Robotics

Introduction to Robotics

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Introduction to Robotics

- What is a robot?
- History

What is a robot?

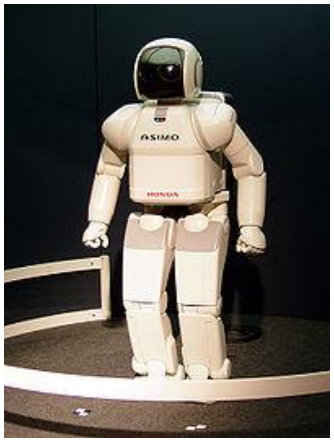
- **The word *robot* was introduced in 1920**
  - By the Czech writer Karel Čapek in his play R.U.R. (Rossum's Universal Robots)
    - "robota" in Slavic languages means "work", "labor"
  - A story of artificial people called robots

A scene from R.U.R.

What is a robot? [cont.]

- **A mechanical device that can perform tasks (semi) automatically**
  - Not necessarily a humanoid in appearance
  - Some robots require human guidance or remote control
  - Usually an electro-mechanical machine

Teakwon V

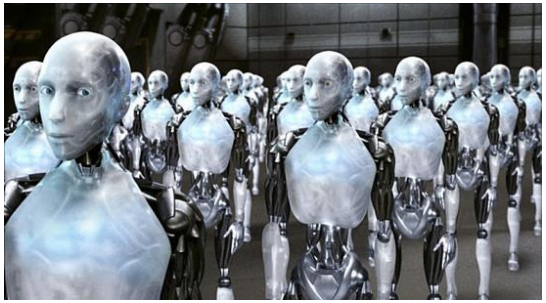


ASIMO

Industrial robot

What is a robot? [cont.]

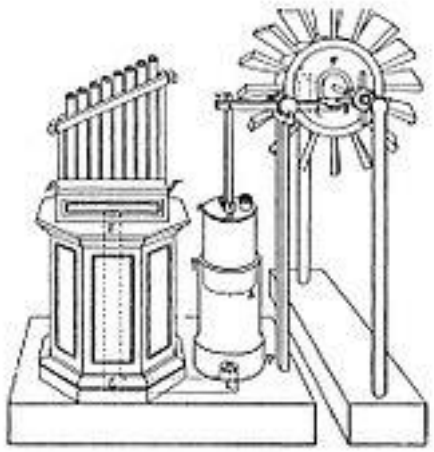
- **No one definition of robot satisfies everyone**
- **Examples**
  - Mechanical device able to perform preset motions but with no ability to adapt
  - Remotely operated vehicle
  - Self-controlled car which could sense its environment and make driving decisions
  - Mechanical humanoid
  - Sentiment robot



History

- **Machinery for repetitive functions**
  - Lifting water and grinding grain
- **Hero of Alexandria (1st century AD)**
  - First recorded *steam* engine
  - *Wind-powered* organ – first instance of wind powering a machine in human history

Hero's engine (aeolipile)



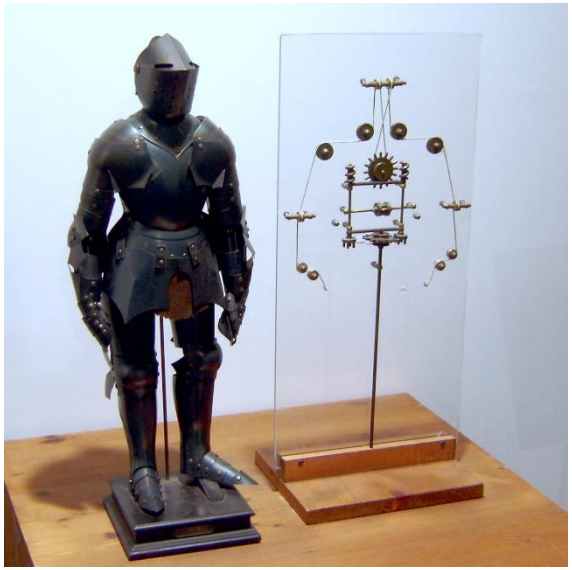
Wind-powered organ

History [cont.]

- **Al-Jazari (12th century AD)**
  - Automaton (*self-operating* machine) – a boat with four automatic musicians that floated on a lake to entertain guests at royal drinking parties

History [cont.]

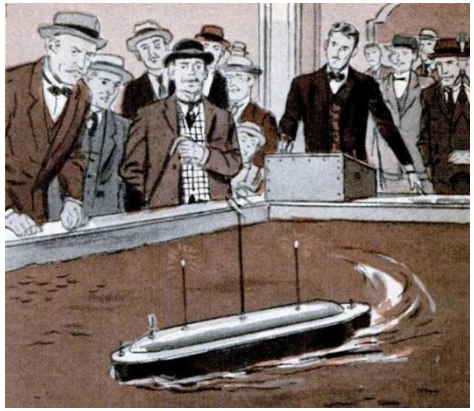
- **Leonardo's robot (1495)**
  - *Humanoid automaton* designed by Leonardo da Vinci
    - Not known whether he actually built it
  - Design notes were discovered in the 1950s
  - Able to make several human-like motions



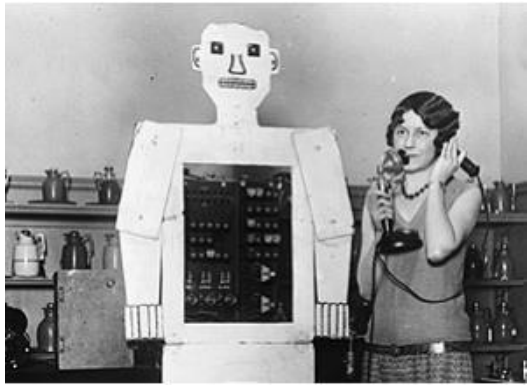
Model of Leonardo's robot

History [cont.]

- **Nikola Tesla (1898)**
  - A *radio-controlled* boat
  - Tesla VS Edison

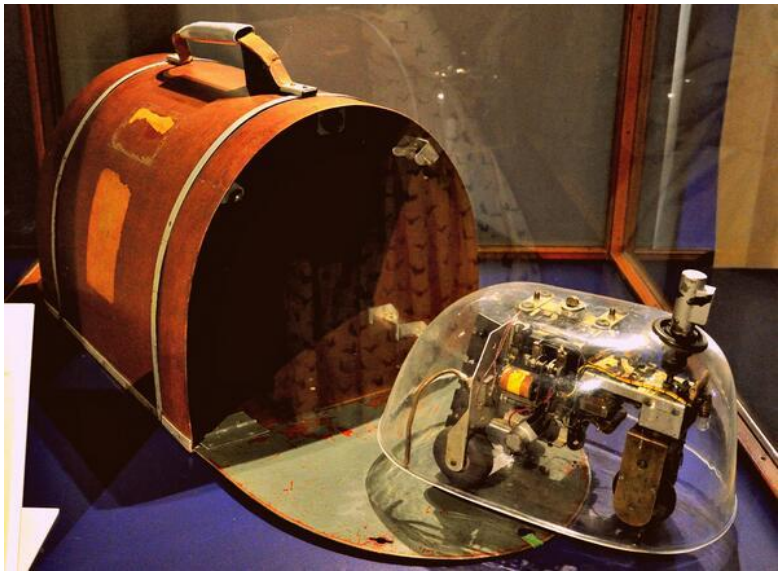


- **Televox (1926)**
  - Considered as first robot put to *useful work for consumer*
  - Connected to various devices via phone lines and allows users to turn equipment off and on using voice commands



History [cont.]

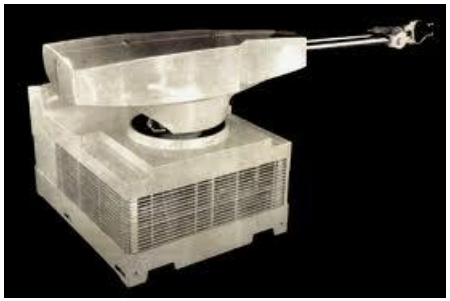
- **William Grey Walter (1948)**
  - First electronic *autonomous robots* recognizing environments
    - Tasks in unknown environments without human guidance



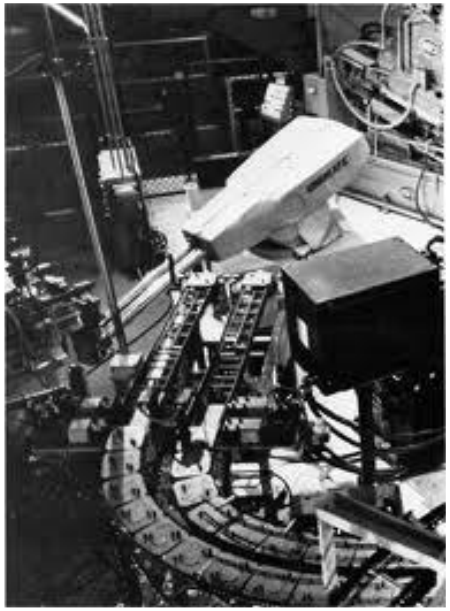
Grey Walter's Tortoise

History [cont.]

- **George Devol (1954)**
  - First patent about digital and *programmable* robot
  - Tasks can be programmable – general-purpose robot which can do multiple tasks



- **Joseph Engelberger (1961)**
  - Unimate : First *industrial robot* which worked on General Motors assembly line



Robots Nowadays...

Still, a far way to go…

Robot as a general-purpose AI

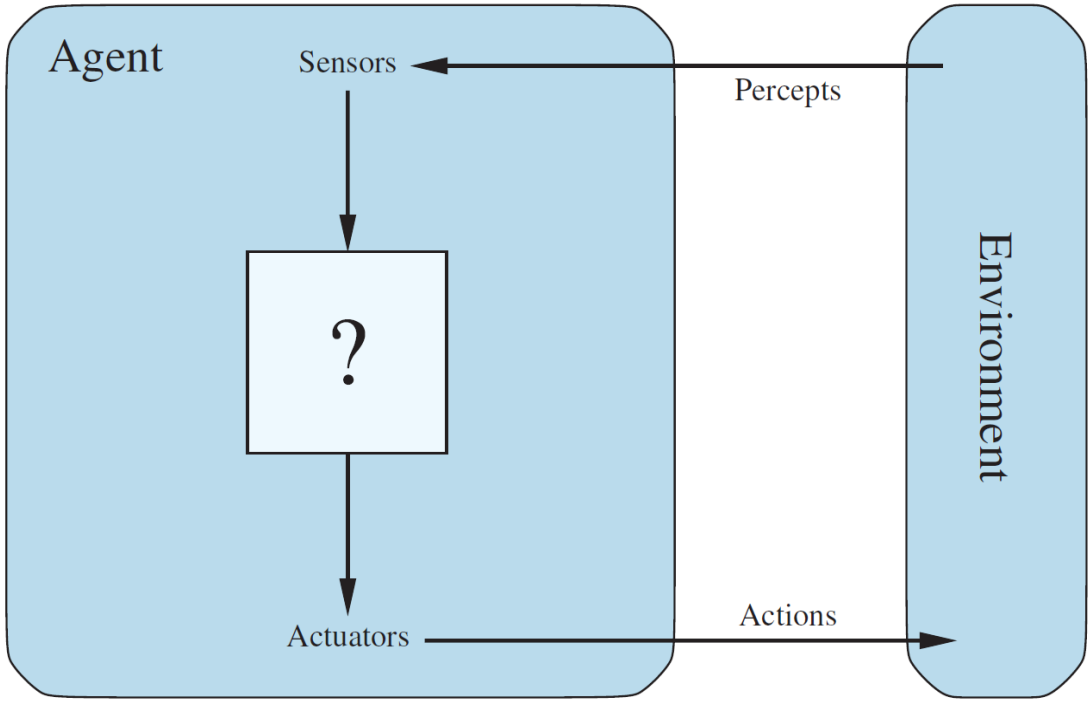
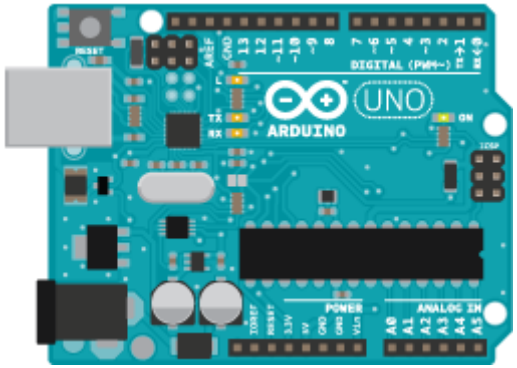


Figure 2.1. Agents interact with environments through sensors and actuators from Norvig & Russell, Artificial Intelligence: A Modern Approach (4th ed.)

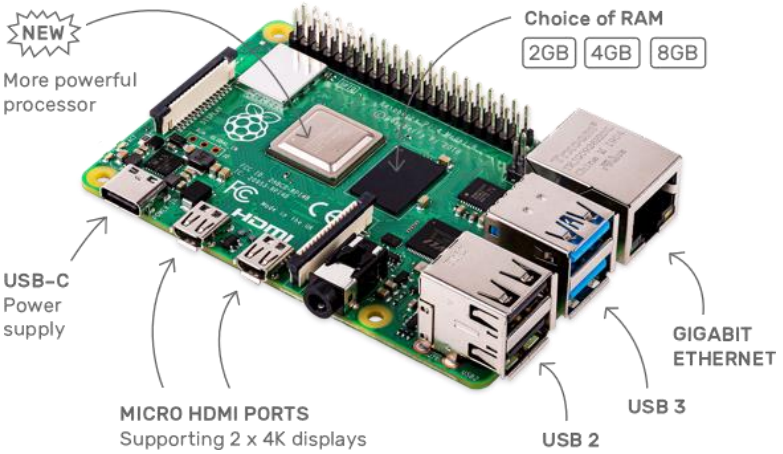
Robot Programming

Q: How do we program a robot to achieve a task goal?

Robot Programming Needs Hardware I/O

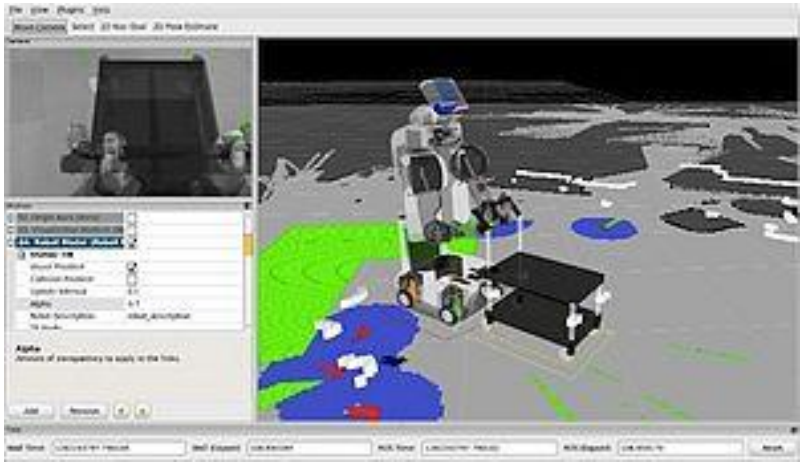


https://www.arduino.cc/



https://www.raspberrypi.org/products/raspberry-pi-4-model-b/

https://www.lego.com/en-us/product/robot-inventor-51515



https://en.wikipedia.org/wiki/Robot_Operating_System