

Technical University of Košice
Faculty of Electrical Engineering and Informatics

Learning Using Teleoperation on Humanoid Robotic Systems

Appendix A

User Guide

Bachelor's Thesis

Study Programme: Cybernetics
Field of study: 9.2.7 Cybernetics
Department: Department of Cybernetics and Artificial Intelligence (KKUI)
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1 User guide

1.1 File and Folder Organization

The appended CD has the following folder organization:

docs/ – This folder contains documentation for whole project in TeX format. It contains 3 sub-folders documenting each of the project components and the *Merge/* folder, which contains documentation for whole project joined together.

simulation/ – This folder contains a Webots simulation app with the file structure organized according to the Webots standards. It also contains a custom controller for *Supervisor* module, and custom NAO world.

visualization/ – This folder holds 2 sub-folders. In the *server/* are files associated to running custom web server with the WebSocket, and also all files needed for the NFQ algorithm like a neural network script. The second sub-folder *app* contains a web application visualizing the teleoperation and the learning process.

1.2 Application startup

This application is intended for usage in web browser. It's necessary to run a web server before running it. I have written such server, which can be found in */visualisation/server* folder on appended CD. To start a server, navigate to the folder and run following command:

```
$ python server.py
```

For a proper functionality of this server, it's necessary to have installed release of *Python 2.7* with following libraries:

1. Tornado – <http://www.tornadoweb.org/>
2. Redis – <https://redis-py.readthedocs.org/en/latest/>
3. numpy – <http://www.numpy.org/>
4. naoqi – <https://community.aldebaran.com/>.

Appended links also provide a guide to install these libraries. After successfully running the server, the web application should be available typing URL *127.0.0.1:9000* into your browser.

1.3 Intro screen

After running the web server and entering the web page, you can see following intro screen. To start a teleoperation process click on *Start Teleoperation* button. If the

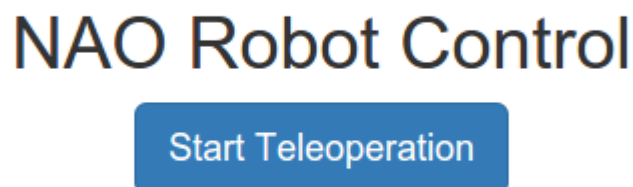


Figure 1 – 1 Application introduction page

connection was successful, the teleoperation screen will show up, otherwise, the error message will be displayed.

1.4 Teleoperation

The application provides following features:

- Movement of a robot.
- Observation of robot state in an environment.
- Saving of currently learned behavior/task.
- Loading and running the behaviors from the past.

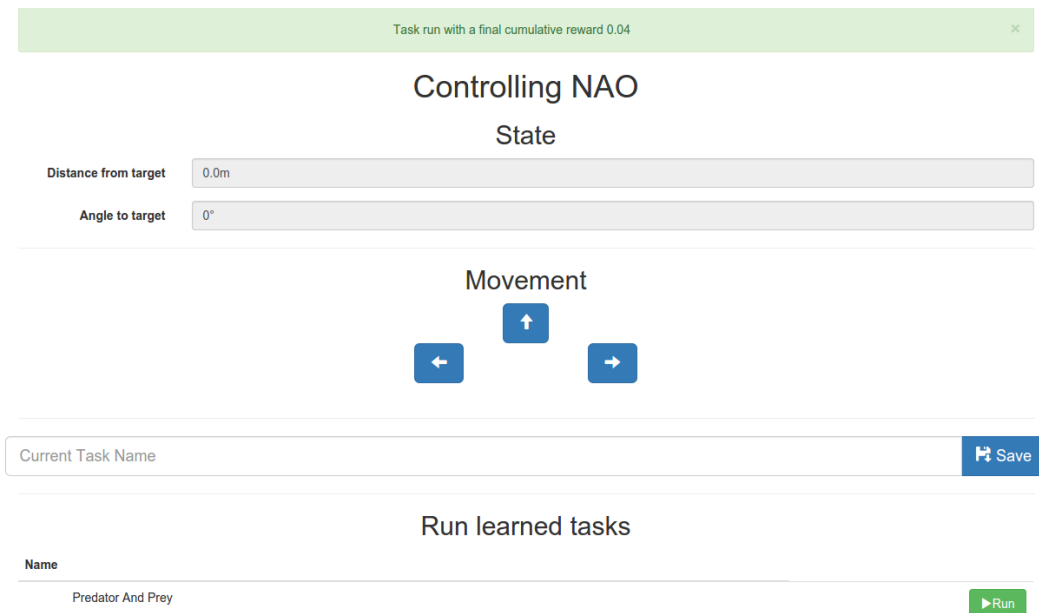


Figure 1 – 2 Application main window

The *State* section provides information about the current state. The first input box is telling how far is a target from the robot. The second input box tells the rotation of a robot against the target as mentioned in the work.

The *Movement* section enables operator to make 3 basic movements. As the arrows indicate, the robot can go forward and turn left/right.

To save the current progress of the learning process, a user has to fill the name of the task in the input box, under the movement arrows. The task is saved after clicking the button *Save* next to it.

In the *Run learned tasks* section, a user can see all behaviors that have been saved previously. To run the behavior on the robot, click the button *Run* located next to the task name. When the performance is over, there appears an info box at the top of the screen notifying about the final reward acquired during the task.