ČESKÉ VYSOKÉ UČENÍ TECHNICKÉ V PRAZE

REVIEWER'S OPINION OF FINAL THESIS

I. IDENTIFICATION DATA

Thesis name:	**Operating-Room scheduling Modeled as a Non-Cooperative Game**
Author's name:	**Ondrej Tkadlec**
Type of thesis :	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Computer Science.
Thesis reviewer:	Broos Maenhout
Reviewer's department:	Faculty of Economics and Business Administration, Ghent, Belgium

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment **extraordinarily challenging**

Evaluation of thesis difficulty of assignment.

The thesis comprised the development of a game-theoretic approach to streamline negotiations between surgeons in an operating room department. Although concepts have been proposed by the advisors, implementation of the proposed algorithm in a workable format was extremely challenging.

Satisfaction of assignment **fulfilled**

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.

The student has proven to master the difficult optimization concepts and to translate these into workable code.

Method of conception **outstanding**

Assess that student has chosen correct approach or solution methods.

The student used a non-trivial approach, i.e. branch-and-price, that is able to outperform standard optimization solvers.

Technical level **A - excellent.**

Assess level of thesis specialty, use of knowledge gained by study and by expert literature, use of sources and data gained by experience.

The student has learned to design a state-of-the-art solution method and to use standard optimization software. In addition, the student acquired insight in the planning and scheduling of operating room departments.

Formal and language level, scope of thesis **A - excellent.**

Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.

The thesis has been structured in an adequate manner. The use of math notations is balanced and concepts are discussed in a comprehensible manner.

Selection of sources, citation correctness **C - good.**

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.

The description of the related problems relative to operating room planning and scheduling is quite brief and could have been more elaborated. The author handled the citations in an ethically correct manner.

Additional commentary and evaluation

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.

The student has proven to conduct research in a scientific correct manner. The results are outstanding, meeting all requirements and will be submitted to an international journal for 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 problem is novel and the required degree of technical implementation is high. A similar approach has not been developed previously in literature such that this work is highly rated and has potential to be published in a top journal.

Questions:

1. [small question] Can you give an indication of the optimality gap when solving the problem via ILP?
2. Subproblems are solved via mixed-integer programming but the underlying problem is NP-hard. Alternatively, the subproblem could have been identified as a bin packing problem for which more efficient procedures exist. What do you think of such procedures accelerating the subproblem solution procedure. Is this useful? Which mechanisms have you implemented to speed up the solving of the subproblem?
3. Can you comment of the use of a bilevel optimization framework versus multi-objective optimization, which also considers the objectives of the different stakeholders involved.

I evaluate handed thesis with classification grade **A - excellent.**

Date: **2.6.2023** Signature: Broos Maenhout