Assessment of bachelor's thesis as external examiner

Title: **Distributed Cohesive Control for Swarms of Micro Aerial Vehicles**
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External examiner: **Dr. Gaël Écorchard, ČVUT**

Fullfilment of Assigned Tasks

All assigned tasks have been fulfilled. A large number of algorithms were implemented and tested on two different simulation environments.

Resolution Methods

The student bases his work on existing algorithms for planar robots and extends them to the three-dimensional case. The transition from 2D to 3D is clearly documented. However, because of the lack of figures and the tendency of the student to rely on the reference to an article without even a small definition of used terms, the explanation of the algorithms are difficult to follow without studying the cited articles. As an example, a lot of notions are cited but there are not accompagnied by any explanation, e.g. BOID, α-lattice, Steiner tree, Gabriel Graph, Gabriel Unit Disk. The analogy to stockings sounds interesting but a picture would have helped the reader understand what is exactly meant. This is a general remark, that more figures describing interactions between drones and the effects of the algorithm on the drone positions would have been welcome.

The complete work is based on the use of a relative localization system but there is no mention of what are the actual type of ouput values and ranges of this system.

An explanation of the data flow between MAVs would have been beneficial.

It is stated in the thesis that the firmware of the PixHawk autopilot was integrated in the simulation. Is this the low-level control stated in the introduction? It is not clear here which part was already available and which part was the student's own work.

Obtained Results

The algorithms, both in 2D and 3D, are well tested and the results sound correct. The GUIs developed both for V-REP and ROS are surely a valuable result for the rest of the team and will ease further development and parameter tuning.

The simulation results could have been accompagnied with a description of the different simulation environments. In particular, the question raises how accuracte or complete they are (wind, turbulences between drones, sensor noise, ...), thus how can the algorithm be applied to the real world.

Practical Requirements

The thesis is clearly written for its major part. Some sentences are a bit difficult to understand though and would have benefited from some rephrasing. Grammatical articles are often missing or, less often, the wrong article is used. Very few grammatical mistakes were noted.

There are a number of uncited figures and tables, as for example Figure 3.1 and Table 3.1. The citations are numerous and appropriate, though the part of the State of the Art dealing with path planning appears to be out of topic.

Conclusion

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

B - Very Good

Prague, January 31, 2017

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