A Supervisor's review of PhD Thesis
Optional Activities in Scheduling
by Mgr. Marek Vlk

The Ph.D. thesis under review deals with using optional activities to solve various planning and scheduling problems. Optional activities may or may not appear in the solution depending on constraints, and hence these activities extend the capabilities of constraint-based scheduling techniques to some planning problems. As demonstrated in the thesis, the topic is significant as it brings the solving technology closer to practical problems and improves scheduling efficiency.

The thesis is grounded around solving three different types of problems, where the common point is exploiting the optional activities. The first problem is a machine scheduling problem with sequence-dependent setup activities. Several models to solve the problem have been proposed and compared. The results have been published at the International Conference on Operations Research and Enterprise Systems. The second problem is a multi-agent path planning problem, where an innovative approach using constraint-based scheduling with optional activities has been proposed to generalize the problem to weighted and capacitated arcs, making the problem closer to reality. The results have been published at the International Conference on Autonomous Agents and Multiagent Systems (CORE A*). Finally, the third problem is scheduling communication in computer networks with critical data traffic. Following the format of previous problems, several models to solve the problem have been proposed and empirically compared. The results have been published in Computers & Industrial Engineering, Computers & Operations Research, and IEEE Transactions on Communications.

The thesis is written in good English, and it demonstrates the author's capabilities to solve realistic planning and scheduling problems using constraint-based scheduling techniques. The flow of text satisfies the requirements for research texts, starting with the precise problem formulation, proposing novel solving approaches, and finally evaluating them empirically and showing some theoretical properties in some cases. All the included results already went through rigorous reviewing at international conferences and journals. The overall number of publications is outstanding (three journal papers and 12 conference papers). The student also demonstrated capabilities to collaborate with research teams at MFF UK and CIIRC ČVUT, as is visible from the list of his co-authors.

In my opinion, the student demonstrated capabilities for doing research work, and I strongly suggest his Ph.D. thesis be accepted and award him a Ph.D. title.

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