

I. IDENTIFICATION DATA

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| Thesis title: | Modeling and optimization for traffic signal preemption for emergency vehicles using V2X communication |
| Author's name: | Lukáš Pospíchal |
| Type of thesis : | master |
| Faculty/Institute: | Faculty of Electrical Engineering (FEE) |
| Department: | Department of Control Engineering |
| Thesis reviewer: | Doc. Ing. Zdeněk Hurák, Ph.D. |
| Reviewer's department: | Department of Control Engineering |

II. EVALUATION OF INDIVIDUAL CRITERIA

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| Assignment <i>How demanding was the assigned project?</i> | challenging |
| The assignment was rather challenging. Not only is the domain of intelligent transportation systems new for a typical student of the Cybernetics and Robotics study program, but also the assignment has a fairly significant academic research component – there are not too many resources to learn from but the latest research papers. | |
| Fulfilment of assignment <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> | fulfilled |
| The assignment was satisfactorily fulfilled. | |
| Activity and independence when creating final thesis <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> | A - excellent. |
| Student was very active and independent while working on the project. At the same time he was also actively asking for meetings where he presented partial results and received feedback. | |
| Technical level <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> | A - excellent. |
| I regard the work presented in the thesis correct. Occasionally some more detailed discussions of the authors decisions would be more appropriate, for example when justifying the particular choice of the optimality criterion. | |
| Formal level and language level, scope of thesis <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> | B - very good. |
| The thesis is written using a fairly decent English. It is correctly typeset and contains appropriately developed graphics. Still, the thesis would have certainly benefited from at least one or two (more) revising iterations. The text (and its length too) reflects that it was compiled in the very last minute. | |

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?

Here comes perhaps the major (relative) weakness of the thesis. One item of the official assignment directly assigns a comprehensive survey of the state of the art in this domain. Those ten references, out of which a few are just manuals to software tools, cannot certainly be regarded as such comprehensive overview. True, this is not a dissertation thesis, yet the desire to know how others have been approaching the same problem (and for sure there are such others) seems an essential engineering attitude.

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.

This was a rather demanding project. Mainly due to the necessity to familiarize with the theoretical concepts and practical tools from a new domain – the domain of intelligent transportation systems –, but also because at least a part of the work that had to be done certainly graded as academic research at the edge of what is currently known. The student has surely done a very good job here, but still, the resulting report (the thesis) could have benefited from at least one of two revising iterations. Furthermore, following the official assignment, the survey of the state of the art should be more comprehensive in order to justify some design decisions such as the choice of the cost function for the optimization.

I view the thesis as very good. Therefore the grade that I award for the thesis is B - very good.

Date: 17.6.2021

Signature:

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| Department: | Department of Control Engineering |
| Thesis reviewer: | Laura Bieker-Walz |
| Reviewer's department: | German Aerospace Center (DLR) |

II. EVALUATION OF INDIVIDUAL CRITERIA

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| Assignment | extraordinarily challenging |
| <i>Evaluation of thesis difficulty of assignment.</i> | |
| The assignment of the thesis was very challenging. The simulation and preemption of emergency vehicles is a very special research field so there is only a small researcher community which is focusing on this topic. Consequently, the amount of research studies is very limited. Furthermore, it was necessary to learn the functionalities of the used simulation framework SUMO. | |

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| Satisfaction of assignment | fulfilled |
| <i>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.</i> | |
| The satisfaction of the assignment was fulfilled. | |

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| Method of conception | correct |
| <i>Assess that student has chosen correct approach or solution methods.</i> | |
| The chosen methods were correct and appropriate. | |

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| Technical level | B - very good. |
| <i>Assess level of thesis specialty, use of knowledge gained by study and by expert literature, use of sources and data gained by experience.</i> | |
| The existing research studies and models have been used very well. The simulation study is very good implemented and analysed. | |

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| Formal and language level, scope of thesis | A - excellent. |
| <i>Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.</i> | |
| The thesis was written and structured very well. It is easy to understand and the ideas of the author can be clearly followed. There are only a few small typographical errors e.g. page 32: "should should" or page 37: "I have give". | |

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| Selection of sources, citation correctness | B - very good. |
| <i>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.</i> | |
| The used literature was referenced very well and the bibliography includes relevant papers and studies of this field. The bibliography is relatively short. For an "excellent" rating a more extended literature review and summary of existing research studies would be expected. | |

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| Additional commentary and evaluation |
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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.

Please insert your commentary (voluntary evaluation).

III. OVERALL EVALUATION, QUESTIONS FOR DEFENSE, CLASSIFICATION SUGGESTION

Summarize thesis aspects that swayed your final evaluation. Please present apt questions which student should answer during defense.

The author of the master thesis was structured and presented very well. The research topic is interesting and challenging. The student showed that he is able to set up a simulation scenario, evaluate and visualize the simulation results. There are only some small recommendations for improvement. As an external reviewer I can not compare this thesis to other master thesis and therefore rated it with "very good".

I evaluate handed thesis with classification grade **B - very good**.

Date: **8.6.2021**

Signature: