

I. IDENTIFIKAČNÍ ÚDAJE

Název práce:	Multi-agent Systems for Production Planning
Jméno autora:	Bc. Tomáš Staruch
Typ práce:	diplomová
Fakulta/ústav:	Fakulta elektrotechnická (FEL)
Katedra/ústav:	Klepněte sem a zadejte text.
Vedoucí práce:	Ing. Vojtěch Janů
Pracoviště vedoucího práce:	Testbed pro Průmysl 4.0, CIIRC, Č

II. HODNOCENÍ JEDNOTLIVÝCH KRITÉRIÍ

Zadání	náročnější
Práce vyžadovala znalosti z hned několika oborů, například plánování, multiagentních systémů, průmyslové komunikace a průmyslových systémů, enterprise vývoje a dalších, které musel autor nastudovat a pochopit, aby došel k požadovanému cíli. Navíc byla samotná práce studentovi ztížena epidemií covidu, díky které se nestihl systém vyvinout včas a autor tak musel improvizovat a použít virtuální dvojče. Do tohoto dvojčete musel autor nad rámec zadání doimplementovat původní algoritmus, s kterým poté porovnával.	
Splnění zadání	splněno
Autor naplnil požadované cíle a splnil zadání bez připomínek. Nad rámec zadání autor doimplementovával původní algoritmus.	
Aktivita a samostatnost při zpracování práce	A - výborně
Autor řešil zadání samostatně a jednotlivé části problému konzultoval i s kolegy znalejšími v dané problematice.	
Odborná úroveň	A - výborně
Splněno bez připomínek.	
Formální a jazyková úroveň, rozsah práce	A - výborně
Autor z počátku bojoval s anglickým jazykem, ale připomínky iterativně řešil a ve výsledné práci se tyto nedostatky již neobjevily. Výsledná práce je tedy bez připomínek.	
Výběr zdrojů, korektnost citací	A - výborně
Splněno bez připomínek.	
Další komentáře a hodnocení	
Autorovo řešení se nyní bude nasazovat a používat na reálné lince.	



POSUDEK VEDOUCÍHO ZÁVĚREČNÉ PRÁCE

III. CELKOVÉ HODNOCENÍ A NÁVRH KLASIFIKACE

Shrňte aspekty závěrečné práce, které nejvíce ovlivnily Vaše celkové hodnocení.

Předloženou závěrečnou práci hodnotím klasifikačním stupněm **A - výborně**.

Datum: 24.1.2023

Podpis:

I. IDENTIFICATION DATA

Thesis title:	Multi-agent Systems for Production Planning
Author's name:	Tomáš Staruch
Type of thesis :	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Control Engineering
Thesis reviewer:	Dr. Tilman Becker
Reviewer's department:	CIIRC

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	challenging
<i>How demanding was the assigned project?</i>	
The topic calls for the design and implementation of a new algorithm for production planning in a multi-agent setting. Thus, there are multiple areas of research to be taken into account and the code should be useful for further research.	
Fulfilment of assignment	fulfilled with minor objections
<i>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.</i>	
The presented implementation addresses the major shortcoming of the previously implemented approach, now guaranteeing to find a solution if it exists. The thesis does not address the problem of distributed resources and it does not discuss the run-time behavior of the implementation, showing only a very limited number of use case examples.	
Methodology	correct
<i>Comment on the correctness of the approach and/or the solution methods.</i>	
The thesis implements a standard backtracking algorithm which is applicable to the production planning scenario. It does not address alternatives, e.g. the conflict-based backjumping algorithm. It also leaves concurrent planning of multiple products to further work.	
Technical level	D - satisfactory.
<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 thesis is well written and it very clear what has been done. It is not fully clear how abstract the implementation is, i.e. if for each use case actual programming is necessary or whether a high-level description language for use cases exists. The complexity considerations (page 36) are not sufficiently explained. As written, they appear to be wrong: enumerating all combinations of N operations with K possible agents for each step ought to be exponential in N. Given the exponential complexity, a consideration of existing methods for efficient search would have been beneficial.	
Formal and language level, scope of thesis	C - good.
<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 thesis is well written and presented, showing proficiency in English. It is clearly structured in a logical way. It is always clear what the proposed solutions are and what has been done. The scope is OK as the intended goal of presenting an implementation in a multi-agent setting that guarantees to find a solution if it exists, has been achieved. Part of chapter 4 (implementation) focus too much on the step-wise development of the code. As the steps are well-organized, this is helpful for understanding the concepts, however, a presentation of the final code would have been more concise.	
Selection of sources, citation correctness	C - good.
<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</i>	

standards?

The bibliography is comprehensive and meets the standards. It could have covered the algorithmic solution more extensively that just citing [27] (Shoham&Leyton-Brown).

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.

The thesis is well presented and clearly fulfills the goal of providing a multi-agent based algorithm/implementation that guarantees to find a solution for a given production planning problem if it exists. However, it stops with presenting only rather simple use cases without exploring practical runtime behavior in more extensive simulations. As the total runtime for an exhaustive search is only around 7 seconds (third product in use case three) it would have been feasible to study a much larger suite of test cases and get numbers on the practical effects of larger problems – i.e. at what point does the exponential explosion happen in practice.

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 grade that I award for the thesis is **C - good**.

Date: **30.1.2023**

Signature: