

University of Genoa, 2021
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Assignment 1

7. Lecture of Experimental robotics

The scenario



The robot moves in the rooms of an apartment.
It looks for hits to find a Killer as in Cluedo.

The Objective

In particular, the robot should

1. Explore the environment by entering in different rooms (e.g., randomly).
2. In each room, it should look around to find hints to make hypotheses.
3. When a consistent hypothesis is deducible, it should go in a designed location and express it in English.
4. If the hypothesis is wrong, it should keep exploring and find new hints.



The Features

The assignment concerns

- the implementation of a behavioral architecture.
- the representation of a map with a suitable level of abstraction.
- the usage of the Cluedo ontology to manage hypothesis.
- the random-based generation of hints and the validation of hypothesis.
- the simulated motion in the environment.

Simulation

Simulate with trivial mechanism the robot motions, e.g.,

- the robot is a point,
- the motion controller is a waiting procedure,
- hints are “perceived” with ROS messages,
- ...

Plan ahead and take in mind that the robot will be modeled and simulated in a dynamic environment.

Define the working hypothesis of the architecture, and critically motivate them.

The Cluedo Hints

Possible type of hints:

- who is (i.e., PERSON),
- what has been used (i.e., WEAPON),
- where it append (i.e., PLACE);

e.g., (HPO, Prof-Plum):who, Prof-Plum:PERSON,
(HPO, "001"):hasID.

Use the possible hints of Cluedo available at:

https://www.picclickimg.com/d/l400/pict/322888355388_/Cluedo-Replacement-Detective-Notes-A6-Pack.jpg



The Cluedo Hypothesis

An HYPOTHESIS is made of hints, e.g.,

“Prof. Plum **with the Wrench** in the Hall”

A consistent h:HYPOTHESIS occurs when
h:COMPLETED and not h:INCONSISTENT.

For the assignment use the file
`cluedo_ontology.owl`.

The Generation of Hints

- Define a list of possible source of information with an ID.
- Each source of information has an associated set of hints.
- Store in the ROS parameter server the ID of the current source of information.
- Sometimes, the robots receive the hint based on random approaches and/or its location.
- When a correct hypothesis is found, define a predefined location where the source ID would be checked.



Submission

Submission

- Send the link to a github repository to `luca.buoncompagni.unige@gmail.com` and `carmine.recchiuto@dibris.unige.it`

The repository should contain:

- all the developed code
- documentation with Doxygen, docstring, or similar
- a README.md file with the report of your work

Deadline: the 5th of November.

Readme Template

1. Brief introduction (couple of sentences).
2. Software architecture, temporal diagram and states diagrams (if applicable). Each diagram should be commented with a paragraph, plus a list describing ROS messages and parameters.
3. Installation and running procedure (including all the steps to display the robot's behavior).
4. A commented small video, a GIF or screenshots showing the relevant parts of the running code.
5. Working hypothesis and environment (1 or 2 paragraph).
 1. System's features (1 or 2 paragraph).
 2. System's limitations (1 or 2 paragraph).
 3. Possible technical Improvements (1 or 2 paragraph).
6. Authors and contacts (at least the email).



Evaluation

We mainly evaluate:

- the design of the software architecture included: interfaces, parameters and behaviors formalization,
- the quality of the code and documentation,
- the ability to design and highlight working hypothesis and limitations,
- the ability to plan ahead and make an architecture that could be adapted to overcome limitations (iterative development),
- the ability to test (using randomness) the architecture and evaluate its outcomes,
- the quality of the repository and readme file.



Questions?!