

I. IDENTIFICATION DATA

Thesis title:	Stabilization of an autonomous multirotor UAV with doppler radars
Author's name:	Libor Dubský
Type of thesis :	bachelor
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Cybernetics
Thesis reviewer:	Ing. Tomáš Rouček
Reviewer's department:	Department of Computer Science

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	challenging
<i>How demanding was the assigned project?</i>	
Tasks given required student to design and manufacture a circuit board as well as its programming and integration into vast software package of MRS group. The task can be considered challenging due to this multidomain goals. This is even better highlighted with the need to manufacture or acquire hardware components which takes time and is usually out of control for the student	

Fulfilment of assignment	fulfilled with major objections
<i>How well does the thesis fulfil the assigned task? Have the primary goals been achieved? Which assigned tasks have been incompletely covered, and which parts of the thesis are overextended? Justify your answer.</i>	
From the goals given student managed to design and do a revision of two separate PCBs as well as the firmware and mounting for them. The integration to the ROS system was also somewhat done. The fusion with onboard IMU and state estimation was not done or mentioned in the work at all.	

Methodology	partially applicable
<i>Comment on the correctness of the approach and/or the solution methods.</i>	
The design of the PCBs, mounting and interface with the PC was done correctly using proper approaches. From the work nor the code it is obvious how many angles for the radars have been tested. The computation of the speed greatly depends on the angle of the radar to the ground which changes with the tilt of the UAV. This could be potentially measured using the IMU.	

Technical level	C - good.
<i>Is the thesis technically sound? How well did the student employ expertise in the field of his/her field of study? Does the student explain clearly what he/she has done?</i>	
Student is most likely well versed in electronics design which is the best described part of the thesis. The analysis of first obtained data to obtain optimal angle for the radars is missing any numerical evaluation and is described as "The velocities are similar" even though it was using different orientation and polling rate than the final solution. The part where student was supposed to make state estimator is not described at all and student tried to present something else as a solution to this.	

Formal and language level, scope of thesis	E - sufficient.
<i>Are formalisms and notations used properly? Is the thesis organized in a logical way? Is the thesis sufficiently extensive? Is the thesis well-presented? Is the language clear and understandable? Is the English satisfactory?</i>	
The technical background section barely contains any information. The structure of the work is fine but some paragraphs appear out of order and sometimes refer to random irrelevant information. The thesis goals and tasks are repeated twice in the work needlessly. English appears to have no typos, but sometimes improper versions of words are used such as "some" vs "same". English grammar has mistakes as well. Wrong English phrases are used such as "purity of the voltage" or "waveforms are wavier than lidar waveforms". The length of the work is acceptable albeit short.	

Selection of sources, citation correctness**E - sufficient.**

Does the thesis make adequate reference to earlier work on the topic? Was the selection of sources adequate? Is the student's original work clearly distinguished from earlier work in the field? Do the bibliographic citations meet the standards?

There are no references to any previous work. Chapters "Intro" and "Technical background" contain less references than the assignment itself. All citations are of datasheets or GitHub except of two. However, used diagrams from other works as well as equations are cited well.

Additional commentary and evaluation (optional)

Comment on the overall quality of the thesis, its novelty and its impact on the field, its strengths and weaknesses, the utility of the solution that is presented, the theoretical/formal level, the student's skillfulness, etc.

Thesis most likely brought at least some benefit to the MRS group from the side of the electronics design of the radar board. However student either run out of time or was not as good in other parts such as ROS or state estimation. The form of the work is

III. OVERALL EVALUATION, QUESTIONS FOR THE PRESENTATION AND DEFENSE OF THE THESIS, SUGGESTED GRADE

Summarize your opinion on the thesis and explain your final grading. Pose questions that should be answered during the presentation and defense of the student's work.

Thesis fulfils some goals outlined at the start such as electronics design for both PCBs well. The mounting and firmware for both boards is also done well and most likely have brought at least some value to the MRS group. Other parts such as ROS integration or choice of the radar position on the UAV are not done as thoroughly as the hardware part but if the system would be finished it would be satisfactory.

I am completely missing any state-of-the-art information on the topic as well as full task of integration with onboard IMU for the drone. The title of the thesis, the "Stabilization of ... UAV" is not tackled at all.

Together with subpar English and rushed conclusion without any numerical evaluation I think that the work could be made much better if student is given more time.

Questions:

Why was a different sampling chosen for the initial tests (10Hz) and the final drone experiment (5Hz)? What changes would have to be made to increase the sampling rate to 20Hz (maximum sample frequency of the Lidar)?

Would four radar arrangement that has two opposite radars tilted to different angels allow for better estimation? If so how much would the proposed design have to change?

The grade that I award for the thesis is **E - sufficient**.

Date: **7.6.2023**

Praha

Signature: