

Sheet 1

Topic: Setup

Due date: 22.04.2016

General Notice

Solving the exercise sheets is recommended but not mandatory to be admitted to the final exam. There are no bonus points.

Exercise sheets will be published on Fridays and will be discussed in class one week later. We strongly encourage you to solve the exercise sheets beforehand to benefit from the discussions in class.

We will be using Octave for the programming exercises. Octave is a command line program for solving numerical computations. It is mostly compatible with MATLAB and is freely available for Linux, Mac OS and Windows from www.octave.org. Octave can be used as a command line tool and also comes with a GUI (similar to MATLAB). A quick guide to Octave is given in the Octave cheat sheet which is available on the website of this lecture. All exercises can be solved with either MATLAB or Octave.

Install Octave on your system in order to solve the programming assignments:

Windows installation short guide:

Download the octave windows installer from

<ftp://ftp.gnu.org/gnu/octave/windows>.

After installing it, you will have two Octave executables:

- the command line tool: Octave(CLI)
- the GUI (similar to the MATLAB GUI) with integrated command line and editor: Octave(GUI)

Linux installation short guide:

Install Octave with apt-get:

```
$ sudo apt-get install octave
```

After installing it, you will have two Octave executables that you can run from the Linux terminal:

- the command line tool: `$ octave`
- the GUI (similar to MATLAB GUI) with integrated command line and editor:
`$ octave --force-gui`

Exercise 1: Defining functions

Functions in Octave are usually defined in files where they can be easily edited. Implement the function

$$f(x) = \cos(x) \exp(x)$$

in a file named `f.m`. Next, launch Octave from the same folder in which you stored the function and use the newly defined function. The file name has to match the function name so Octave can find your newly defined function.

Exercise 2: Plotting data

Like functions, entire Octave programs or scripts are usually placed in files and later evaluated.

- a) Write an Octave script that plots the graph of the function f in the interval $[-2\pi, 2\pi]$ (Octave has as a special variable `pi` for π). Save the script to a file named `plot_f.m`.
- b) Save the resulting plot as a PNG-file to your hard disk.

Exercise 3: Generating random numbers

Random numbers are important in probabilistic robotics so it is preferable to know what kind of random variables are provided by Octave and how to use them.

- a) Create a vector with 100000 random variables which are normally distributed with a mean of 5.0 and a standard deviation of 2.0.
- b) Create a vector with 100000 uniformly distributed random variables between 0 and 10.
- c) Compute the mean and standard deviation of the two vectors with random variables. Are the results what you would expect?
- d) Plot histograms of the random variables you generated. The `hist` command can be used to plot histograms. Take a look at `help hist` for more information about how to use it.