I. IDENTIFICATION

Title:	**Control design of a quadcopter with suspended load**
Name of author:	**Min Joonhong**
Type of thesis:	Bachelor thesis
Faculty:	Faculty of Mechanical Engineering
Department:	Department of Instrumentation and Control Engineering
Supervisor:	Matěj Kuře
Supervisor's department:	Department of Instrumentation and Control Engineering

II. EVALUATION

Assignment:	**Medium difficulty**

Evaluation of thesis difficulty of assignment.

The assignment included performing state of the art on control of quadrotor with suspended load, proposing and simulating various control schemes for a given mathematical model of a quadrotor with suspended load. Based on the simulation results, student should propose scheme for implementation on the physical model.

Satisfaction of assignment	**Fulfilled with minor objections**

Assess that handed thesis meets assignment. Present points of assignment that fell short or were extended. Try to assess importance, impact or cause of each shortcoming.

State of the art on the unmanned aerial vehicles (UAVs) is performed in chapter 2. Chapter 3 describes use cases of quadrotors, quadrotor design and its parts – actuators, sensors, propellers, … Control algorithms are presented in chapter 4. Mathematical model is described in chapter 5 and two design schemes, namely cascade PID-PD controller and state feedback controller, are presented and simulated in chapter 6. Results are compared and discussed in chapter 7 and final summary is done in chapter 8. Student fulfill given tasks.

Given that the deadline was prolonged till middle of August I expected chapter 4 to be more detailed. Also, I expected that the method used for tuning the PID to be more sophisticated than trial and error one.

Activity and independence when creating final thesis	**E - sufficient**

Assess that student had positive approach, time limits were met, conception was regularly consulted and was well prepared for consultations. Assess student's ability to work independently.

After initial introduction of the topic, student worked independently and consulted every two weeks. As the deadline was approaching, thesis was consulted on week basis, but the progress was insufficient to finish thesis in time. When the deadline was prolonged, there was two-month period of silence till next consultation. I was contacted 5 days after deadline and thesis was submitted with 13 days delay without any final consultation.

Technical level	**D - satisfactory**

Assess level of thesis specialty, use of knowledge gained by study and by expert literature, use of sources and data gained by experience.

Student found relevant references and discuss only relevant information. With this information, he designed and simulated two control designs. However, the evaluation is decreased by using only trial and error method to tune PID controller.

Formal and language level, scope of thesis	**D - satisfactory**

Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.

As for typographical side, there are no issues. Thesis is logically structured and fulfill formal requirements.
Regarding English, some notations are unusual like non-time variant instead of time invariant. Some sentences are strangely divided by commas, some of them miss the verb and some seems to be glued from two different ones or it seems that author's thoughts were volatile.

Selection of sources, citation correctness	A - excellent
Present your opinion to student's activity when obtaining and using study materials for thesis creation. Characterize selection of sources. Assess that student used all relevant sources. Verify that all used elements are correctly distinguished from own results and thoughts. Assess that citation ethics has not been breached and that all bibliographic citations are complete and in accordance with citation convention and standards.	
Student used enough sources. I appreciate that student used recent articles from scientific journals. Online sources are correctly noted.	

Additional commentary and evaluation
Present your opinion to achieved primary goals of thesis, e.g. level of theoretical results, level and functionality of technical or software conception, publication performance, experimental dexterity etc.
The requirements were fulfilled. Two control designs were presented and simulated. Both stabilize quadrotor and reach setpoint position. If the student would like to publish his work somewhere else I would strongly recommend him to make language revision of the work. I'm disappointed I was not contacted or informed from middle of June till middle of August and that the thesis was submitted without final consultation. Having in mind that deadline was prolonged I expected more.

III. OVERALL EVALUATION, QUESTIONS FOR DEFENSE, CLASSIFICATION SUGGESTION

I evaluate handed thesis with classification grade **D - satisfactory**

In Prague, August 31st, 2018

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Matěj Kuře
Supervisor