Università di Genova

DIBRIS DIPARTIMENTO
DI INFORMATICA, BIOINGEGNERIA,
ROBOTICA E INGEGNERIA DEI SISTEMI

SofAR Assignments

2020-2021

Fulvio Mastrogiovanni

Contacts

Fulvio Mastrogiovanni – fulvio.mastrogiovanni@unige.it

Alessandro Carfì – alessandro.carfi@dibris.unige.it

General rules

The SofAR assignment is a group project

- Groups maximum size is 4.
- Groups minimum size is 2.
- All the group members are evaluated on the entire project.

Each group should submit

- A detailed report.
- A GitHub repository.

General rules

The evaluation would also imply a system demonstration

- Each project is associated with evaluation metrics.
- The demonstration should be performed in EMARO Lab on our PCs.

The SofAR assignments are designed as challenges

- We will use the results of each group to compile a ranking.
- We will fix a hard deadline for the challenge. Groups not meeting the deadline can still take the exam, but they will not be included in the ranking.

General rules

Each group for the evaluation should submit

- A detailed report.
- A GitHub repository.

The evaluation would also imply a system demonstration

- Each project is associated with evaluation metrics.
- The demonstration should be performed in EMARO Lab on our PCs.

General rules

The usage of already available libraries is encouraged but should properly referenced both in the report and the repository.

Tools

The main tool for the projects is ROS. While the simulation environments are going to be managed by Unity.

It is recommended to use one PC with Ubuntu for ROS and a second one with Windows for Unity.

Challenges

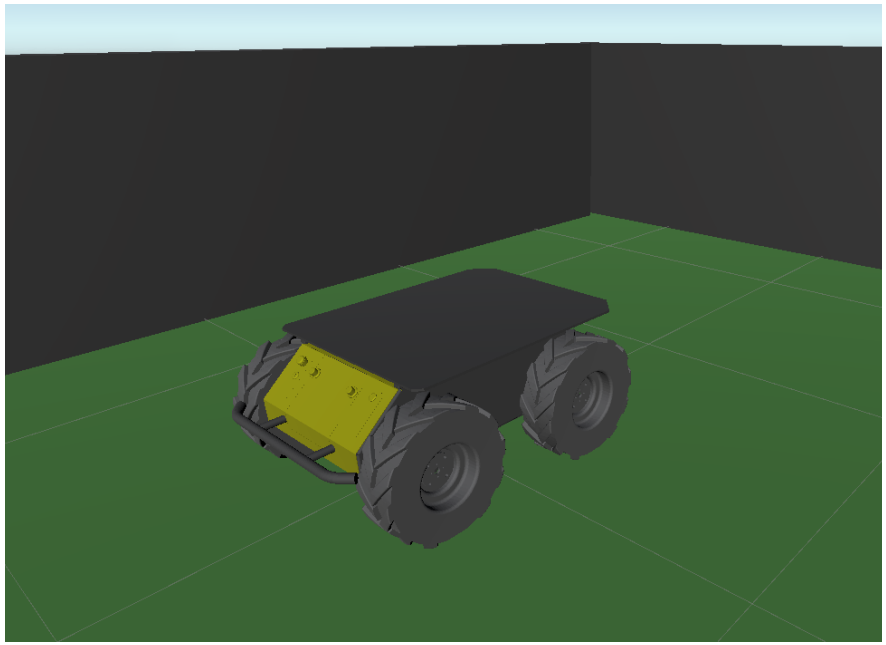
This year we propose two challenges of similar difficulty

- Mobile Navigation and Mapping.
- Human-Robot Collaborative Manipulation.

Each group should select one of the two.

Challenges – Mobile Navigation and Mapping

The challenge goal is to control a mobile robot, equipped with an RGB-D sensor, to explore the environment and compute a 3D map.



Each group will be provided with a Unity simulation containing a virtual robot, a simulate sensor and the test environment to explore.

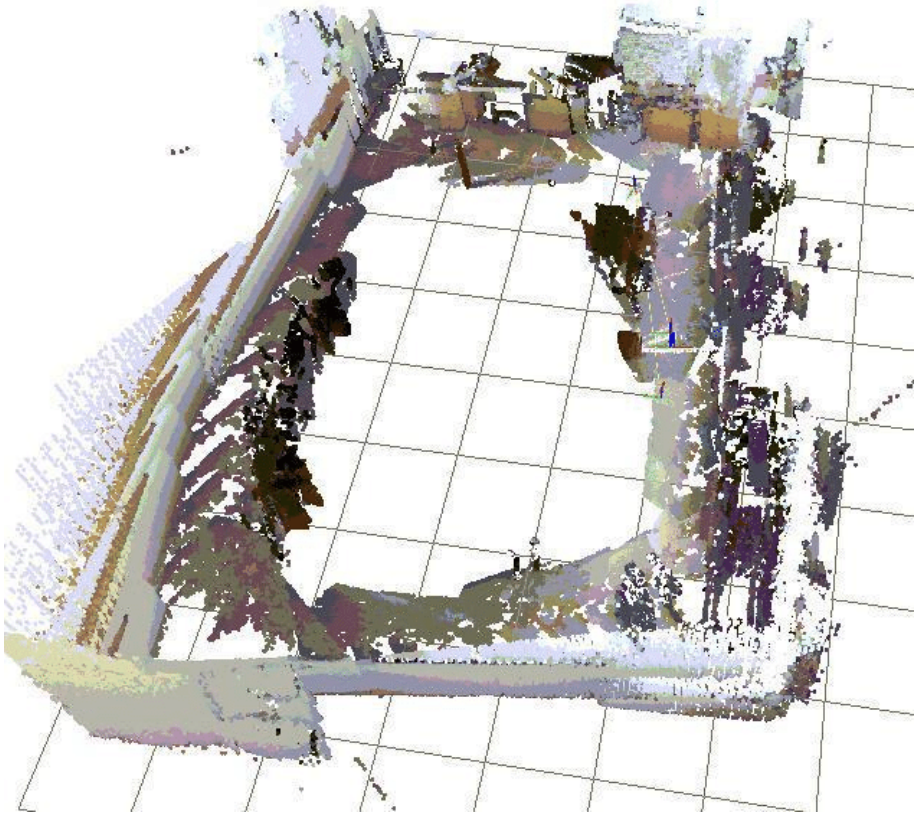
Challenges – Mobile Navigation and Mapping

Gathering the data from the simulation the ROS architecture should:

- Create the 3D map (SLAM).
- Implement the exploration logic.

We will perform the final evaluation on a new environment monitoring these metrics:

- Time to complete exploration.
- Map quality.



Challenges – Mobile Navigation and Mapping

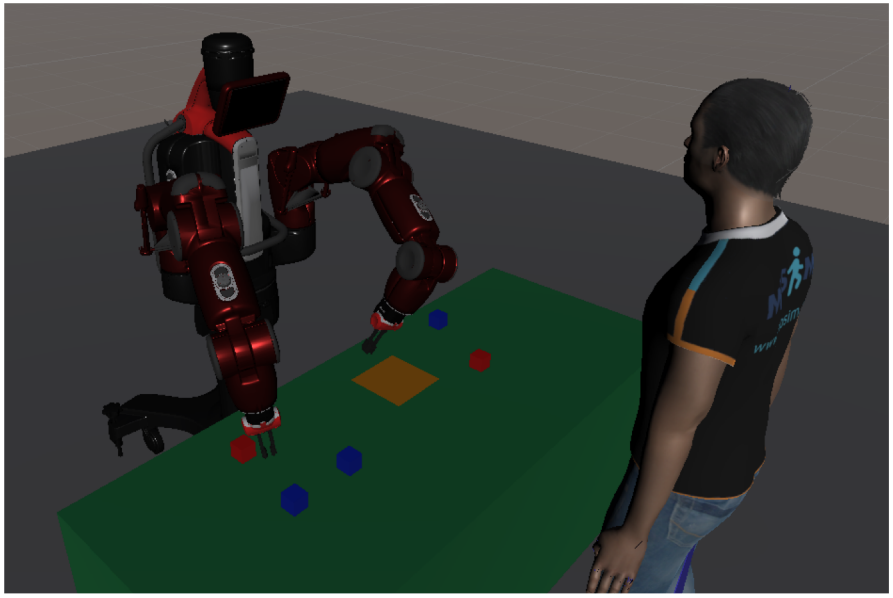
Extra points will be granted for groups deploying the same architecture on the real robot.

Challenges – Human-Robot Collaborative Manipulation

The challenge goal is to develop a software architecture to solve a collaborative task with a human.

The scenario would involve a series of pick-and-place tasks that the human and the robot should perform simultaneously.

Each group will be provided with a Unity simulation containing the Baxter model, a human model, the software that controls the human simulation, the set of objects and the collaborative plan.



Challenges – Human-Robot Collaborative Manipulation

The ROS architecture could gather information from the perfect perception of the simulation:

- To solve the pick-an-place tasks.
- To avoid collisions with humans.

We will perform the final evaluation on a new collaborative task monitoring these metrics:

- Time to complete the task.
- Number of collisions with the human.

Challenges – Mobile Navigation and Mapping

Extra points will be granted for groups deploying the same architecture on the real robot.