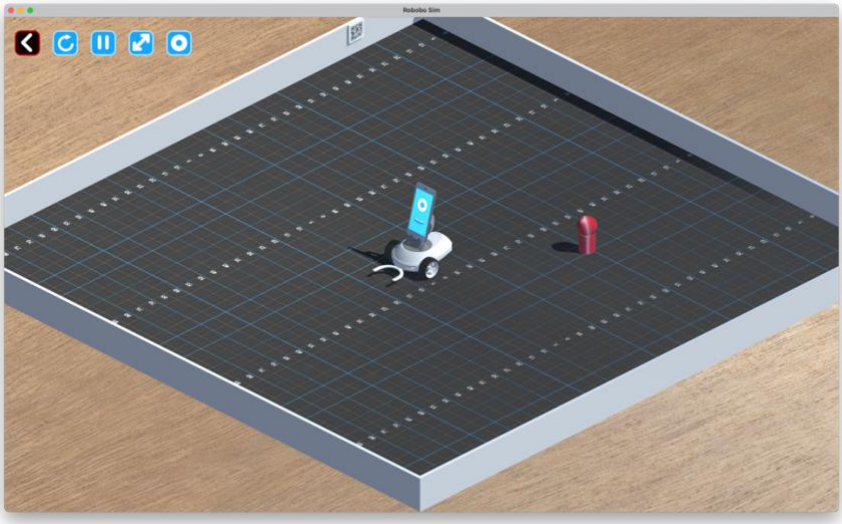
COMPUTER SCIENCE. COURSE 22/23

Autonomous Robotics with Python

1. Introduction



Autonomous robotics is a field of engineering that tries to make robots perform tasks autonomously, that is, without human intervention. To achieve this goal, these robots must be programmed so that they are capable of solving problems in changing situations, not contemplated in the initial design.

To do this, autonomous robotics requires continuous use of sensors that allow changes in the environment to be detected. Likewise, correct use of the robot actuators (motors) is also necessary, so that movement control does not depend on preset values.

2. Aim

The objective of this practice is to develop a Python program that allows the Robobo educational robot to find a red object in a closed environment, move towards it and capture it.

The solution will be considered correct when this task is solved for any position of the object.

3. Necessary elements

To carry out this practice, the following elements are necessary:

- RoboboSim Simulator CE (https://github.com/mintforpeople/robobo-programming/wiki/Unity)
- robobo.py library (https://github.com/mintforpeople/robobo-programming/wiki/python-doc)

- Robobo programming reference with Python (https://github.com/mintforpeople/robobo-programming/wiki/robobosimpy)
- Visual Studio Code or equivalent IDE

We recommend you to carefully read all these documentation, including the tutorial you can find in the bottom part of this page: https://github.com/mintforpeople/robobo-programming/wiki/Unity

4. Expected operation of the program

In the RoboboSim simulator, the world called “Cylinder” must be used. The expected behavior of the robot in said world is the following:

1. Find the colored object (it may not be in view initially).
2. Say by voice if the colored object is to the left, to the right, or in front.
3. Orient yourself facing the colored object accurately.
4. Move towards the colored object.
5. Catch the colored object with the pusher accessory. It will be considered hooked when in contact with it.

The program must solve the objective proposed in section 2 regardless of the position of the cylinder, so it must be tested several times before delivering it, with the simulator in RANDOM mode. A *video demonstrating the expected behavior* is included.

To achieve this operation, at least the following sensors must be used:

- *Color blob (readColorBlob method*): to detect the red object.
- *Infrared Sensors (readIRSensor method*): to detect that the object has been contacted.

And, at least, the following actuators:

- *Wheel motors (moveWheels methods*, *stopMotors*): to turn and move forward.
- *Voice synthesis (sayText* method): to indicate where the object is and what has been reached.

The use of other sensors and actuators available on the robot is also possible. For example, the PAN and TILT motors might be necessary to adjust the object in the robot's field of view.