Assessment of Bachelor's Thesis as an External Examiner

Title: **Map Import for Mobile Robot from CAD Drawing**
Author: **Vojtěch Pánek**
Supervisor: **Ing. Vladimír Smutný, Ph.D.**
External examiner: **Dr. Gaël Écorchard, ČVUT**

Fulfilment of Assigned Tasks

All assigned tasks were fulfilled. Though not clearly specified in the task assignment one could expect that the student would use at least a simulator if not a real robot to test the implemented converter. The converter was only tested visually. The assigned task are of middle difficulty but the implementation of the converter must have required a lot of programming work.

Resolution Methods

After manual cleaning in a CAD drawing program the entities in the drawing are decomposed into smaller line segments. The end points of these line segments are the base of the alpha-shape calculation, used to filter out the entities that should not be taken into account into the NDT-map. This method requires however that the user chooses the sampling parameter correctly as it looks that a wrong sampling will lead to bad results. It appears to me that the student spend lots of efforts to correct some errors in the CAD drawing. According to me, it would have been better to concentrate the efforts on providing an algorithm that does not require parameter tuning and supposing that some of these errors must be corrected manually. Couldn't the sampling method be replaced by a bitmapping method, for example? It is easy for example to check if walls are watertight on a bitmap image. Also, redundant lines, which are difficult to detect in a CAD program, have no influence on a bitmap image.

In Section 3.2 it is stated that an occupancy of -1, representing an unknown value, is assigned to a cell that doesn't contain any geometric object but the space in the middle of a room is also without any geometric object but its occupancy is known. Why using raytracing for the occupancy map and not getting the value directly form the Gaussian distribution. Section 5.3 describes a method to divide entities into cells, however, it is not clear to me why such a division is required. All entities are sampled by a series of points which automatically fall into a single cell.

Why is it a problem that both sides of a wall fall into the same NDT cell?

The thesis doesn't state any normalization of the Gaussian distributions between each other. Isn't any such normalization required?

Obtained Results

It appears that a lot of implementation work was provided by the student. The limitations of the converter are also given by the student what is important for further work on the project. As already written, a simulation using the created map would have been welcome.

Practical Requirements

In a general manner, the thesis is written in a comprehensible English, though some sentences would have require another proofreading. The usefulness of the description of DXF format would have been more appropriate in annexes, it would have been sufficient to detail which kind of entities are supported. In general, in my opinion, it would be better to describe the used technologies where they are needed. By reading the thesis in order, the reader reads a complete chapter of technology descriptions without any idea about their use.

The variables in Eq. 3.1 to 3.4 are not defined in the text.

The figures and the presentation in general are of good quality. The presented diagrams explain cleary how the converter works.

The bibliographic references are appropriate.

General Comments and Conclusion

As a conclusion, I advise the commission to evaluate the presented bachelor's thesis with the grade

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B - Very Good.

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Prague, June 4, 2018 — Dr. Gaël Écorchard
ČVUT, CIIRC