Introduction to Robotics

IEEE RAS - Slides adapted from
https://frezza.pages.centralesupelec.fr/st5-drones/

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Role of robotics in modern society

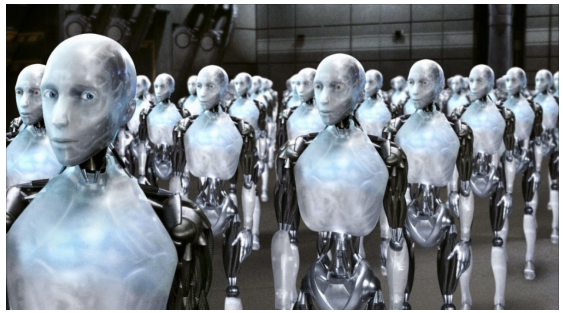
Nowadays, robotics permeates every aspect of our lives and industries

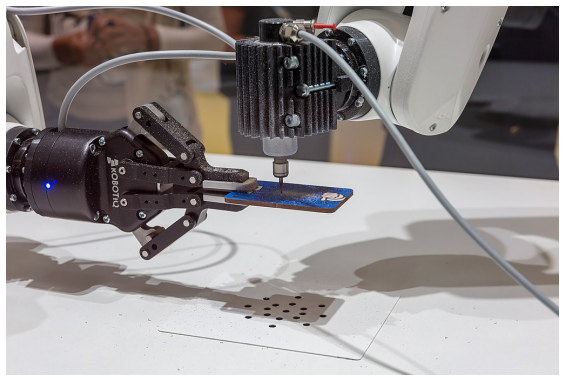
- Manufacturing: Industrial robots are the backbone of modern manufacturing, streamlining assembly lines and enhancing precision.
- Healthcare: Surgical robots (i.e. Da Vinci Surgical System), assist surgeons in performing minimally invasive procedures.
- Agriculture: From automated tractors and harvesters to drones that monitor crop health, robots are everywhere.
- Space Exploration: Robots and rovers are our eyes and hands in distant celestial realms, expanding our understanding of the cosmos.
- Search and Rescue: Autonomous drones and ground robots are deployed in disaster-stricken areas, aiding in rescue missions and providing critical data.
- Education: Educational robots engage and inspire students to explore STEM fields, nurturing the next generation of roboticists.

What is a robot

Definitions (en.wiktionary.org)

- "(chiefly science fiction) An intelligent mechanical being designed to look like a human or other creature"
- "A machine built to carry out some complex task or group of tasks by physically moving, especially one which can be programmed
- In French: multi-function kitchen appliance





What is an autonomous robot?

Autonomous robot, for us:

- Mechatronic device (mechanics, electronics, and software),
- Which can perform a task by itself,
- In a non-dedicated environment,
- Through the interaction between perception and action,
- With some decision autonomy

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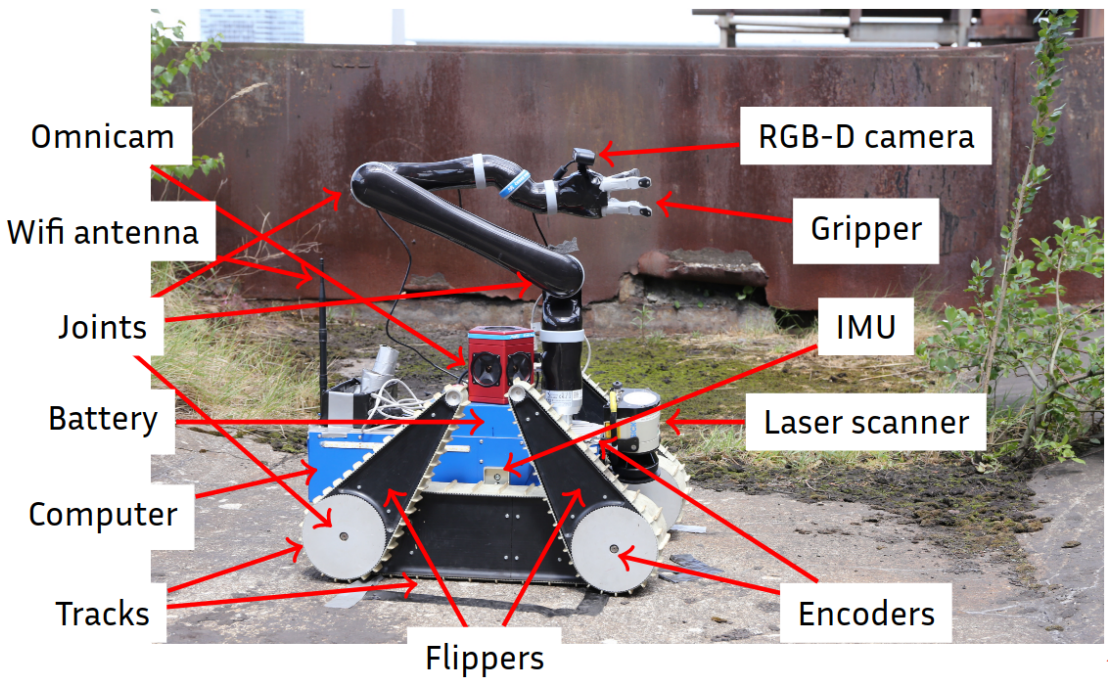
Tasks examples

- Cleaning floor
- Museum tour guide
- Demining
- Create a map of a place
- Operate in human unfriendly environments

Robot anatomy

Components

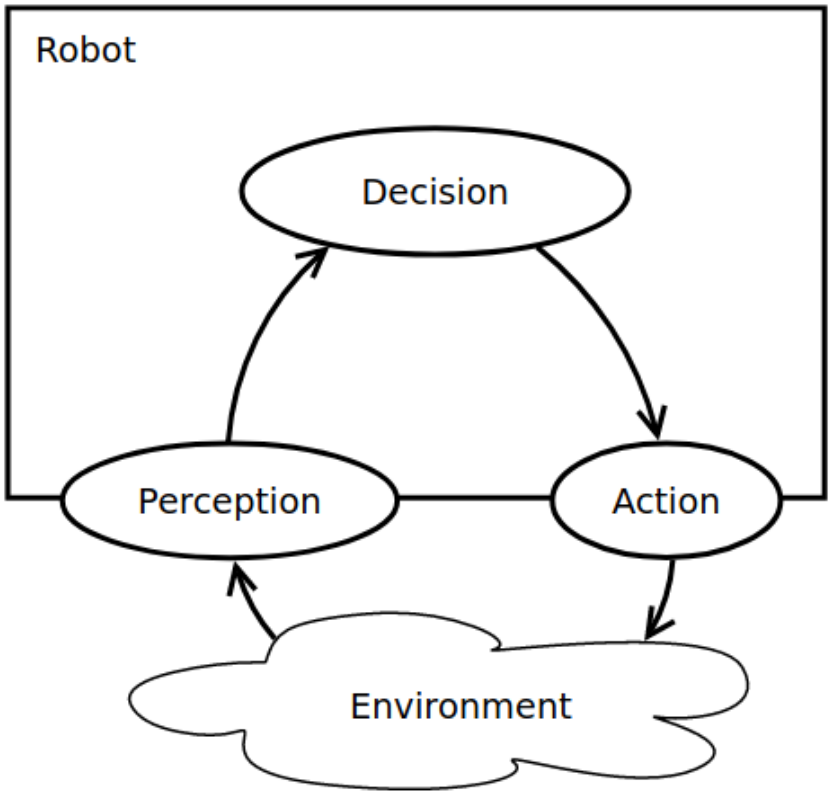
- Mechanical structure
- Actuators (joints, wheels. . .)
- Sensors (sonar, encoders. . .)
- Electronics (power, communication bus, computers)
- Software



Operation of an autonomous robot

Main functions

- Perception and representation of the environment
- Motion and action
- Decision and planning
- Learning



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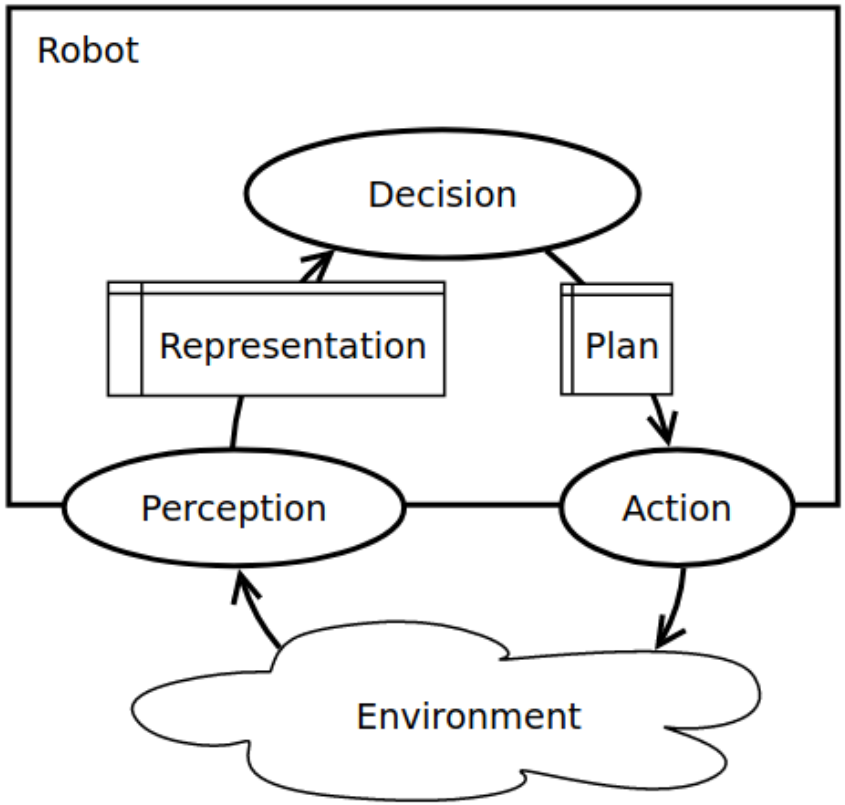

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