THESIS REVIEWER'S REPORT

I. IDENTIFICATION DATA

Thesis title:	**Disassembly Path Planning**
Author's name:	**Petr Ježek**
Type of thesis :	bachelor
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Cybernetics
Thesis reviewer:	Dr.-Ing. Martin Rudorfer
Reviewer's department:	Research Fellow at School of Computer Science, University of Birmingham, UK

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment **extraordinarily challenging**

How demanding was the assigned project?

- The project requires in-depth knowledge of sampling-based motion planning and dives into disassembly path planning based on that
- Literature references have been provided but these approaches had to be advanced and refined to match the goals of this thesis
- A scenario-based benchmark had to be designed for the experimental comparison of the methods, rather than relying on an existing benchmark

Fulfilment of assignment **fulfilled**

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.

- All assigned tasks have been addressed

Methodology **correct**

Comment on the correctness of the approach and/or the solution methods.

- The general approach is sound
- Problem formulation is clearly stated, but the designated final configuration of the parts requires motion planning which is not directly related to the disassembly problem – experiments show that some errors originate from this part rather than from the actual disassembly problem
- Matrix-based method could be improved by first solving monotonic motions based on DAIM (i.e. remove parts that can be directly disassembled) before extending it to non-monotonic operations – this would speed up the method
- Integration of rotations in the matrix-based method is not fully described

Technical level **C - good.**

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?

The thesis is technically sound in general, but there are a few things to note:

- There are few minor mistakes in the presented algorithms, but since the methods work it can be assumed that these mistakes originate from the presentation
- It is often described *how* things have been done, but not *why* – clearly expressing the intentions and the reasoning especially during design of the methods is crucial part of scientific work
- Exact conditions regarding assembly sequences are not clear for all experiments: it seems that some approaches need to work with a random, but fixed assembly sequence which strongly affects further outcomes
- More focus on transparency

Formal and language level, scope of thesis **B - very good.**

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?

- Language is mostly clear and understandable, only few minor mistakes

- General outline of the thesis is good, however the author does not strictly adhere to his own agenda:
  - ML-RRT is presented in method section, although it is state of the art
  - multi-part matrix-based approach is presented in experiments section, rotation-based approach also only mentioned in experiments section
- Many well-designed figures support the text and make the work more comprehensible, however, placement of these figures can be improved as a lot of jumping between pages is required to follow the line of thought

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?

- Selection of references to earlier work are adequate
- It must be stated more explicitly which parts are contributions by the author and which parts are state of the art – this is not always the case and especially missing for the main reference (Breakout Local Search) that has been used to design the matrix-based approach
- Citations meet the standards, except few references in bibliography which are incomplete (only contain author, title and year)

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. Pose questions that should be answered during the presentation and defense of the student's work.

Overall this is a very good thesis in which Petr demonstrated that he can work on a very challenging problem, come up with own solutions inspired by state-of-the-art methods, and systematically evaluate them.

Nevertheless, this work has some room for improvement. In particular, Petr should express his intentions and his reasoning during the design of methods more clearly – particularly how his own ideas relate to earlier works. He could further improve the document by more rigorously adhering to his own structure and by more thoroughly discussing his findings (especially surprising ones).

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

Questions that should be asked during the defense are:

- Regarding Matrix-based method and DRRRT method, could you please point out your own contribution over existing works?
- Your Matrix-based method is able to solve non-monotic disassemblies, but relies on random choice. How could you improve the Matrix-based method to first solve monotonic disassemblies in a deterministic way and only relying on random choice when necessary?
- Please explain how your Matrix-based approach takes rotation into account and discuss which particular difficulties you encountered with this approach.

Date: **27.5.2021** Signature: