



Sensor and Actuator

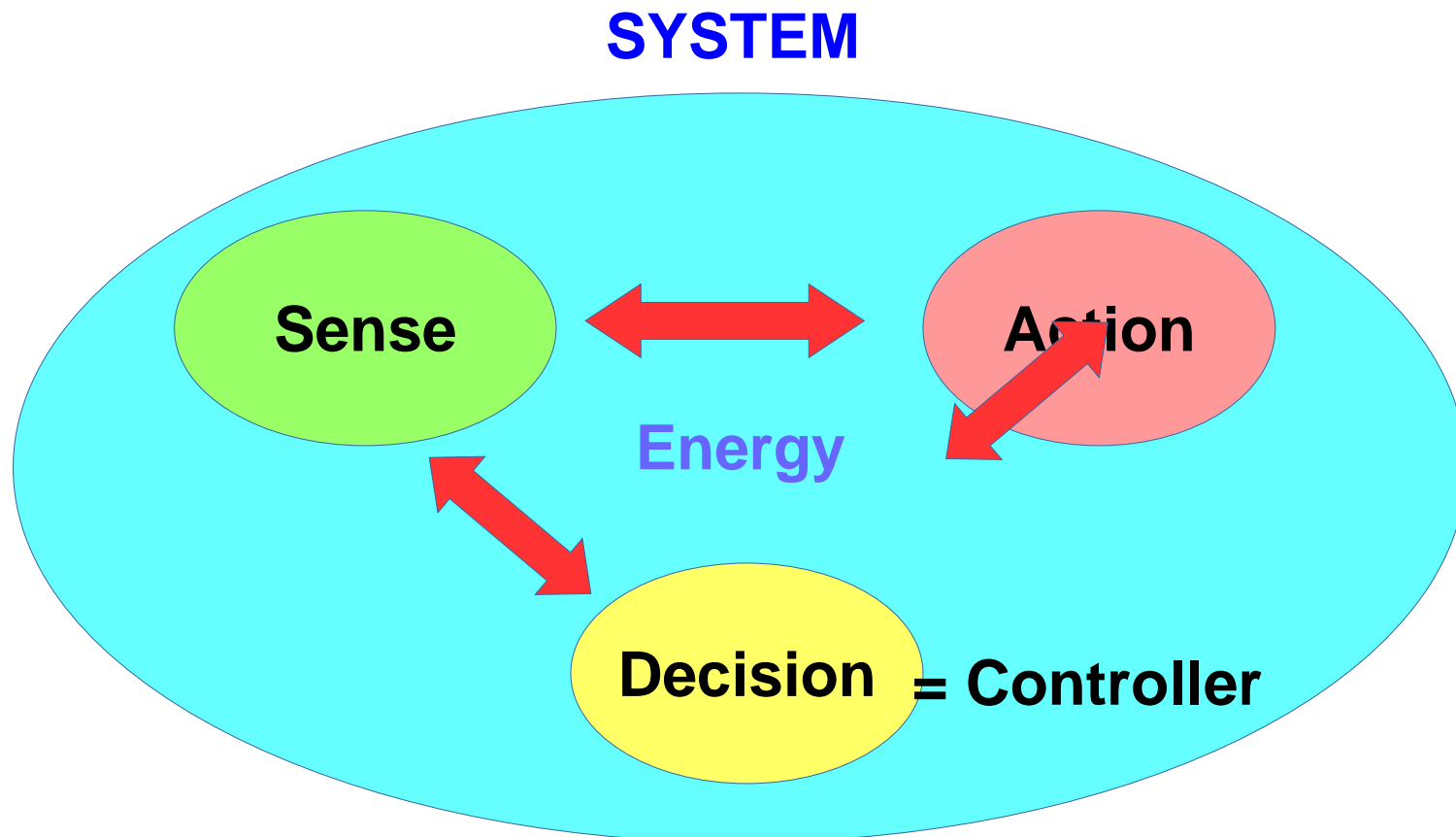
Presented by Putapon Pengpad, Thai Microelectronic Center

- Know Sensor and Actuator
- Why do we need them?
- Learn how to use them

Definition

.Sensor = Sense

.Actuator = Action





Examples of system in nature

.Human and animal

- .Sensor : 5 senses
- .Actuator : muscles
- .Controller : brain/spine
- .Energy : food

.Plant eg. sunflower

- .Sensor : flower
- .Actuator : stem
- .Controller : cell organism
- .Energy : sun light



Examples of manmade system

- Combusion engine (manual control)

- Sensor : Tachometer

- Actuator : cylinders and other moving parts

- Controller : driver (human)

- Energy : fuel

- Washing machine (automate control)

- Sensor : water level sensor

- Actuator : solenoid valve

- Controller : relay circuit with logic gate IC

- Energy : electricity (DC current)

History of making(1)

.Oldest system can be trace back to a stone age

.Hunting trap eg. Deadfall trap



Sensor : stigs

Actuator : rock

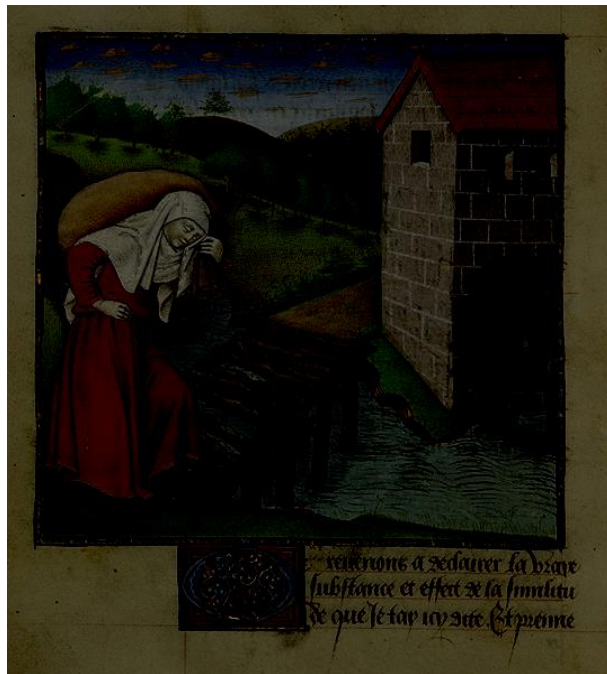
Controller : prey (animal)

Energy : gravity (potential energy)

Full automate control!

History of making(2)

- .Date back to medieval time to dark age
- .We had water wheel, wind mill as actuator
- .We also had telescope as a sensor invented by Galileo.

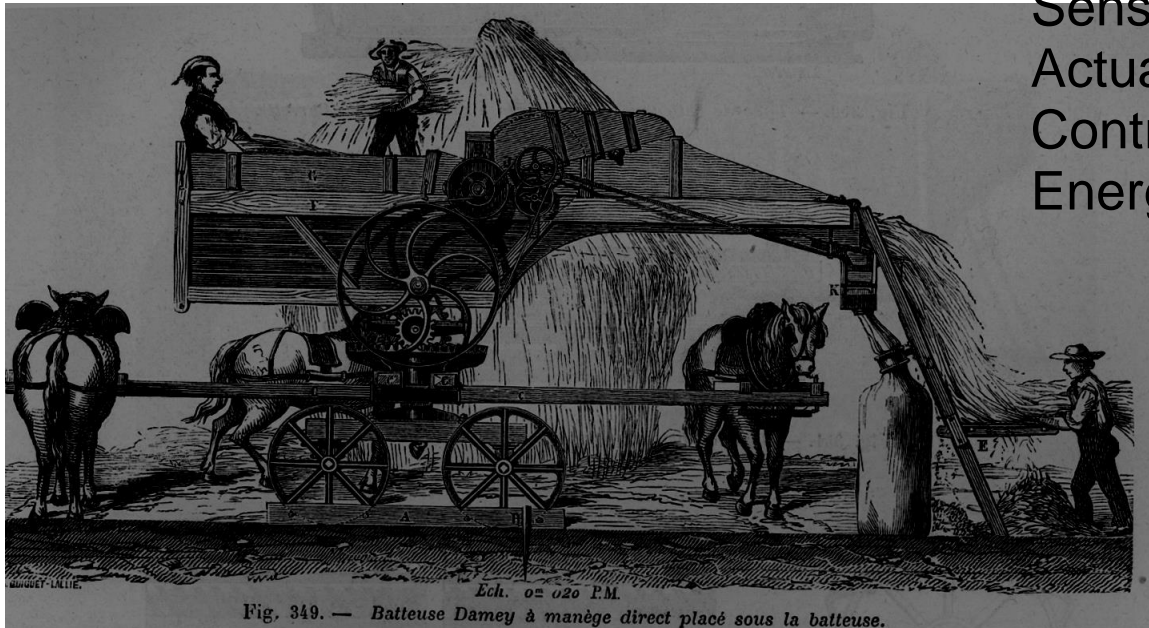


Sensor : none
Actuator : wheel
Controller : none
Energy : gravity (potential energy)

**Infinite machine &
Free energy!**

History of making(3)

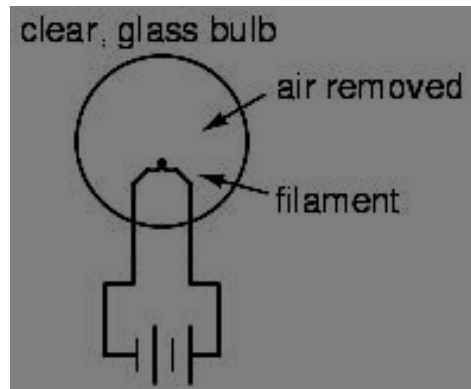
- .During period of agricultural revolution to industrial revolution
- .Manmade machine dominated but had to be controlled by man
- .we had : Electricity, Telegraph, Telephone, Electric motor



Sensor : none
Actuator : wheel and gear
Controller : human
Energy : animal labour/stream/fuel

History of making(4)

- From the first light bulb by Edison to first integrate circuit at Texas Instrument automate system was still limited use and exclusive
- We had Sonar, Radar system, military machines and first computer "Eniac"



First light bulb (1898)



First IC (1958)

History of making(5)

.Automate System Era started after IC industrial was climbing up the s curve (last five decades)

.We have

- .Personal computer/micro controller

- .Software/Programming language

- .Solid-state sensor

- .Servo motor and many type of actuator

They are available for everyone!

History of making(6)

- .Advance fields of invention emerge:
 - .Artificial intelligence (AI)
 - .Virtual reality (VR)
 - .Augmented reality (AR)
 - .Cloud computing
 - .Internet of things (IoT)
- .All for making of **Ultimate Automate Machine!**
- .and it needs a load of **Sensor and Actuator!**

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How to build a system(1)

- .Base on electronic sensor and actuator system
- .for example you need
 - .Electronic sensor : **accelerometer/gyrometer**
 - .Actuator : **digital display (My notebook)**
 - .Controller : **Microcontroller module (Arduino)**

How to build a system(2)

- Design and build your action fist
 - use accelerometer to control a pixel dot on laptop screen and draw something
 - Need to write a display program (Processing)
 - Need to establish communicate between laptop and controller board (Arduino)
 - Check for a good communication (make Arduino to send some known information)



How to build a system(3)

- .Connect sensor to controller
 - .Follow sensor module specsheet
 - .Make sure sensor do thing as expect
- .Filnally

Enjoy the result!



The Future?

.It is on your

- **Imagination**

Invention

Creativity

Software + Hardware working in harmony