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Master's Thesis Review

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Title: Semantic Surface Segmentation for RC car model
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The thesis presents a method for semantic segmentation of surfaces in images captured by a vehicle camera. The proposed method is implemented on our sub-scale vehicle platform. The accuracy and performance of the method are shown in a simple auto-pilot demonstrator. The algorithm autonomously drives the sub-scale vehicle so that it follows a path of a given surface.

Michal was one of developers of the sub-scale vehicle platform. The project started in CTU team project course in 2019, continued over the summer, and the effort resulted in paper accepted to IEEE Intelligent Vehicles Symposium [1]. The paper contains a baseline semantic surface segmentation algorithm. In the thesis, Michal further developed the method by extensively elaborating the hyper-parameters and proposing novel loss functions. It turned out, that the elaborated model outperforms the baseline significantly.

Michal worked systemically, and proved a solid competence in recent machine learning techniques and at the same time strong engineering skills needed for the platform development, implementing the method on an embedded computer, and performing real ride tests. Michal was quick in understanding and implementing new concepts. For instance, his incorporating the focal loss was very smooth.

To name a few weaknesses of the thesis, the auto-pilot algorithm is rudimentary and heuristic. A single experiment only on the CTU yard is shown. On the other hand, I did not see this point as the core of the thesis but rather as a bonus. Moreover, we have to consider that due to Covid-19 measures, possibilities to perform real experiments have been limited. The text of the thesis would benefit from another proofreading. Nevertheless, the weaknesses are minor compared to the overall Michal's contribution.

In summary, I suggest evaluating the thesis as

A – excellent.

Ing. Jan Čech, Ph.D.
Thesis Advisor

References

[1] M. Bahnik, D. Filyo, D. Pekarek, M. Vlasimsky, J. Cech, T. Hanis, and M. Hromcik, "Visually assisted anti-lock braking system," in *Proc. IEEE Intelligent Vehicles Symposium*, 2020, To appear.