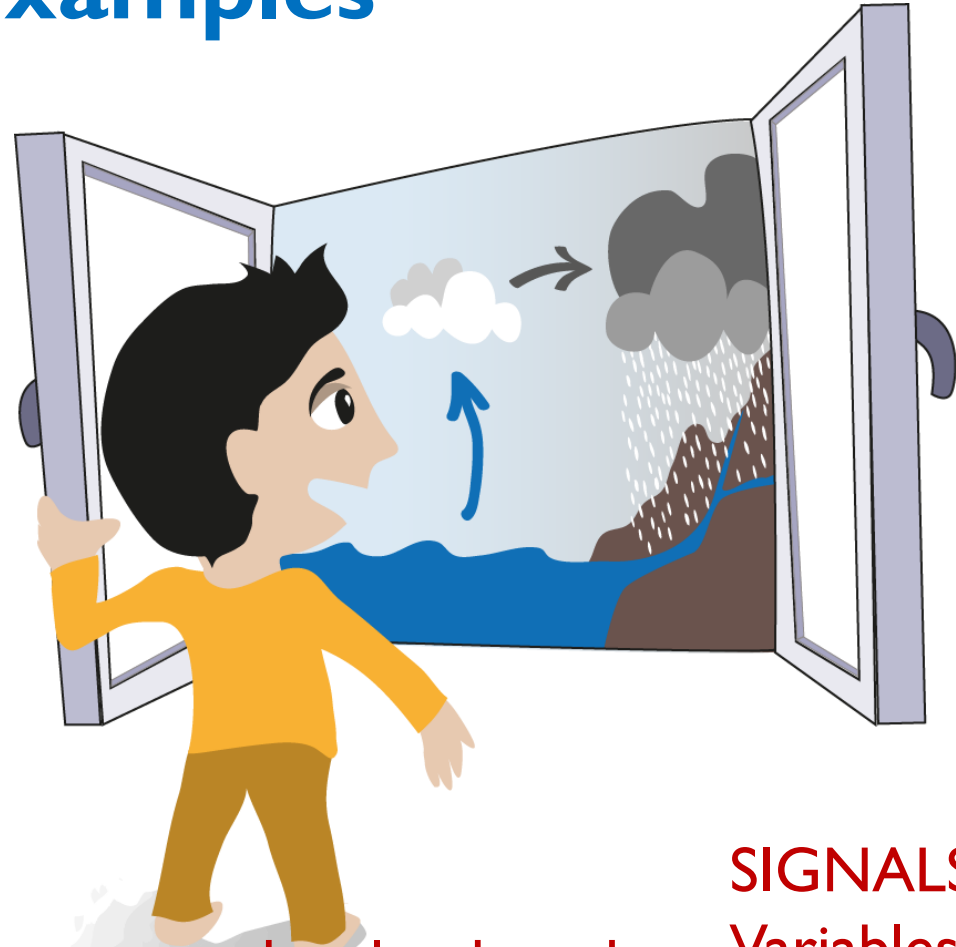
The system is static (even it can be moving)

Consider a running car



It is a dynamic system (the current position and speed depend on the past)

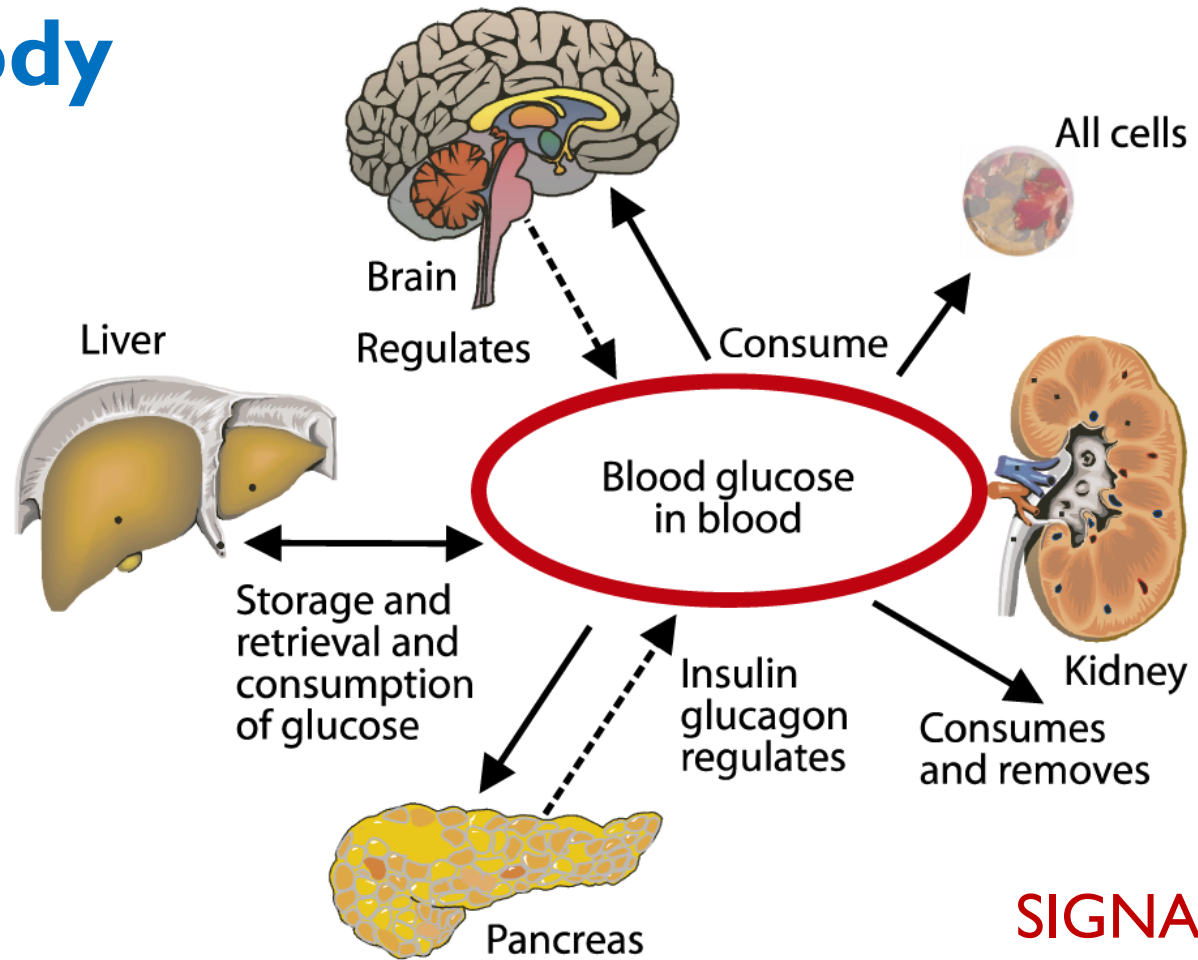
Let's see some examples in Nature



The water cycle from the sea to the clouds and then to the earth, to rivers and then to the sea

SIGNALS?
Variables?

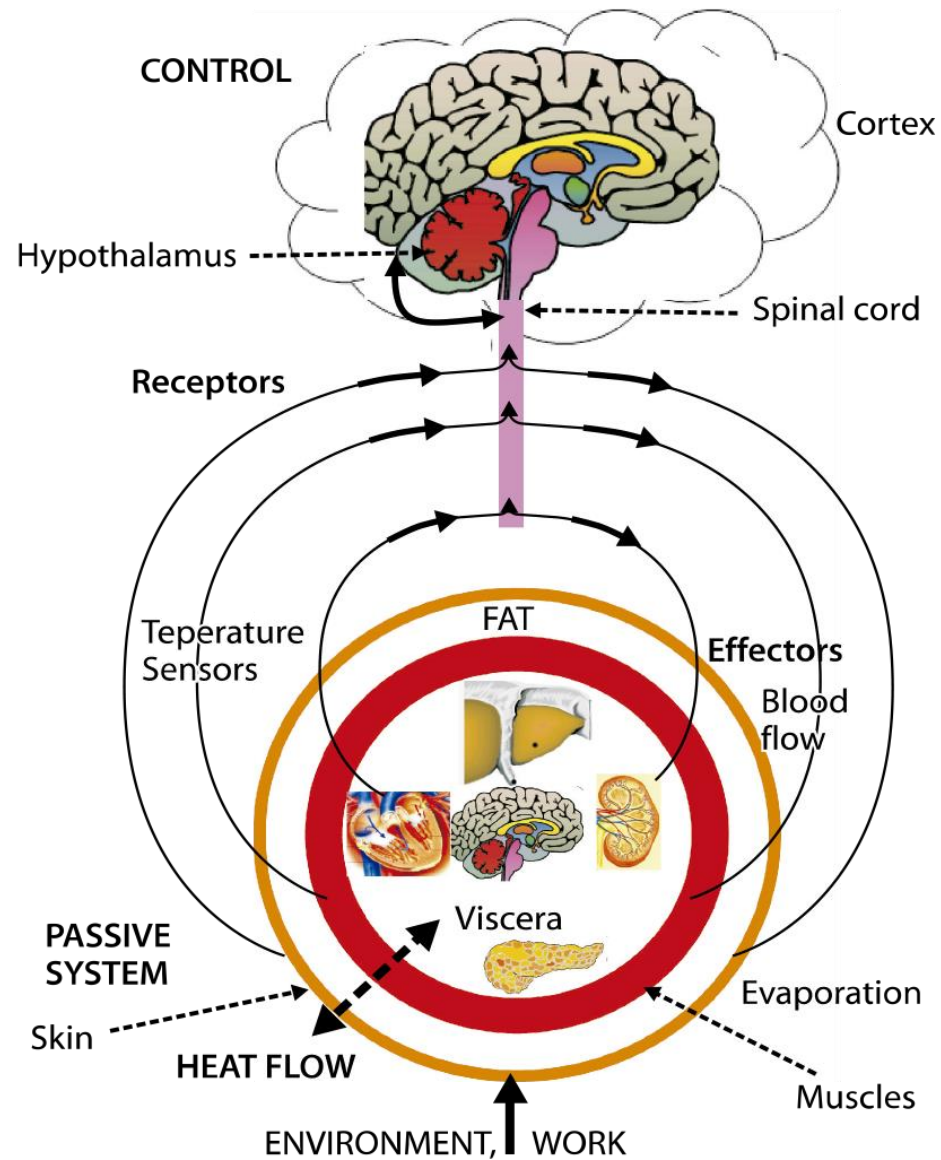
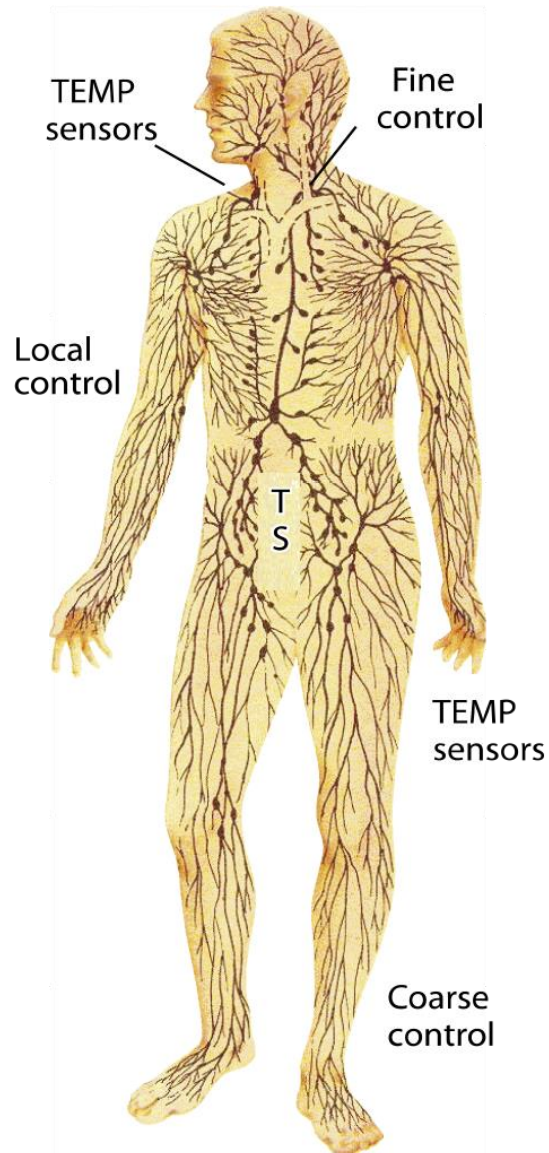
Human body



Glucose regulation in blood

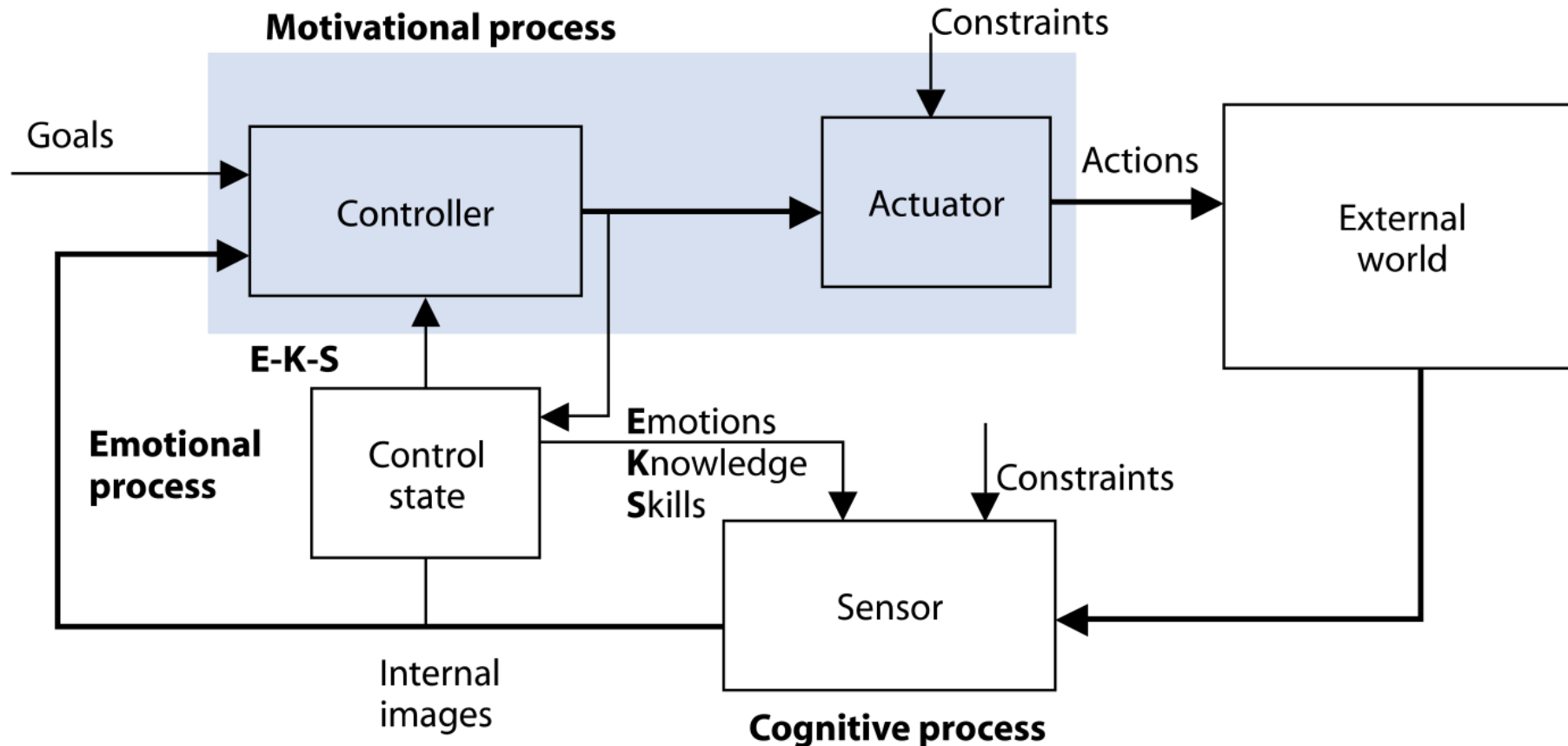
SIGNALS?
Variables?

DYNAMICS & CONTROL



SIGNALS?
Variables?

Psychological Processes



**SIGNALS?
Variables?**

Feedback in Social Systems

- We act to achieve some goals
- We are expecting to see the external reaction
- Most actions are “reactive”

**Life, without feedback
would be very boring!!**

What have we seen today?

Systems in Nature

- *Where can be find them and study.*
- *Which are the attached variables.*

What is next?

- Examples of Systems and Signals
 - Artificial systems
 - Components
 - Goals
 - Benefits

Thank you!

The sources of some of these figures are :

- Slide3-1 http://commons.wikimedia.org/wiki/File%3ANIST_Industrial_Control_Security_Testbed.jpg By National Institute of Standards and Technology's Manufacturing Engineering [Public domain], via Wikimedia Commons
- Slide3-2 http://commons.wikimedia.org/wiki/File%3AIndustrial_robot.jpg Por Jo Teichmann, Augsburg, Germany (KUKA Roboter GmbH) [Public domain], undefined
- Slide3-3 <http://www.flickr.com/photos/32454422@N00/659752947> 'Vee flight, pelicans flying in formation, Oxnard,+CA'