Assessment of Masters' thesis as supervisor

Title: **An Optical Flow Odometry Sensor Based on the Raspberry Pi Computer**
Author: **Adam Heinrich**
Supervisor: **Dr. Gaël Écorchard**

Fullfilment of Assigned Tasks

The four assigned tasks have been fullfiled entirely. Particularly, a large part of the work was the experimental verification of the developed algorithms.

Resolution Methods

After a thorough study of existing solutions the student develops the theoretical part of the different algorithms used through his thesis. An appreciable fact is the great deal that the student gives to details. The student studied for example the implementation of the H.264 video encoding standard and describes the part of it which are necessary to understand the developed GPU-based algorithms. The number of iterations of the RANSAC algorithm is justified by a set of equations, cited from an article, using a few parameters related to the required precision instead of using an empirical value as often seen. In Chapter 6, the different issues encountered during the implementation of the mixed GPU-CPU solution are described and their resolution by the student is shown.

Obtained Results

The most obvious positive result of the student's work is the one presented in Figure 7.11, where the trajectory of the UAV as obtained with the Raspberry Pi is compared to the absolute, though imprecis, data from GPS. When compared to both the Whycon system and the current reference sensor, the PX4Flow, the developed solution shows promising results which are described in details in Chapter 7. One of the significant results from the work is the contribution of source code for general availability either as standalone project or patches to larger projects. The methods developed within this thesis will for sure be used further within our Group, and probably also outside of it. The method indeeds returns the changes in orientation around the camera axis, which the reference sensor is unable of doing. The student states that some computationnal power of the Raspberry Pi remains available for other algorithms. An intersting fact, however, would have an estimation of the computer resources used by the method on top of the description of the time spent to evaluate the motion for each camera frame.

Practical Requirements

The thesis is well presented. Apart from a few stylistics error that do not disturb the comprehension of the text, I didn't notice any error in the English language. The presented plots are clear. The work is accompagnied with a comprehensive list of bibliographic references as well as a few footnotes.

General Comments and Conclusion

It was a real pleasure to supervise the work of student Adam Heinrich. He came punctually to the planned meetings and presented new interesting results almost each time. Only a few discussion were necessary and the student would independently develop and test the ideas discussed as well as his own ideas.

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

A - Excellent

Prague, January 23, 2017

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