UR5 arm project

Presented by:
Alessandro Benassi
Daniele Calvo
Niccolò Cristoforetti
Matteo Gottardelli

01. **Project's objective**

Objectives for this project

02. **Our Environment**

What we used for the simulation

03. **Vision**

Block spawning and recognition

04. **Manipulation**

Path analysis and movement

Objective

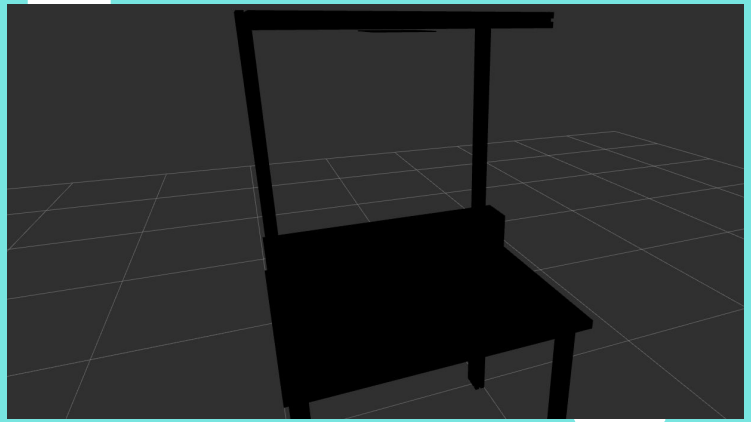
Move an UR5 robotic arm with a gripper, in order to grab and move some different randomly spawned blocks from a random start position to a desired position.

Environment

The project is made on a simulated environment.

Using Ros2, we can simulate a UR5 arm to make the task.

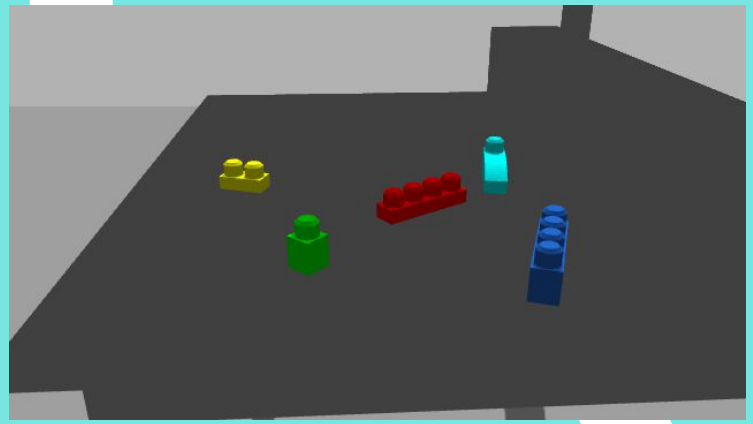
To work on it, we structured our project in a certain way.



Vision

Section related to the creation, analysis and of the block spawned. The main sections are:

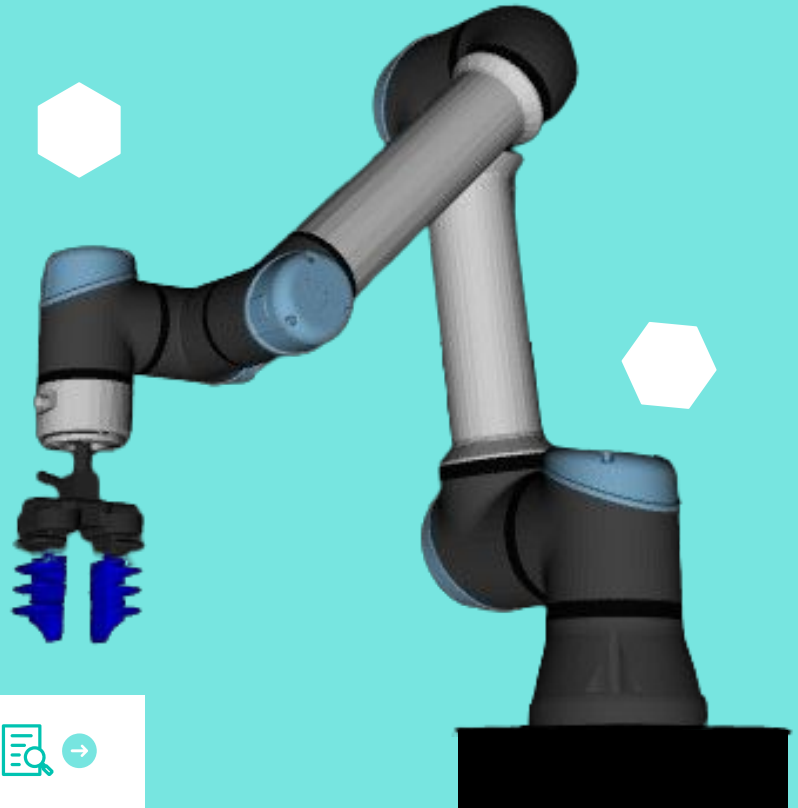
- spawn blocks
- image detection
- image analysis/processing
- object elaboration (camera instance and orientation)



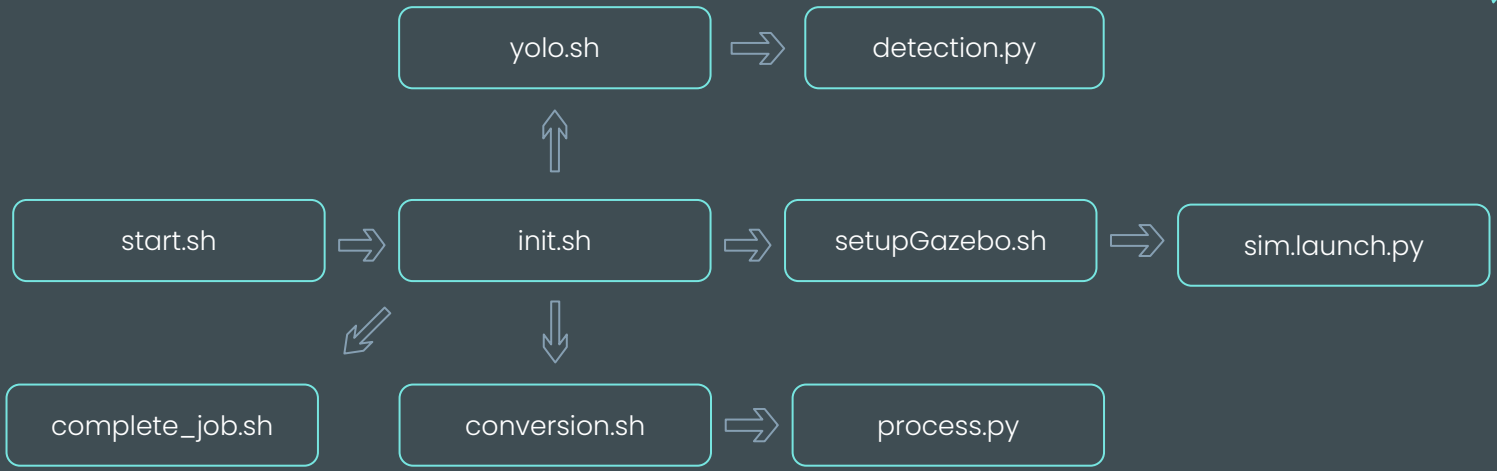
Manipulation

Section related to the trajectory computation and actuation. The main sections are:

- path calculation
- gripper control
- path actuation



Invocation workflow



Execution workflow

1

main.cpp

from complete_job_ws
It calls all next files to manage the sequential flow

2

image.cpp

from camera_ws
waiting for the images

3

visual.py

from camera_ws
image manipulation, for taking what we need

4

detection.py

detect the block and calculate his bounding box

5

process.py

converts 2D image points to 3D coordinates

6

gripper_service.cpp

manage the change in the state of the gripper (closed, neutral, open)

7

kinematics.cpp

Processes UR5 joint states and controls robot movement

8

kin_communication.cpp

Receives joint states and sends motion trajectories.