ROBOTICS FOR TEENS

ROOKIE | 0X04-ROBOT

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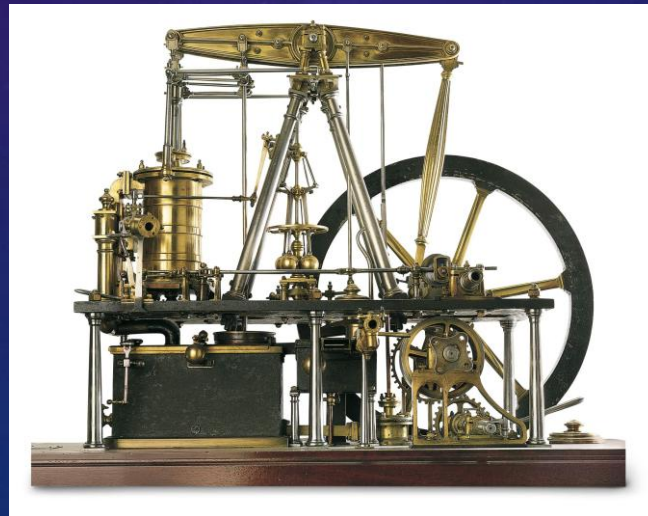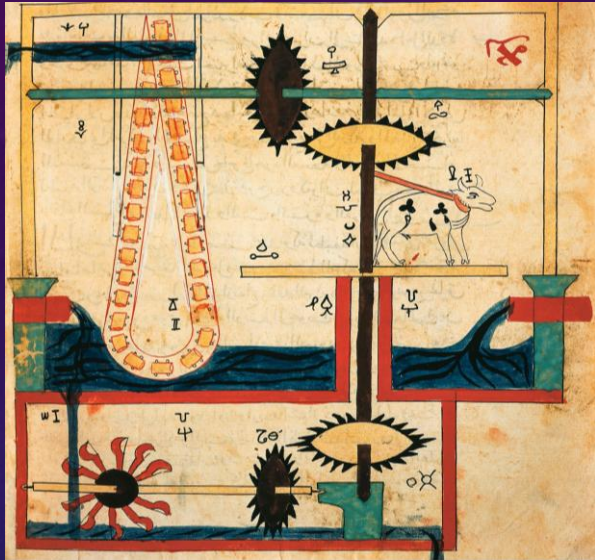- **Microcontrollers**

🤖 WHAT IS ROBOT

- **Definition:**

    - **Robot + ics**

    - **A robot is a machine capable of carrying out a complex series of actions automatically.**

    - **It may be controlled by a computer or follow pre-programmed instructions.**

    - **Robots can <u>sense</u>, <u>decide</u> and <u>act</u>.**
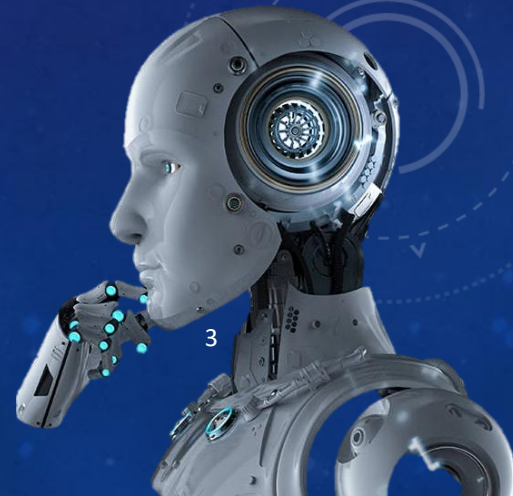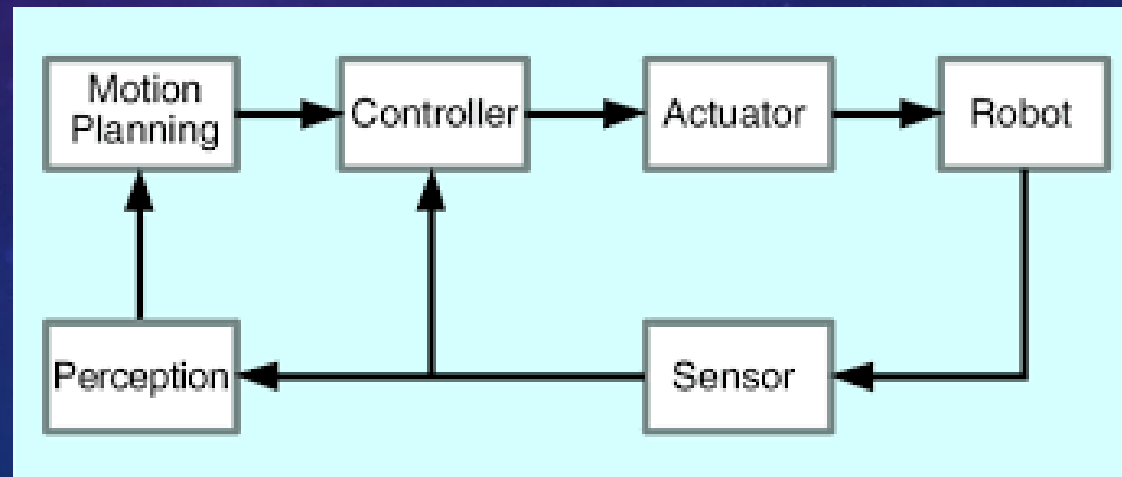
HISTORY QUICK RECAP

- **Ancient myths and automata (Greek and Chinese)**

- **Muslim inventor Al-Jazari's machine**

- **Industrial revolution => Mechanical Automation**

- **20th Century => Industrial robots**

- **Nowadays => AI-powered robots**

HISTORY QUICK RECAP

ROBOT AS A SYSTEM

- **A robot is a system made up of multiple subsystems.**
  - **Input (Sensors)**
  - **Processing (Microcontroller)**
  - **Output (Actuators)**

WHY ROBOTS ?

- **Perform dangerous tasks**
- **Work in harsh or toxic environments**
- **Operates 7/24 without getting tired**
- **Deliver consistent precision and speed**
- **Reduce human errors**
- **Save cost in the long term**
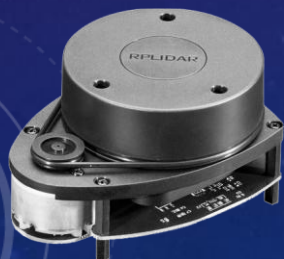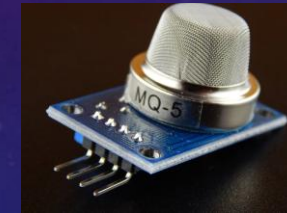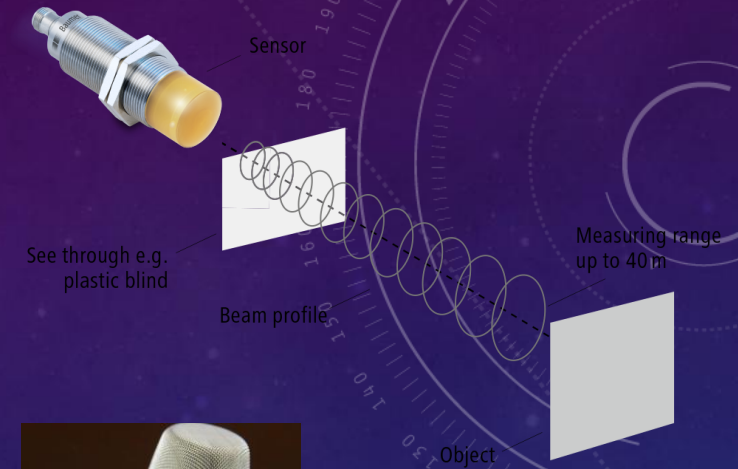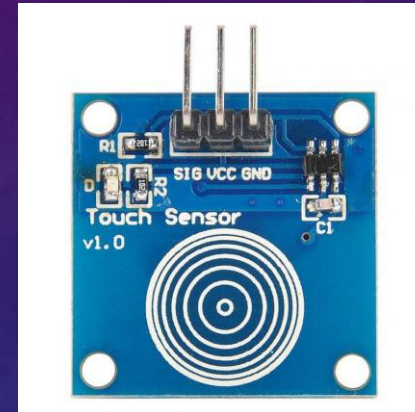- **Automate boring or repetitive jobs**

ROBOTS
VS
HUMANS

WHAT IS A SENSOR

- **Definition:**
  - **Sensors collect data from the environment. They are robot's eyes, ears and skin!**
- **Examples:**
  - **Vision: IR sensor, Camera, Light sensor, Ultrasonic sensor, LIDAR, …**
  - **Hearing: Microphone**
  - **Smell: Gas sensors**
  - **Taste: PH sensor**
  - **Touch: Touch sensor, Pressure, Temperature and Humidity …**

WHAT IS A SENSOR

WHAT IS AN ACTUATOR

- **Definition:**
  - **Actuators allow the robot to move or interact with the world, like muscles.**
- **Examples:**
  - **Motors: DC, BLDC, Servo, Stepper, AC, …**
  - **Magnetic: Relays, Solenoids, …**
  - **…**

WHAT IS AN ACTUATOR

MICROCONTROLLER AS ROBOT BRAIN

- **Control:**
  - **Control + er**

- **Microcontroller:**
  - **A compact computer !**

MICROCONTROLLERS

- **AVR:**
  - **Arduino**
- **ARM:**
  - **STM32**
- **FPGA:**
  - **Xilinx**
- **SoC:**
  - **ESP32, Raspberry Pi, ... ASIC**

ELECTRONICS

- **Resistor**

- **Capacitor**

- **Inductor**

- **Semiconductors, Diodes, Transistors**

- **Integrated Circuits, …**

✍️ HOMEWORK

1. **Research about "Boston Dynamics"**