

Research Plan for Combinatorial Optimisation for Scheduling

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April 20, 2022

Background of the research

The problem of scheduling tasks arises in industries all the time. It is not hard to imagine that generating an optimized schedule can be of great profit for production or logistic operations. Optimization can for example be minimizing the overall required time or minimizing the delay before starting a task. Because this type of problem is so prevalent it has already been subject to much research. Formally this specific type of problem is known as the resource-constrained project scheduling problem (RCPSP). On its own the problem definition for RCPSP is too limited to be of use for realistic application. To make sure the researched algorithms solving the scheduling problem would have a wider use case many variations and extensions to the problem definition have been made over time [1].

Research Question

Can the addition of a heuristic in a SAT solver algorithm for PRCPSP-ST models reduce the average time needed for each intermediate schedule it creates? Can the addition of a heuristic for variable selection in the SAT solver algorithm applied to PRCPSP-ST models reduce the resulting schedule makespan?

Method

TBD in the final version of the research plan.

Planning of the research project

To make finish the project successfully a planning is outlined in this section. For each week the meetings and presentations are outlined in the first subsection. The next subsection contains all the activities that should be performed and lastly a list of deliverables is provided to keep track of all parts required for the following weeks.

0.1 Week 1

0.1.1 Meetings

Participants	Objective	Date and time
Peers + supervisor	Detailing research topic	April 20 9:00 am
Peers	Discussing research plan and background information	April 21 or April 22

0.1.2 Activities

Activity	Objective
Read reference paper from project forum	<ul style="list-style-type: none">• Gain insight in the RCPSP problem• Learn about the pre-emption variant of the problem• Learn a way to model the problem• Analyse the use of the model in a SAT-solver
Analyse research topic	<ul style="list-style-type: none">• Formulate the research topic• Formulate a research question• Derive sub-questions• Make search queries• Selecting information sources• Store information sources• Generate a literature list
Read abstracts from literature list	<ul style="list-style-type: none">• Make tags for literature list• Find an example for a RCPSP problem model• Gather information for the background of the research
Transform sub-questions into tasks	<ul style="list-style-type: none">• Find the required tasks to answer the research question• Make a time-line for the remaining 9 weeks of the project
Make a list of tools/software/data	<ul style="list-style-type: none">• Making sure all required parts are accessible• Checking for completeness with supervisor
Write research plan	<ul style="list-style-type: none">• Finishing the first deliverable to get feedback from supervisor

0.1.3 Deliverables

After all the activities have been finished the following deliverables should have been made:

- Research question

- Sub-questions
- Information sources
- Literature list (with tags)
- Example for a RCPSP problem model
- Written background research
- List of tasks
- Time-line for tasks and official deadlines
- List of tools/software/data
- Final version research plan

References

- [1] Sönke Hartmann and Dirk Briskorn. A survey of variants and extensions of the resource-constrained project scheduling problem. *European Journal of Operational Research*, 207(1):1–14, 2010.