

Modeling an initial guess model

We will use OpenSCAD to build an initial guess model of the environment. After some conversions, this model can be used as input for the post-processing step of the map merging system

- The first step is to install OpenSCAD on your Ubuntu machine:

```
sudo add-apt-repository ppa:openscad/releases  
sudo apt-get update  
sudo apt-get install openscad
```

- In this portfolio, you can find an example .scad file at '**Tech report/Initial guess/OpenSCAD/dataset_model.scad**'. Open this file in OpenSCAD.
- As you can see in the example, OpenSCAD allows you to model an environment by writing code. Try changing the dimensional parameters at the top of the file to adapt the model. When you want to apply your changes, press F5 to refresh the model.
- If your model is finished, press F6 to render the model. Then, go to '**Design**' > '**Export to STL**'. Via some detours, the .stl file format can be converted to a binary file or a point cloud.

Conversion to binary

In order to convert the .stl file to a binary or a point cloud, we have to convert it to a .binvox file. **Binvox** is an open-source program that reads a 3D model file, rasterizes it into a binary 3D voxel grid, and writes the resulting voxel file. You can download it at <http://www.patrickmin.com/binvox/>.

- In your home folder, create a folder called 'binvox'.
- Download the binvox executable from the link above to your binvox folder.
- In this portfolio at '**Tech report/Code/Shell scripts**', you will find my *binvox.sh* script. Open a terminal and execute this script. You will be asked which .stl file you want to convert. Enter the file location and hit 'Enter'. You can find the binvox file in the same folder as the .stl file you converted
- Open a terminal, and navigate to this folder
- OctoMap includes the **binvox2bt** package. Convert the binvox file to a binary by running:

```
binvox2bt --mark-free<your_file>.binvox
```
- A binary file called <your_file>.binvox.bt is now placed in your folder that includes the .stl file and .binvox file. You can visualize it with octovis

```
octovis <your_file>.binvox.bt
```

Conversion to point cloud

For my map merging approach, we will have to convert the binary file to a point cloud. Based on an executable I found in the OctoMap package, I built a ROS node that does this.

- In my portfolio, go to **/Tech report/Code/ros_catkin_ws/src/** and copy the **/octomap_merger** folder to your ROS workspace. As usual, build it by running ***catkin_make --pkg octomap_merger***
- Open a terminal and start a roscore by typing ***roscore***
- To convert a .bt file to a point cloud, execute ***roslaunch octomap_merger bt2pcd <input_file.bt> <output_file.pcd>***
Replace **<input_file>** with the file path of your binary that has to be converted, and replace **<output_file>** with the a good name for your point cloud.

To visualize the .pcd file, you can install the PCL library. Installation instructions for Linux can be found at http://pointclouds.org/documentation/tutorials/compiling_pcl_posix.php#compiling-pcl-posix.

The installation process can take quite a while. When it's done, open a terminal, navigate to the folder that contains your .pcd file and type

pcl_viewer <your_file>.pcd