

## I. IDENTIFICATION DATA

<b>Thesis title:</b>	<b>Protection of driving corridor with respect of various road conditions</b>
<b>Author's name:</b>	<b>Bohdan Kachel</b>
<b>Type of thesis :</b>	master
<b>Faculty/Institute:</b>	Faculty of Electrical Engineering (FEE)
<b>Department:</b>	Department of Control Engineering
<b>Thesis reviewer:</b>	Ing. Denis Efremov
<b>Reviewer's department:</b>	Department of Control Engineering

## II. EVALUATION OF INDIVIDUAL CRITERIA

<b>Assignment</b>	<b>challenging</b>
<i>How demanding was the assigned project?</i>	
<p>The student had to get familiar with vehicle dynamics and high-fidelity software for its simulation, IPG CarMaker. He also needed to study the model predictive control approach and familiarize himself with technologies for its implementation. Mr. Kachel's primary tasks were analyzing existing lane-keeping and obstacle avoidance systems and suggesting and validating his novel approach, which will help the driver stay on a drivable surface and avoid drivable obstacles. According to the task's difficulty, I rate it as challenging for a master's student because the student had to be creative to find a solution to previously unsolved/unseen technical problems.</p>	

<b>Fulfilment of assignment</b>	<b>fulfilled</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>	
All assignment tasks are fulfilled without any exception.	

<b>Activity and independence when creating final thesis</b>	<b>C - good.</b>
<i>Assess whether the student had a positive approach, whether the time limits were met, whether the conception was regularly consulted and whether the student was well prepared for the consultations. Assess the student's ability to work independently.</i>	
<p>The student had a positive approach. Time limits were mainly met. We consulted regularly, and the student was well prepared for the consultations. However, I should admit that the student's ability to work independently could be something to focus on in future projects.</p>	

<b>Technical level</b>	<b>B - very good.</b>
<i>Is the thesis technically sound? How well did the student employ expertise in his/her field of study? Does the student explain clearly what he/she has done?</i>	
<p>The final thesis has a very good technical level, with minor exceptions regarding the student's description of the optimal control formulation and results from experiments.</p>	

<b>Formal level and language level, scope of thesis</b>	<b>B - very good.</b>
<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>	
<p>The work is well-structured and well-organized. Each chapter covers its particular subject. The student used LaTeX to format the final thesis, which I should positively admit is a good choice for such technical work. According to the language, there are minor mistakes that could be found in the text. Nevertheless, student's work is mainly clear and understandable.</p>	

**Selection of sources, citation correctness****A - excellent.**

*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 thesis adequately references all the required sources. The selection of sources is satisfactory. The student's original work is distinguished from the used bibliography. The bibliographic citations meet the standards.

**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.*

The quality of the thesis is high. It is complete research that validated the ideas of our research team in the field of lane-keeping and obstacle avoidance. The resulting controller in the form of an advanced driver assistance system would be a baseline for our future research interests.

### 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.*

The overall level of this master thesis is high, with minor exceptions on technical and language levels. The thesis's tasks are fully fulfilled. However, as I admit, the student's ability to work independently could be something to focus on in his future projects.

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

Date: **22.8.2022**

Signature:

## I. IDENTIFICATION DATA

<b>Thesis title:</b>	<b>Protection of driving corridor with respect of various road conditions</b>
<b>Author's name:</b>	<b>Bohdan Kashel</b>
<b>Type of thesis :</b>	master
<b>Faculty/Institute:</b>	Faculty of Electrical Engineering (FEE)
<b>Department:</b>	Department of Control Engineering
<b>Thesis reviewer:</b>	Ing. MSc. Martin Klaučo, PhD.
<b>Reviewer's department:</b>	Institute of Information Engineering, Automation, and Mathematics, Slovak University of Technology in Bratislava

## II. EVALUATION OF INDIVIDUAL CRITERIA

<b>Assignment</b>	<b>challenging</b>
<i>How demanding was the assigned project?</i>	
The particular tasks are challenging for a master level student, however, the concepts of application of MPC to control the cars behavior is a standard practice nowadays.	

<b>Fulfilment of assignment</b>	<b>fulfilled</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>	
The student has addressed all tasks from the assignment in the thesis.	

<b>Methodology</b>	<b>correct</b>
<i>Comment on the correctness of the approach and/or the solution methods.</i>	
The student chosen appropriate methods for constructing the control algorithms and optimization solvers.	

<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>	
The thesis contains several illogical statements and paragraphs mainly resulting from directly writing down "train of thoughts", like in section 6.2. Presenting original plan with YALMIP and GUROBI that was immediately abandoned degrades the overall positive feeling from the document. Student also uses symbols and terms in concrete statements, without proper prior definition.	

<b>Formal and language level, scope of thesis</b>	<b>C - good.</b>
<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 student mixes present and past tense, passive and active voice, and writes the thesis in first person which is unusual for a scientific document. The thesis contains several misplaced and floating single figures on a blank page which just inflates the page count. On the other hand, I consider the document length in terms of content and scope adequate.	

<b>Selection of sources, citation correctness</b>	<b>A - excellent.</b>
<i>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?</i>	
The thesis contains suitable set of references, including top-level scientific papers and other practical publications. The student has included wide range of literary sources.	

**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.*

The thesis is full of many inconsistencies:

1. Somewhere referenced figure or equations labels are in parenthesis, and somewhere not.
2. Somewhere table caption is on the top of the table, somewhere not.
3. Some of the equations are not referenced nor explained in the text.
4. Units are often written as full text, but many times are written as abbreviations.

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

I pose the following questions, which should be answered during the thesis's presentation and defense:

1. Is it possible to approximate the non-linear constraints by a convex hull or some other form of convexification procedure?
2. Is the approximation of IPG CarMaker simulator as a single track model viable? Was some sort of a comparison made?

Date: **22.8.2022**

Signature: