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EVALUATION OF THE MASTER'S THESIS

Author: **Erik Derner**
Title: **Visual Localization and Place Recognition**
The review was written by the supervisor of the thesis: **Assist. prof. dr. Danijel Skočaj**

The Master's thesis addresses the problem of mobile robot localization using visual information, more precisely using panoramic images captured with an omnidirectional sensor. The task the student was given was to set up a robot system equipped with an omnidirectional camera, to acquire the images, and to develop and implement a method that would recognize the current position of the robot using an image captured at that position and previously learned model of the environment.

The student successfully fulfilled this task. He spent three and a half months in the Visual Cognitive Systems laboratory at the Faculty of Computer and Information Science, University of Ljubljana. He was given a robot and he managed to set up the robot to perform the required task. He acquired with the robot datasets containing panoramic images and reference locations obtained using a laser range finder. Due to malfunction of the GPS receiver, he was not able to capture the ground truth data outdoors, so he performed the experiments inside the building. He implemented a method for image-based localization using CNN descriptors and k-NN classifier. He also implemented several extensions of the basic approach that considerably improved the results. The results of localization were very good and show that such an approach could be used for image-based localization.

The thesis is written very well. The technical language is good, the thesis is readable and clearly written, it contains all the elements that are to be expected from a technical document. The English is excellent. The thesis is formatted very well; the fonts, line spacing, margins, etc. are adequate. The thesis contains a number of figures and tables that provide additional information about the work. The document is adequately decomposed to chapters and sections. It is concisely written, but it contains all the necessary information. The pages, sections, figures, and tables are adequately numbered. At the beginning the corresponding table of contents and lists of figures and tables are given. The notation is clear and used consistently throughout the thesis. The terms are defined prior to their usage. The related work is adequately cited, the list of references is adequate.

Final clause:

I evaluate the submitted thesis with the grade B – very good (or with A – excellent).

Since I have no experience with grading the MsC students at CTU Prague, it is difficult to me to choose the correct grade. The candidate was working very well; he was very independent and able to fulfill the given tasks. He spent quite some time working on the robot to gather the data and consequently he run out of time to perform some additional experiments that could be done (using other descriptors, estimators of location, etc.). The thesis could be richer from the content point of view if these additional experiments were performed. Since the candidate set up the entire pipeline nicely, they could be performed in a week or two, but unfortunately he run out of time. I would therefore grade his work and effort as very high, although this is not entirely reflected in the content of the written part of the thesis.

Thesis supervisor: assist. prof. Danijel Skočaj