

Robotics 2 (SS 2022)

Exercise Sheet 0

Presentation during exercises in calendar week 19

Exercise 0.1 – Installation of rbdL-toolkit

The fastest way to run rbdL-toolkit is to use the provided AppImage (Linux Users) or the DMG (MACOS Users). Download the latest release from <https://github.com/ORB-HD/rbdL-toolkit/releases>. To run rbdL-toolkit directly from your terminal symlink the location of the downloaded image to your path. For example on Ubuntu based systems do:

```
ln -s $PATHSTOREDIMG/rbdL-toolkit-x86_64.AppImage $HOME/bin/rbdL-toolkit
```

Also make sure that the AppImage can be executed!

Exercise 0.2 – First steps in rbdL-toolkit

In this exercise, you will explore the visualization tool RBDL-TOOLKIT. RBDL-TOOLKIT uses skeleton based animation and OpenGL to visualize models and 3D motions.

To start RBDL-TOOLKIT, open a terminal window and type in

```
rbdL-toolkit
```

Open the example model file

```
samplemodel.lua
```

and the example animation file

```
sampleanimation.txt.
```

Both files are simple text files and can be edited using a standard text editor such as `gedit` or `vim`.

Familiarize yourself with RBDL-TOOLKIT, especially with the camera controls. What happens if you hold the different mouse buttons while moving the cursor?

Exercise 0.3 – Animation files

You can load models and animations directly via the command line

```
rbdl-toolkit -m samplemodel.lua -a sampleanimation.txt
```

Inspect the animation file. How does it work?

Inspect your model file and make use of the `rbdl_luaamodel_util` function.

How are joints defined in the lua model?

Exercise 0.4 – "Hello World"

Copy the files `samplemodel.lua` and `sampleanimation.txt` in a separate folder and edit the animation file to make the model wave with its right arm.

Hint 1: Press F5 to load the changes directly in RBDL-TOOLKIT.

Hint 2: **View Settings** allows activating the local coordinate systems. The X , Y and Z axis are red, blue and green respectively.

Exercise 0.5 – Model changes

Edit `samplemodel.lua` in the following ways:

1. Double the size of the head
2. Display spheres in the joints. Use the file `"meshes/unit_sphere_medres.obj"` as `src` attribute. Choose a 0.15 radius and a green (0., 1., 0.) color.
3. Reduce the length of the arms and legs by a factor of 2 (Note: this means you also have to adjust the values of `joint_frame = { r = { ... } }`)

Exercise 0.6 – Create your own model

For a future exercises, we need a visualization of a double pendulum.

First, create a model mounted $1m$ above ground . The two elements should be of $0.4m$ (upper one) and $0.3m$ (lower one). The rotation axis shall be X .

Next, create an animation for this model. The first element should rotate counterclockwise once in two seconds. In the same time, the second element should rotate twice clockwise.

Notes:

- RBDL-TOOLKIT can be downloaded from <https://github.com/ORB-HD/rbd1-toolkit> Some documentation is available there, as well.
- The skeleton semantics for the model visualization is based on Lua, a scripting language <http://www.lua.org>, which makes the model representation highly flexible.