

## I. IDENTIFICATION DATA

<b>Thesis title:</b>	<b>Design of a small quadrotor</b>
<b>Author's name:</b>	<b>Kengo Nagashima</b>
<b>Type of thesis:</b>	bachelor
<b>Faculty/Institute:</b>	Faculty of Mechanical Engineering (FME)
<b>Department:</b>	Department of Instrumentation and Automatic Control
<b>Thesis reviewer:</b>	Ing. Jaroslav Bušek, Ph.D.
<b>Reviewer's department:</b>	Department of Instrumentation and Automatic Control

## II. EVALUATION OF INDIVIDUAL CRITERIA

<b>Assignment</b>	<b>challenging</b>
<i>How demanding was the assigned project?</i>	
The task of designing and building a (small) quadrotor is not easy even for advanced modeler. According to the author, he had no experience with this task, so the assignment was challenging for him in my opinion. Also, there is no such a course at the faculty tackling a drone design. However, the lack of information can be compensated by easily accessible information published on internet by more advanced users.	

<b>Fulfilment of assignment</b>	<b>fulfilled with minor objections</b>
<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>	
Primary goals have been achieved. However, the evaluation of results from performed measurements of several motors and propellers have not been done. There are only results (measurements) presented by figures without deeper description or final comparison.	

<b>Methodology</b>	<b>partially applicable</b>
<i>Comment on the correctness of the approach and/or the solution methods.</i>	
The text of the thesis seems to be just description of the steps done. There is no systematic approach to a design of mechanical parts. Even desired or supposed parameters of the quadrotor are missing. It is not defined what is a small quadrotor. There is also no purpose of the quadrotor design defined. The purpose of mounting "various" sensors is not satisfactory in this meaning. The requirements in section 1.2 are contradictory. It is not clear which of the parameters are crucial. There is also no information about batteries – types, weight etc. - although it represents the heaviest part of a small-size quadrotors. The reason "to satisfy some requirements from the supervisor" for modelling mechanical parts stated in section 5.3 is not objective reason for doing something. Also, the material selection is partly wrong. Using balsa is the worst choice for such a stressed part of the frame. This choice was a huge mistake.	

<b>Technical level</b>	<b>C - good.</b>
<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>	
Technical level of the thesis is good. Student used correct technical terms. However, the conclusion from measurement is incorrectly processed. Some figures in section 4.1.1 extrapolate/interpolate linear function from low number of points measured. For example, figure (no reference number) illustrating revolution by current dependency for FOXY G3 extrapolates just two measured points with a linear function (for current less than 2 A) to currents up to 20 A (which is 10 times more). The measuring device is described very vaguely. Most of information about setup is missing although the measurement was given as one of the main tasks. RPM and thrust measurement methods are unclear. There is no information about accuracy of devices used.	

### Formal and language level, scope of thesis

**B - very good.**

*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?*

The language level is very good. There are some typos in the text (for example "flamework of the quadrotor", "poisoning of the motors"). Some text formatting is inconsistent (section 4.1.2). Not all figures are referenced in the text (for example fig. 1.1-5). Some figures (fig. 3.3-4) illustrate principles which are not described in the text (Hall sensor effect and measurement). Also, the purpose of fig. 3.5-2 is not clear. There are some time responses without further explanation. It would be better to explain a basic quadrotor control scheme instead. There is also something referred as to be "explained later" without any reference to chapter number. Abbreviation CFRP is not explained. Pictograms meaning in fig. 5.2-1 is not explained.

### Selection of sources, citation correctness

**B - very good.**

*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?*

The chosen sources are adequate. The student's original work is clearly distinguished. The bibliographic citations slightly vary from the given standard. Some referenced parts are overabundant. There is no explanation how the comparison list (6 pages) of DJI copters helped to solve the given tasks. This part is unnecessary as a cited source. The number of references used is sufficient. However, some significant properties important for final motor choice are missing references (BLDC motor).

### 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.*

## 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.*

The thesis is description of complex work necessary to be done in order to build a quadrotor. However, any systematic approach to a mechanical design is missing due to explicit intended parameters specification left out. Also, some parts of the text and figures are unnecessary for the given tasks solution. Nonetheless, there is no doubt that the student had to study a wide range of information and he successfully built flying drone.

Questions:

What parts did Your measuring device consist of? What was the accuracy of the measurement?

Why are some measurements extrapolated to such high currents?

The grade that I award for the thesis is **C - good**.

Date: **4.9.2020**

Signature: