FACULTY OF INFORMATION TECHNOLOGY CTU IN PRAGUE

Supervisor's statement of a final thesis

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Student:	Tomáš Novotný
Thesis title:	Simulation of recreational pedestrian movement along the trail in the Luzen valley
Branch / specialization:	Artificial Intelligence 2021
Created on:	30 May 2024

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 of the assignment were fulfilled. But the survey of the existing models might have been more detailed - explanation of the principles of existing models and comparison to the proposed approach is weak.

2. Main written part   85 /100 (B)

The formal aspects of the thesis are above average. The thesis is written in a good quality English with adequate ratio of "Czenglish" terms and formulations. The thesis is well structured, especially chapters 4-6 describing student's contribution and results. The introductory *Chapter 1* containing description of basic theoretical principles is quite heterogeneous in style and form, the section on *Equations of motion* is very shallow. On the other hand, the student had to combine and understand a broad variety of concepts and theory, which were not covered by the courses in bachelor programme at FIT (e.g. differential equations, random arrival processes), thus some lack of rigorousness is forgivable. The more is the described subject related to student's contribution, the readable the text is. I especially value the survey of empirical findings in recreational scenarios in *Chapter 3* and their relation to the implemented model.

The studied model is well described in two chapters focusing on different aspects of the model, which makes the thesis readable. *Chapter 4* focuses on proper mathematical description of the model, while *Chapter 5* describes the implementation details together with the parameter description and calibration. The description of simulation experiments is sufficient and supported by various graphs in the Appendix.

The student studied multiple sources, the reference list is comprehensive, the sources are well cited and referenced in the text. The graphs and schemas taken from the sources are well related to their origin.

3. Non-written part, attachments   95 / 100 (A)

The result of the practical part of the thesis is a functional prototype of the simulation tool and variety od simulation experiments focusing on validation of the proposed model against empirical data. Student actively contributed to the development of the model principles in relation to empirical findings. Main focus was given on the transport section of the model that should combine the advantages of microscopic agent based modelling and macroscopic approach leaning over fundamental diagram. Student performed multiple simulation studies justifying the model definition and its implementation. The presented simulation results show well correspondence with empirical findings. Thus, the thesis proved that the chosen approach is applicable for non-emergent pedestrian flow modelling giving reasonable results.

The simulation experiments are sufficiently described in the thesis (of course improvements can be made) including the description and reason for the experimental study. Conclusions drawn from the simulations are well supported by the data obtained from the simulations.

4. Evaluation of results, publication outputs and awards   90 / 100 (A)

The thesis results were transformed to 14 pages article and submitted to Workshop on Complex Collective Systems of the conference on Parallel Programming and Applied Mathematics (CORE C), notification of acceptance is planned to June 21. Student participated at VýLet 2023 and continues in VýLet 2024 in order to finish the Stage II. Furthermore, the student participated at SVOČ 2024 with no awards.

I believe that the results are scientifically sound and valuable. The developed model offers a new approach to non-emergent pedestrian movement modelling with high applicability potential.

5. Activity of the student

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

The student worked on the thesis systematically and with enthusiasm. He performed uncommonly detailed survey and literature review in comparison to other thesis I encountered (yet, some improvement can still be made).

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

Student worked sufficiently independently, regularly consulted the progress.

The overall evaluation   90 /100 (A)

This thesis definitely belongs to above-average theses in both practical and theoretical part. With respect to the student's involvement in research activity and publication potential I decided to grade the thesis 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.