

Robotics Students

Jesus Savage

Bio-Robotics Laboratory, School of Engineering,
Universidad Nacional Autónoma de México (UNAM),
robotssavage@gmail.com

Robotics Students

Robotics Students is a system to test robots' behaviors developed by engineering students.

To use it please follow the next instructions:

1. Using an Ubuntu-Linux operating system, unpack `robotics_students.tar.gz` in the user's directory.
2. Unpack `data_students.tar.gz` in the user's directory.
3. Open an X terminal and go to the directory where the programs are with the following command:

```
cd robotics_students
```

Change the permissions of the file `robotics_students_make` with the following command:

```
chmod 777 robotics_students_make
```

Compile the source files with the following command:

```
./robotics_students_make
```

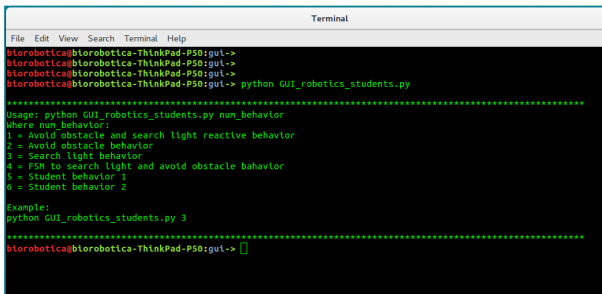
Robotics Students

During compilation is possible that some warnings will appear.

4. GUI usage:

If there were no critical compilation errors, go to directory gui and type the following command to see the system usage:

`python GUI_robotics_students.py`



```
Terminal
File Edit View Search Terminal Help
btorobotica@btorobotica-ThinkPad-P50:gui->
btorobotica@btorobotica-ThinkPad-P50:gui->
btorobotica@btorobotica-ThinkPad-P50:gui-> python GUI_robotics_students.py
*****
Usage: python GUI_robotics_students.py num_behavior
Where num_behavior:
1 = Avoid obstacle and search light reactive behavior
2 = Avoid obstacle behavior
3 = Search light behavior
4 = FSM to search light and avoid obstacle behavior
5 = Student behavior 1
6 = Student behavior 2
Example:
python GUI_robotics_students.py 3
*****
btorobotica@btorobotica-ThinkPad-P50:gui-> 
```

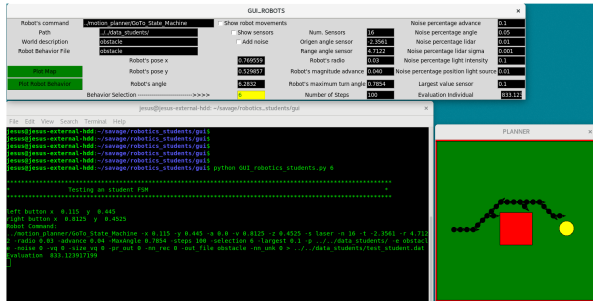
Robotics Students

5. Select the type of behavior to be tested after the command `python GUI_robotics_students.py`

For example to test "Student behavior 1", type the following command:

```
python GUI_robotics_students.py 6
```

In the PLANNER window select the robot's origin with the mouse's left button. Select the robot's destination with the mouse's right button.



Robotics Students

6. Different behaviors can be selected in the Behavior Selection option. In the field World description can be selected the environment where the simulated robot operates, there are 14 environments: obstacle, random_1, random_2,..., random_13. When a new environment is selected push the Plot Map button to display it. The result of robot's results can be seen again pushing button Plot Robot Behavior. To display the robot's sensors select the check button Show sensors.

Robotics Students

To display the movement of the robot step by step select the check button Show robot movements. Show robot movements. To add noise to the sensors and to the movement select the check button Add Noise.

The screenshot displays the GUI_ROBOTS application interface, which is divided into several sections:

- Robot's command:** `./motion_planner/GoTo_State_Machine`
- Path:** `./data_students/`
- World description:** `obstacle`
- Robot Behavior File:** `obstacle`
- Buttons:** `Plot Map` and `Plot Robot Behavior` are highlighted in green.
- Behavior Selection:** A dropdown menu showing `6`.
- Sensors and Noise:** A table of sensor data and noise percentages.
- Terminal:** A window showing the execution of the `python GUI_robotics_students.py 6` command and the output of the robot's movement.
- PLANNER:** A 2D plot showing the robot's path (blue dots) and the environment (green background with obstacles).

Sensors and Noise	
Num. Sensors	16
Origin angle sensor	2.3561
Range angle sensor	4.7122
Robot's radio	0.03
Robot's magnitude advance	0.040
Robot's maximum turn angle	0.7854
Number of Steps	100
Noise percentage advance	0.1
Noise percentage angle	0.05
Noise percentage lidar	0.01
Noise percentage lidar sigma	0.001
Noise percentage light intensity	0.1
Noise percentage position light source	0.01
Largest value sensor	0.1
Evaluation Individual	833.124

```
jesus@jesus-external-hdd: ~/savage/robotics_students/gui
File Edit View Search Terminal Help
jesus@jesus-external-hdd:~/savage/robotics_students/gui$
jesus@jesus-external-hdd:~/savage/robotics_students/gui$
jesus@jesus-external-hdd:~/savage/robotics_students/gui$
jesus@jesus-external-hdd:~/savage/robotics_students/gui$
jesus@jesus-external-hdd:~/savage/robotics_students/gui$
jesus@jesus-external-hdd:~/savage/robotics_students/gui$ python GUI_robotics_students.py 6
.....
*          Testing an student FSM          *
.....
left button x 0.115 y 0.445
right button x 0.8125 y 0.4525
Robot Command:
./motion_planner/GoTo_State_Machine -x 0.115 -y 0.445 -a 0 -v 0.8125 -z 0.4525 -s laser -n 16 -t -2.3561 -r 4.712
2 -radio 0.03 -advance 0.04 -MaxAngle 0.7854 -steps 100 -selection 6 -largest 0.1 -p ./../data_students/ -e obstac
le -noise 0 -ve 0 -size vg 0 -pr_out 0 -nn_rec 0 -out_file obstacle -nn_unk 0 > ../data_students/test_student.dat
Evaluation 833.123917199
```

The PLANNER window shows a 2D plot with a green background, a red square obstacle, and a blue path of dots representing the robot's movement. A yellow circle is also visible on the right side of the plot.