Supervisor's statement of a final thesis

Supervisor:	Ing. Pavel Hrabák, Ph.D.
Student:	Bc. Juraj Kmec
Thesis title:	Sensitivity analysis of models of cramped interior evacuation
Branch / specialization:	Knowledge Engineering
Created on:	18 May 2023

Evaluation criteria

1. Fulfillment of the assignment

▸ [1] **assignment fulfilled**
  [2] assignment fulfilled with minor objections
  [3] assignment fulfilled with major objections
  [4] assignment not fulfilled

All tasks from the assignment were fulfilled on a very comprehensive and above-average level.

2. Main written part   97 / 100 (A)

The written part of the thesis is of a high level and meets required standards with respect to clarity, fluency, and informativity. All relevant sources are properly cited. When re-using or adopting graphs or other illustration materials from articles, the student consulted the copyright policy of the concerned publishers. From the formal perspective, the thesis is of good quality, however, in some parts, the English language would deserve stylistic revision and spellcheck.

Regarding the content, the thesis is very good. Chapters 1-3 provide the theoretical background of pedestrian dynamics, the Pathfinder model used, and sensitivity analysis methods. The survey contained in those chapters is very comprehensive. Chapters 4 and 5 contain a sufficient description of the setup of performed simulation experiments together with a basic description of the developed simulation pipeline. The last chapter summarises the course of the analyses and their results and provides detailed sensitivity analyses from three different perspectives comparing the results and conclusions.

One terminological remark: in Chapter 6.3.1 (page 57) the student uses force F as a tool helping to quantify the seating configuration. The name is, however, quite misleading and the term potential (or negative potential) should be used instead.

3. Non-written part, attachments   94 / 100 (A)

The practical part of the thesis is very extensive and consists of three main parts: simulation pipeline, quantification of initial seating configurations, and sensitivity analysis.

The simulation pipeline, developed as a simtools Python package, enables repetitive runs of Pathfinder model algorithmically changing values of quantities of interest and controlling detected sources of randomness. The pipeline is functional and was used not only for the purposes of the thesis but also in the process of the experimental design during the preparation of the ongoing evacuation experiment. In its current state, the tool cannot serve as a tool for fire engineers without programming skills but seems to be easily modifiable the fulfil this task in the future.

An important part of the thesis was the quantification of the seating configurations, so the sensitivity analysis can capture and reveal the influence of this aspect on observable quantities. Several suggestions together with their simulation analysis are described in section 6.3.

The whole work then results in the comprehensive study of various methods of sensitivity analysis applied to two chosen case-study scenarios: train and lecture hall. Next to the performed sensitivity analysis itself, the comparison of various SA methods is very important and may help in future studies.

4. Evaluation of results, publication outputs and awards   100 / 100 (A)

Part of the thesis was done during the Research Summer (VýLeT) project and resulted in presentation at the international conference FEMTC 2022. The research related to the quantification of seating positions was accepted for poster presentation at Pedestrian and Evacuation Dynamics 2023.

5. Activity of the student

▸ [1] **excellent activity**
  [2] very good activity
  [3] average activity
  [4] weaker, but still sufficient activity
  [5] insufficient activity

6. Self-reliance of the student

▸ [1] **excellent self-reliance**
  [2] very good self-reliance
  [3] average self-reliance
  [4] weaker, but still sufficient self-reliance
  [5] insufficient self-reliance

The overall evaluation 98 /100 (A)

The thesis can be, according to me, considered significantly above-average in extent and quality. The results have publication potential and the practical part of the thesis have promising potential to be used in the fire-engineering praxis. For those reasons, I recommend the thesis to be evaluated as excellent.

Instructions

Fulfillment of the assignment

Assess whether the submitted FT defines the objectives sufficiently and in line with the assignment; whether the objectives are formulated correctly and fulfilled sufficiently. In the comment, specify the points of the assignment that have not been met, assess the severity, impact, and, if appropriate, also the cause of the deficiencies. If the assignment differs substantially from the standards for the FT or if the student has developed the FT beyond the assignment, describe the way it got reflected on the quality of the assignment's fulfilment and the way it affected your final evaluation.

Main written part

Evaluate whether the extent of the FT is adequate to its content and scope: are all the parts of the FT contentful and necessary? Next, consider whether the submitted FT is actually correct – are there factual errors or inaccuracies?

Evaluate the logical structure of the FT, the thematic flow between chapters and whether the text is comprehensible to the reader. Assess whether the formal notations in the FT are used correctly. Assess the typographic and language aspects of the FT, follow the Dean's Directive No. 52/2021, Art. 3.

Evaluate whether the relevant sources are properly used, quoted and cited. Verify that all quotes are properly distinguished from the results achieved in the FT, thus, that the citation ethics has not been violated and that the citations are complete and in accordance with citation practices and standards. Finally, evaluate whether the software and other copyrighted works have been used in accordance with their license terms.

Non-written part, attachments

Depending on the nature of the FT, comment on the non-written part of the thesis. For example: SW work – the overall quality of the program. Is the technology used (from the development to deployment) suitable and adequate? HW – functional sample. Evaluate the technology and tools used. Research and experimental work – repeatability of the experiment.

Evaluation of results, publication outputs and awards

Depending on the nature of the thesis, estimate whether the thesis results could be deployed in practice; alternatively, evaluate whether the results of the FT extend the already published/known results or whether they bring in completely new findings.

Activity of the student

From your experience with the course of the work on the thesis and its outcome, review the student's activity while working on the thesis, his/her punctuality when meeting the deadlines and whether he/she consulted you as he/she went along and also, whether he/she was well prepared for these consultations.

Self-reliance of the student

From your experience with the course of the work on the thesis and its outcome, assess the student's ability to develop independent creative work.

The overall evaluation

Summarize which of the aspects of the FT affected your grading process the most. The overall grade does not need to be an arithmetic mean (or other value) calculated from the evaluation in the previous criteria. Generally, a well-fulfilled assignment is assessed by grade A.