

## I. IDENTIFICATION DATA

<b>Thesis title:</b>	<b>Optimization Metaheuristic for Robust Multi-Agent Pathfinding</b>
<b>Author's name:</b>	<b>Jan Podlucky</b>
<b>Type of thesis :</b>	bachelor
<b>Faculty/Institute:</b>	Faculty of Electrical Engineering (FEE)
<b>Department:</b>	Department of Cybernetics
<b>Thesis reviewer:</b>	RNDr. Jiří Švancara, Ph.D.
<b>Reviewer's department:</b>	Charles University, Faculty of Mathematics and Physics

## II. EVALUATION OF INDIVIDUAL CRITERIA

<b>Assignment</b>	<b>ordinarily challenging</b>
<i>How demanding was the assigned project?</i>	
The task of the thesis deals with k-robust multi-agent pathfinding (MAPF), specifically, modifying two known and well-performing algorithms (SIPP and LNS2) to be able to handle the k-robust setting. The first challenge is to familiarize oneself with the quite extensive literature on (k-robust) MAPF and the specific algorithms. Secondly, the challenge is to adapt the algorithms. While SIPP is quite straightforward to adapt, LNS2 is more complex with many parameters and options that need to be considered.	

<b>Fulfillment of assignment</b>	<b>fulfilled</b>
<i>How well does the thesis fulfill 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 of the specified parts of the assignment, as well as the challenges stated above, were reasonably fulfilled.	

<b>Methodology</b>	<b>correct</b>
<i>Comment on the correctness of the approach and/or the solution methods.</i>	
The methodology used by the student is appropriate for the laid-out assignment. They performed a review of existing literature on the topic, implemented their adaptation, performed experiments, and provided results with their analysis. My only reservation is the lack of comparison with other existing k-robust MAPF algorithms.	

<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 student familiarized themselves with the problem of MAPF, the k-robustness concept, and the two required algorithms. From the code and the text, it is clear that the student understands the problem. However, there are many places in the text where the student fails to explain their knowledge. Specifically, more formal definitions should be used, some terms were not defined, and some decisions were not explained (for example, the setting in the experiments section).	

<b>Formal and language level, scope of thesis</b>	<b>A - excellent.</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 text of the thesis is very well written with only a few mistakes. All of the necessary formalities are, to the best of my knowledge, fulfilled. The organization of the text is reasonable.	

<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 student provided citations to relevant work in the field of MAPF. It has been clearly stated which works the thesis builds on top of.	



### 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 task of the thesis deals with k-robust multi-agent pathfinding (MAPF), specifically, modifying two known and well-performing algorithms (SIPP and LNS2) to be able to handle the k-robust setting. The student fulfilled all of the specified tasks and performed an experimental evaluation of the implemented algorithms. The student gained non-trivial knowledge of MAPF. My only reservation is that in some places the student fails to forward the knowledge to the reader. Overall, I support the defense of the thesis and I recommend a grade of B.

My questions for the defense are:

1. Why use Euclidian distance for the heuristic functions, when all of the experiments are performed on grid graphs? You even mention Manhattan distance in the text, but then do not use it.
2. Is the code (algorithms SIPP and LNS) written from scratch? I assume yes, as it was never stated that you used someone else's code. What is the reason for not using the available implementation of the algorithms?

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

Date: **23.1.2024**

Signature: