POLIMI EDUCATION | TECHCAMP

COURSE PRESENTATION

Robotics: the art of intelligent motion

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TEACHERS

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We will talk about robots!

What is a robot?

An automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes, which can be either fixed in place or mobile for use in industrial automation applications

(ISO 8373:2012)

Well, not about all robots…

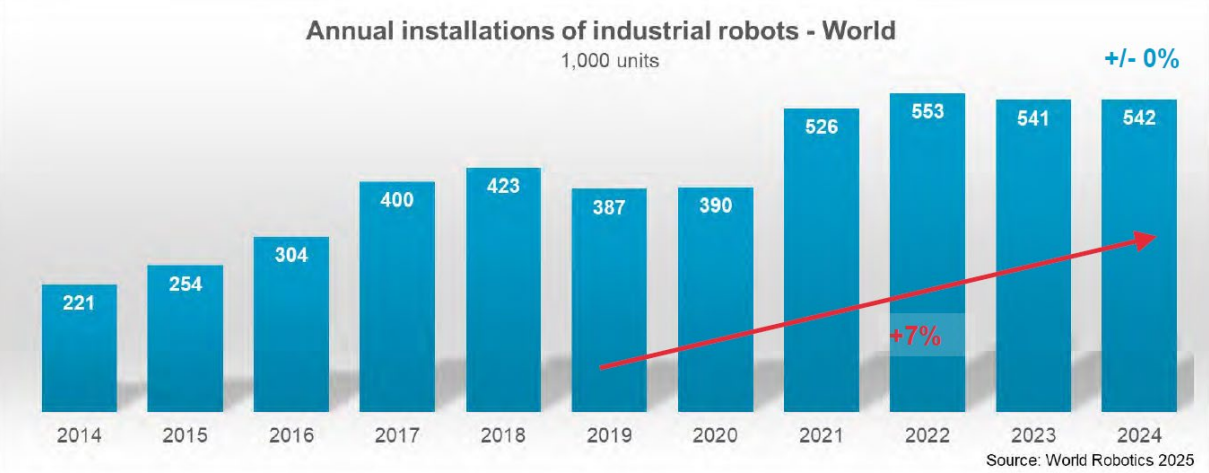
Is this a robot?

Well, it moves, but it cannot manipulate the environment moving parts.

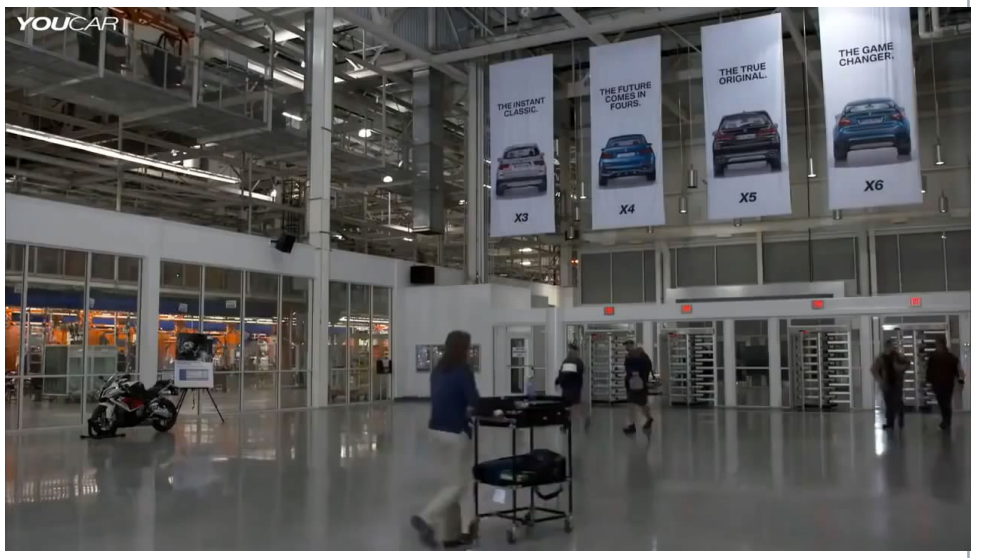
So it is not a robot by our definition

And a generic artificial intelligence product (a chatbot for example)? No, it is not a robot.

Robots in action



Industrial robots are used more and more



There are many different robots

- Anthropomorphic
- The typical dexterous robotic arm

- SCARA
- All vertical axes, very fast

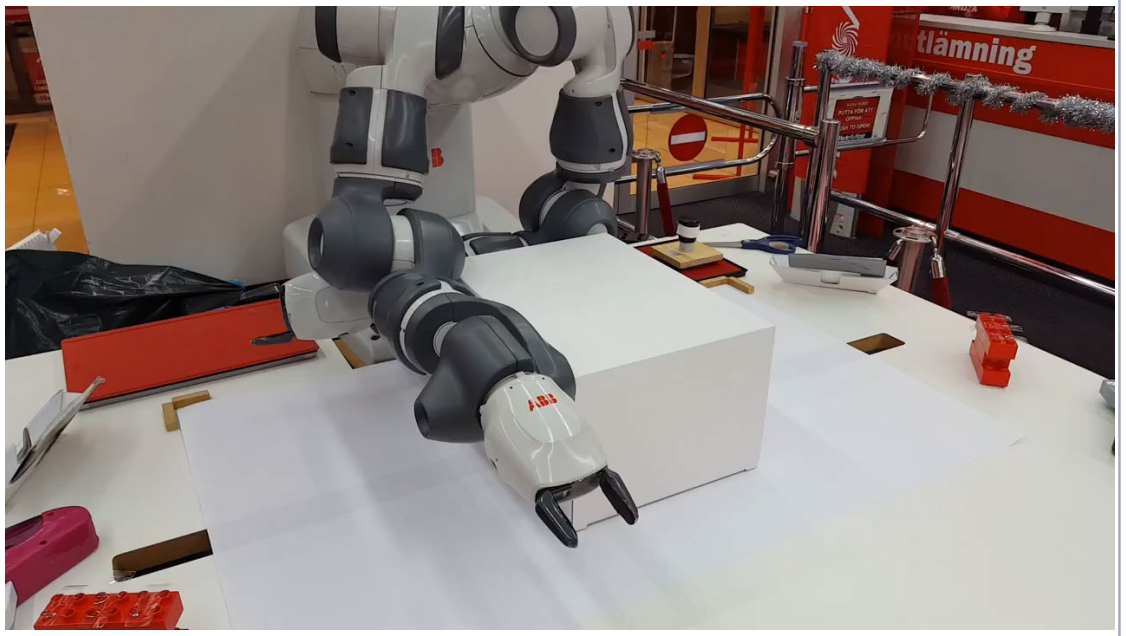
- Delta
- Fast pick and place

New robots

Dual-arm collaborative robots.

Collaborative robots (cobots) are robots that can operate close to the human.

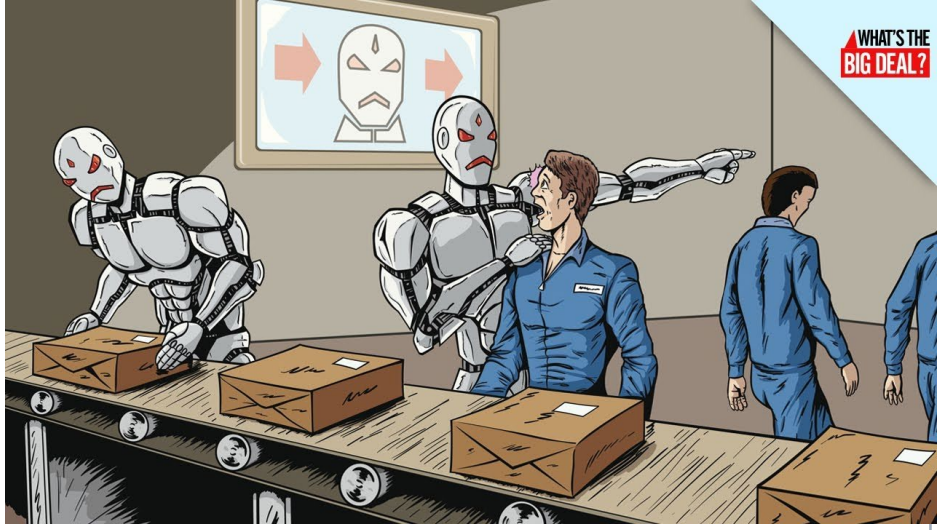
It’s the new frontier of industrial robotics

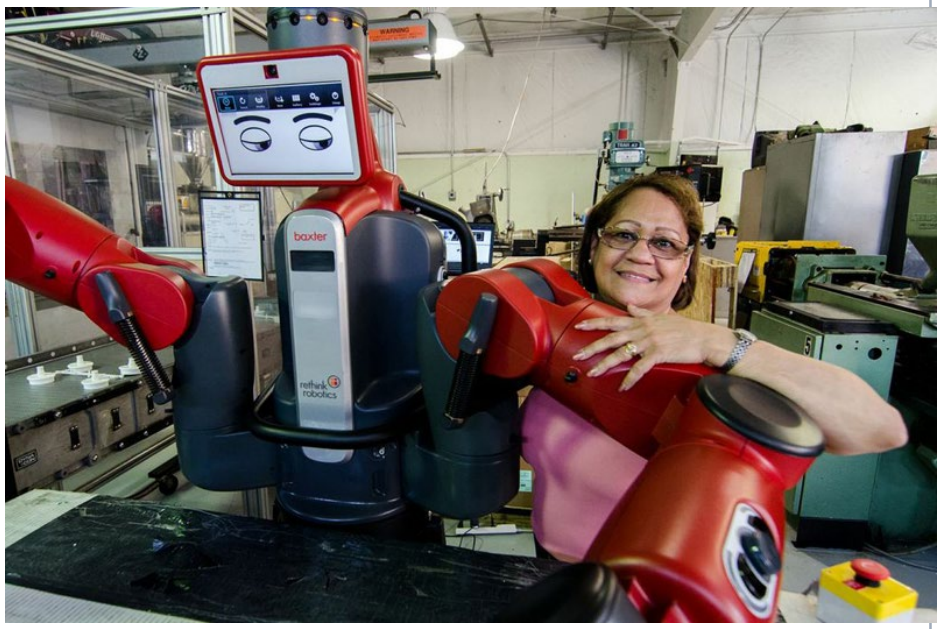


Ethical issues

Robotics and employment

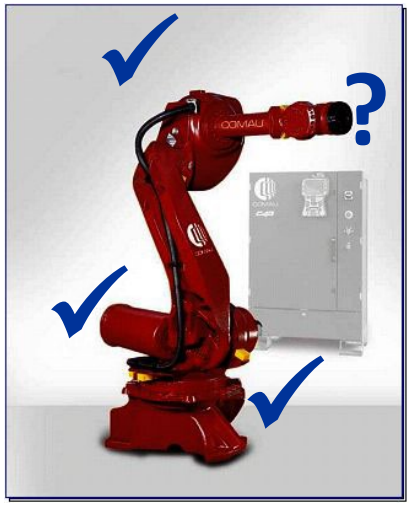
We will stimulate discussions on these topics

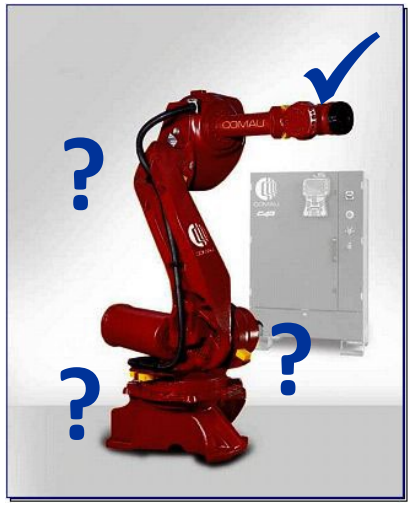




How to describe motion?

The robot kinematics: we will study the direct and the inverse kinematics



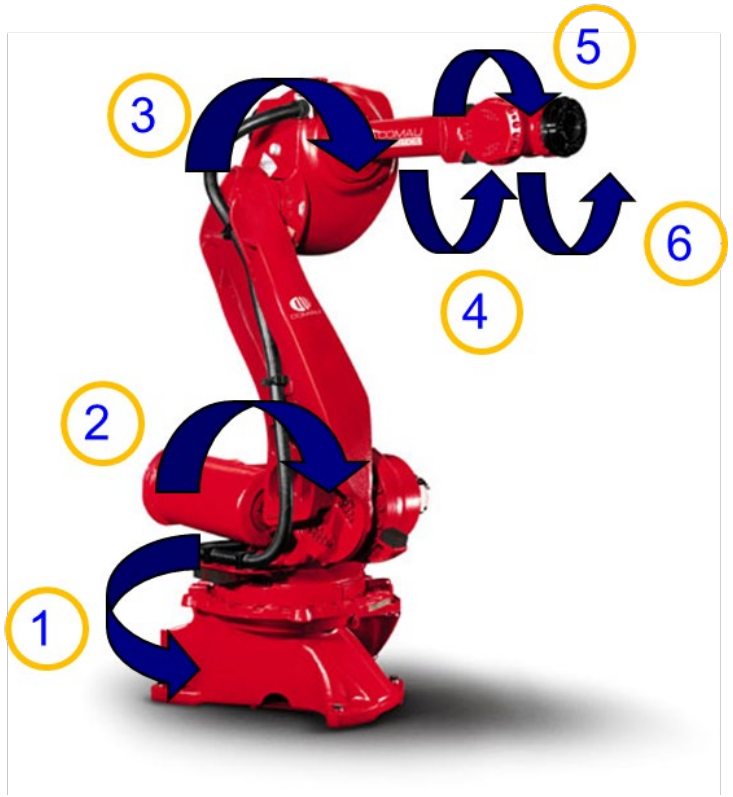


How to make a robot move?

The generation of motion.

The robot is just a collection of mechanical bodies.

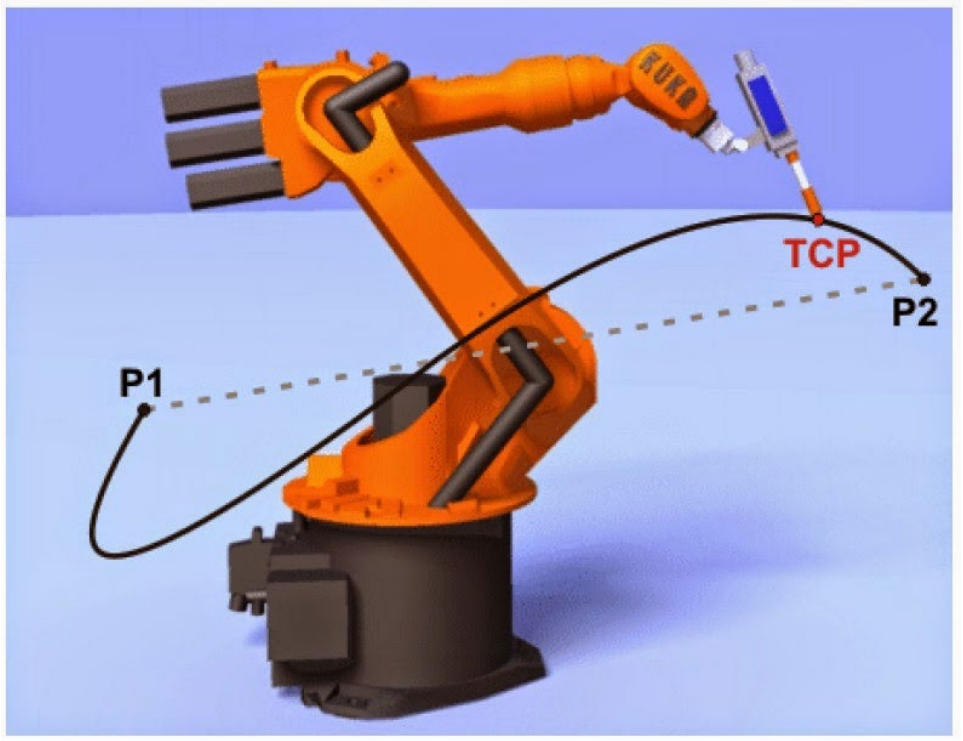
How can we make it move in space?



How to make a robot move?

The generation of motion.

We need to decide how the robot has to move: what points in space should it cover? and how fast?

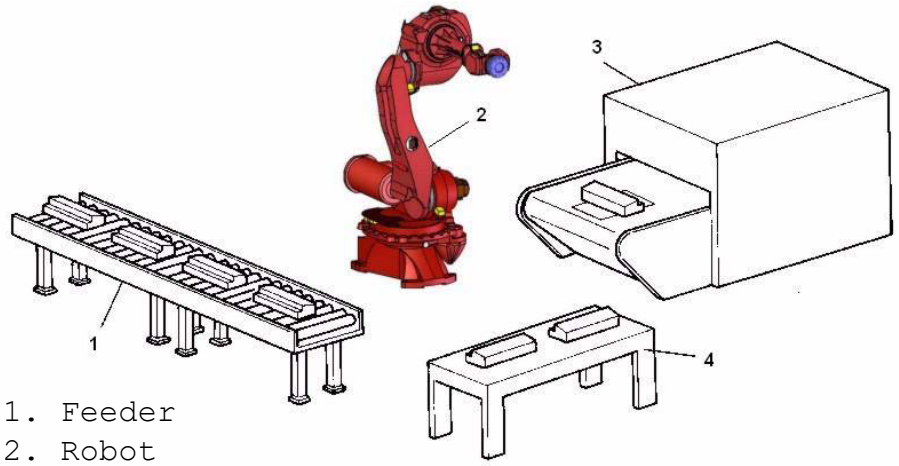


How to program a robot?

Programming environments

```
PROGRAM pack
VAR
   home, feeder, table, discard : POSITION
BEGIN CYCLE
   MOVE TO home
   OPEN HAND 1
   WAIT FOR $DIN[1] = ON
-- signals feeder ready
   MOVE TO feeder
   CLOSE HAND 1
   IF $DIN[2] = OFF THEN
-- determines if good part
     MOVE TO table
   ELSE
     MOVE TO discard
   ENDIF
   OPEN HAND 1
-- drop part on table or in bin
END pack
```

The program moves pieces from a feeder to a table or to a discard bin, depending on digital input signals:



1. Feeder
2. Robot
3. Discard Bin
4. Table

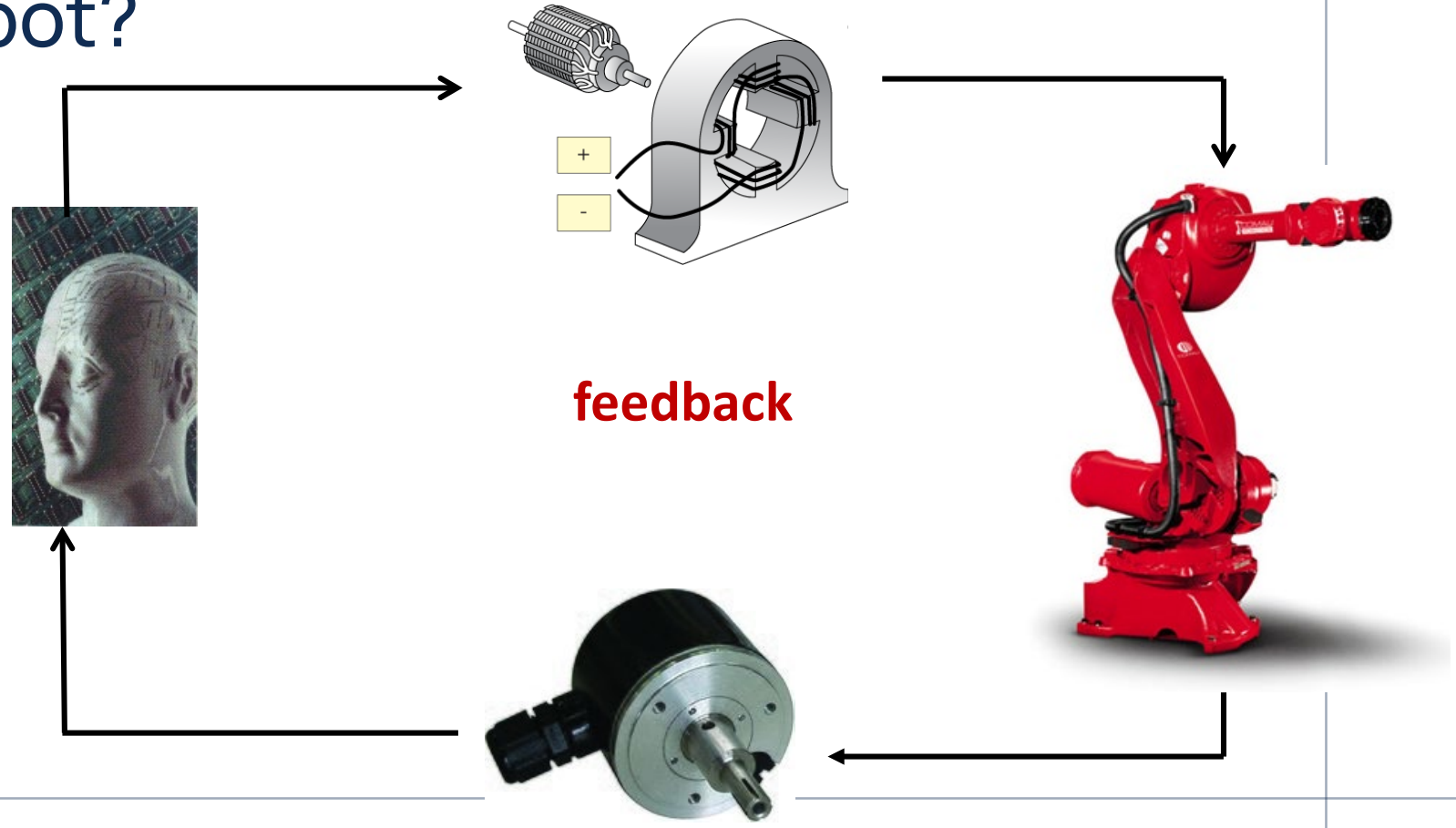
How to program a robot?

Teaching by demonstration

How to control a robot?

The role of feedback

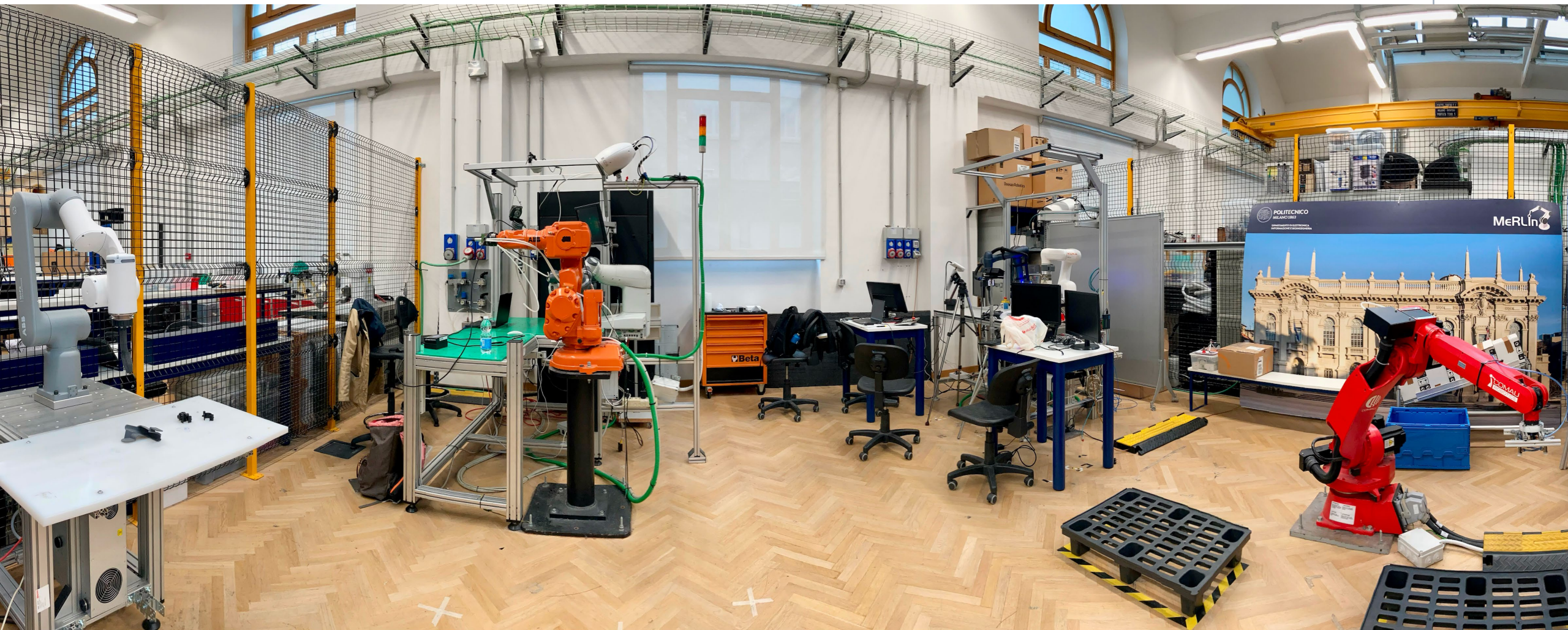
How can we command the motors such that a certain motion is executed?



We will use...

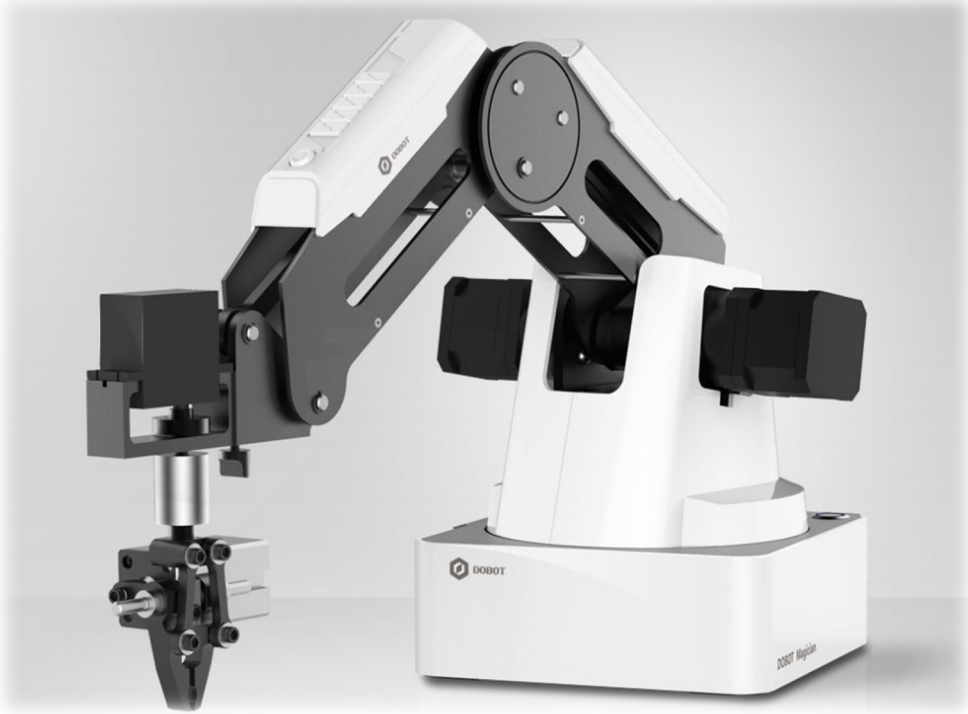
Kahoot!

And we will visit the lab!

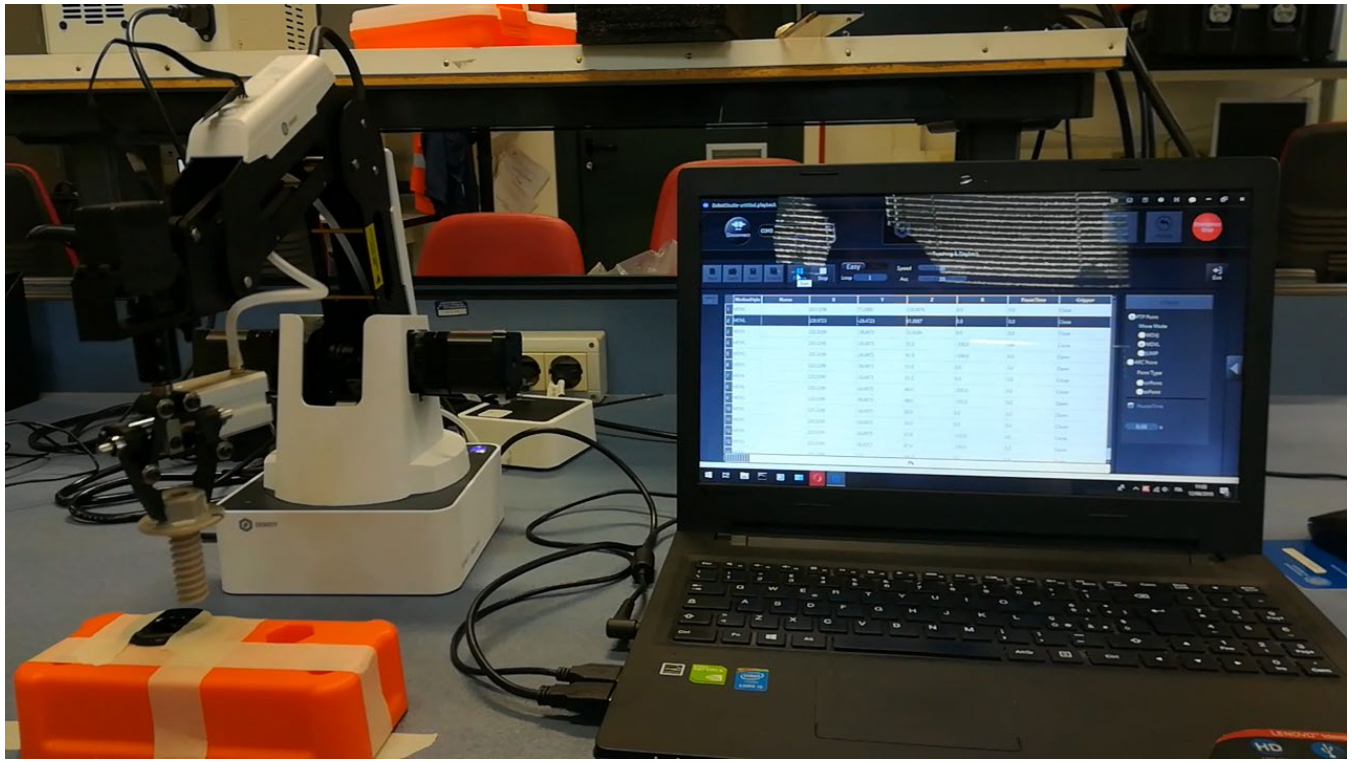


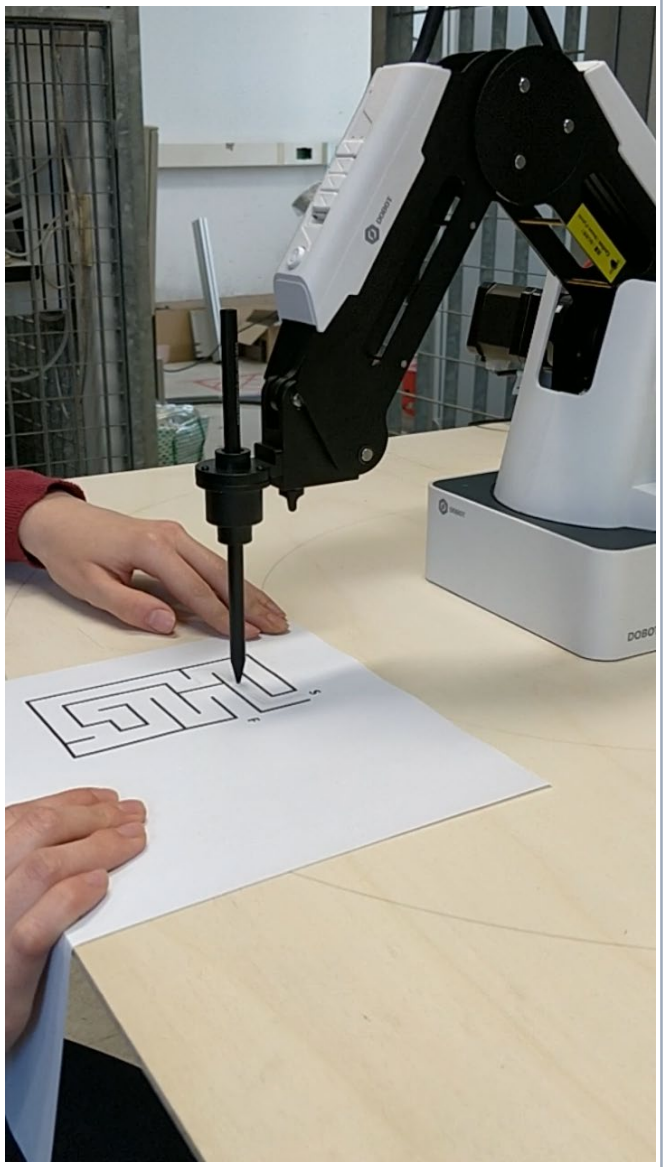
In the afternoon we will use the Dobot magician!

The Dobot is a multifunctional and small size robotic arm.



Enjoy robotics!





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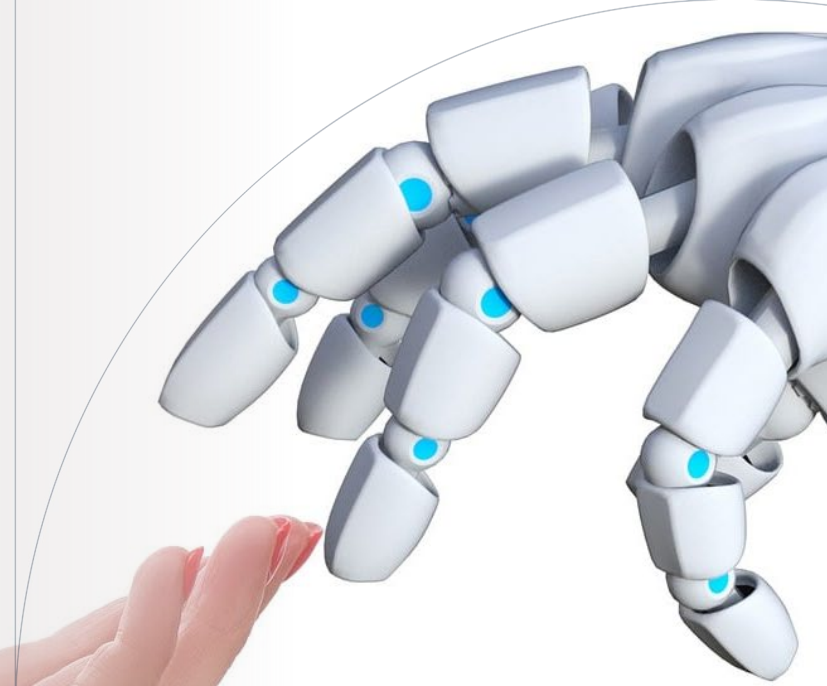

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