Bachelor thesis evaluation
"Visual analysis of beehive queen behaviour"

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The thesis aimed to implement a system capable of reliable detection, localisation and tracking of honeybee queens in an observation hive.

The assignment was rather difficult due to its interdisciplinary character, the necessity of working with large and noisy data, and cooperating with scientists from different fields. Fulfilling the thesis goals required to quickly learn state-of-the-art computer vision and tracking methods as well as the Robot Operating System middleware. Moreover, the student had to learn to work with large datasets and invested a significant effort in data annotation necessary to evaluate the developed methods. The student worked autonomously and systematically, testing and integrating components of her work into a larger system for analysis of honeybee queen interactions. She consulted her work regularly, reliably fulfilling due dates set for the individual steps of her work. Most importantly, she proved her ability to cooperate with an interdisciplinary, international team of biologists, roboticists, and machine learning experts.

The work in the thesis is well-motivated, and the problem to be solved is described well. The overview of the performance of state-of-the-art methods used is sufficient to understand why the particular fiducial marker detection was chosen as a base method to solve the problem. Then, the thesis shows how the original method was integrated into the beehive observation system and points out two aspects in which its performance needs to be improved. The modifications developed to address the performance deficiencies are described, leading to a novel fiducial marker detection method capable of dealing with the conditions in the observation hive. The experiments performed on the previously gathered datasets convincingly demonstrate that the proposed method significantly outperforms the original one. While the thesis does a good job to explain why and how the overall problem was approached, some sections are a bit short. In particular, state of the art focuses on particular methods applicable to the problem, and the theoretical background of computer vision is relatively short. Despite this minor shortcoming, the thesis does a very good job of describing the developed method, its purpose and its performance.

Therefore, I propose to classify the thesis as

B - very good.

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