

## **Miniature navigation system for UAS application**

The objectives of the diploma thesis were:

1. to design and develop a light-weighted and small-sized inertial navigation system (miniINS) consisting of inertial measurement unit, GNSS receiver, and pressure measurement unit.
2. to specify the requirements based on which the miniINS is composed of and further developed.
3. to design and develop FW part based on a given Matlab code suitable for the STM uC.
4. to perform practical experiments with the miniINS put on a UAS and test/verify the final solution and specify the reached accuracy.

At the beginning the student has planned the steps to take in a common agreement with the supervisor, and fully followed the agreement withing the whole period. The structure of the mini-navigation system was made based on a current methodology and the selection of components based on specified requirements and market analysis. As a first step in the development phase, the student used a breadboard and components as well as development kits available on market. In general, there was a lack of components available on market, so some decisions had to be taken based on the components' availability. When the components and dev. kits were put together into the breadboard, the student started developing the FW keeping the requirements related to the data synchronization, collection, and treatment in mind. FW design was made based on the given Matlab code, nevertheless, I have appreciated the student's effort to understand the code and several time the student came up with the improvement. The FW consisting of the navigation solution was written in C language. The breadboard version was confirmed by experiments in the lab and the development moved to another phase, i.e. the PCB of the navigation unit design and development. To design the PCB the KiCAD was used. There had been performed many iterations between the design was ready for manufacturing.

There was just a short time for the PCB manufacturing at the end as well as for its finalizing. The current stage is that the PCB is manufactured, but not soldered, finalized, and verified. The final tests with the breadboard version were performed by the student himself while travelling on the bus. The performance suffers from the lack of tuning, but based on its appearance it can be mentioned it is functional.

Even the student did not finalize the PCB and did not confirm the final performance, he spent a plenty of time on his diploma thesis and reached good results. The solution was sometimes affected by bad communication between the supervisor and student leading to small delays, but all was caught up and the written and practical forms of the diploma thesis are good. The student cooperated with the supervisor on a good level, steps were discussed, agreed, and followed and results are meaningful. There is just a pity, that it was not finalized in an appropriate period, which I reflect in the evaluation, but the rest what was done by the student is high quality work. I appreciate a lot the student involvement and promise of finalizing the work even after the defense. The student paid a big effort into the diploma thesis and thus:

**I do recommend Mr. Mantaos's diploma thesis for the defense and suggest its classification with respect to the ECTS rules by the grade**

**B (very good).**

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