Planning and Optimization

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Classroom Exercise 1

Exercise 1 (Setting Up Fast Downward)

The *Fast Downward* planning system is a tool that we use frequently for demos in the lecture and for exercises of the course. Your task in this exercise is to get access to the course repository as well as the planner installed and running. We describe two ways of setting up your system in the following: we start with the recommended way that uses *Vagrant* and *VirtualBox*, which should be possible on all Intel and AMD architectures. Afterwards, we point to relevant repositories and installation instructions in case you want to or have to set up your system manually. Please follow the instructions **in one** of these two possibilities.

Installation with *Vagrant* and *VirtualBox* Start by installing *Vagrant 2.4.1* and *VirtualBox 7.0.20* by following the installation instructions for your operating systems at

- `https://developer.hashicorp.com/vagrant/install` (version: 2.4.1) and
- `https://www.virtualbox.org/wiki/Download_Old_Builds_7_0` (version: 7.0.20).

Note: Some versions of the two programs are not compatible with each other (such as the version shipped with the *apt* package manager on recent Ubuntu versions). Therefore, we recommend installing the above-mentioned versions that we have tested.
Troubleshooting: If you receive an error message, inspect it carefully. It may be that the packages depend on another package, *X*, which has not yet been installed. You will need to install it first, e.g., with `$ sudo apt install X`.

With both tools installed, you can set up the virtual machine that runs the *Fast Downward* planner:

(a) Download the vagrant configuration file (Vagrantfile) from the Git repository of the course at `https://github.com/aibasel-teaching/planopt-hs24`. For example, you can use the following command:

`$ wget https://raw.githubusercontent.com/aibasel-teaching/planopt-hs24/main/hands-on-1/Vagrantfile` (remove potential spaces in the link)

(b) Copy or move the downloaded file to an *empty* directory. Make sure that your operating system didn't add a (possibly hidden) file extension (we have seen this happen frequently on Windows).

(c) Open a console in that directory and execute `$ vagrant up` (this may take a while).

Over the course of the semester, you'll have to interact with the virtual machine set up with *Vagrant* repeatedly. The most important commands to do so are:

- `$ vagrant up` to start the virtual machine (after the first time, this won't take as long)
- `$ vagrant halt` to stop the virtual machine
- `$ vagrant ssh` to connect to the virtual machine
- `$ exit` to disconnect from the virtual machine

You now have set up the virtual machine, cloned all relevant repositories and installed required packages and tools. You have not yet compiled the Fast Downward planner that is used for this exercise, though. To do so, connect to the virtual machine (with `$ vagrant ssh`), then

(a) change to the directory with the Fast Downward version used for this hands-on session with

```
$ cd /vagrant/planopt-hs24/hands-on-1/fast-downward
```

(b) compile the planner with `$ ./build.py`.

(c) run the planner on the gripper instance with

```
$ ./fast-downward.py ../gripper/domain.pddl ../gripper/problem.pddl \
          --heuristic "h=ff()" --search "eager_greedy([h])"
```

Congratulations, you have successfully set up your system for the practical part of the exercises!

Manual Installation An alternative is to install everything that is required manually. Start by cloning the following repositories:

- the repository of the course at `https://github.com/aibasel-teaching/planopt-hs24`
- the plan validator `val` at `https://github.com/KCL-Planning/VAL`
- the plan validator `INVAL` at `https://github.com/patrikhaslum/INVAL`
- the LP-solver `SoPlex` at `https://github.com/scipopt/soplex.git`

You can find the individual steps that are required to install the plan validators and the LP-solver in the Vagrantfile. To give you an idea of what is happening in the Vagrantfile, please note that

- we are not using the latest version of `val` and `SoPlex`
- the `val` revision we use raises warnings during compilation that are treated as errors
- the produced binaries are moved to a folder on `PATH` (such that they can be executed from anywhere without providing a path to the binary)

If you manage to successfully install the validators and the LP-solver, you still need to compile the Fast Downward planner that is used for this exercise sheet:

(a) Change to the directory with the *Fast Downward* version used for this hands-on session. You can find it in the directory `hands-on-1/fast-downward` of the repository of the course.

(b) Follow the instructions on how to compile *Fast Downward* in the `BUILD.md` file of the cloned repository.

When you have successfully compiled *Fast Downward*, run the planner on the gripper instance with

```
$ ./fast-downward.py ../gripper/domain.pddl ../gripper/problem.pddl \
          --heuristic "h=ff()" --search "eager_greedy([h])"
```