Aalto University
MS-E2177 Seminar on Case Studies in Operations Research

Optimizing the Planning of Floorball Match Schedules in Finland

Interim Report

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Contents

1 Changes in the project objectives and scope **3**

2 Project status **3**

2.1 Completed tasks 3

2.2 Ongoing tasks 3

2.3 Remaining tasks 4

3 Updated project schedule **4**

4 The updated risk management plan **4**

1 Changes in the project objectives and scope

The project objectives and the scope have remained unchanged. The objective is to automate the scheduling of floorball series played in minitournament format. We are currently developing a scheduling tool that utilizes Mixed Integer Linear Programming. We do not consider the availability of floorball halls in our scheduling.

2 Project status

2.1 Completed tasks

From the six main tasks listed in the project plan, we have completed the literature review and background study, the brainstorming of the model ideas, and the creation of initial models. We created initial models separately in three groups for different series formats. The initial models were benchmarked by comparing the schedules they produced for a selected series. Some benchmarking was performed by comparing the travel distances of our models to those in [1]. In addition, we had meetings with the Swedish Floorball Federation, representatives of tournament software tool TorneoPal and Cimmo Nurmi.

2.2 Ongoing tasks

There exist hundreds of different series that the Finnish Floorball Federation schedules. These series have partially different restrictions and features. Due to this uniqueness, all of the series' schedules cannot be solved with the same model.

Currently, we are in the process of dividing the different types of floorball series into subsets based on their features and constraints. A natural division can be made by separating series with round-robin format from those with non round-robin format. In addition, the series can be further divided, for example, by the maximum distance between teams in the series. When the maximum distance is short, the minimization of traveling distance becomes less important and thus finding a feasible schedule satisfying the series' constraints is enough. Another way to divide the series is by the number of teams inside the series. When there are many teams (over 12) the optimization becomes costly, and the optimal schedule may not be found in a reasonable time. Thus, different heuristics or stopping criteria might be needed for series with different sizes.

Having the series divided into subsets, we aim to eventually develop a separate model for each subset to cover the optimal scheduling and take into account the unique constraints each series in each subset has. Also, having different models, we

can better utilize our resources as each team member can concentrate on developing a model for one subset.

In addition, we have to decide which of our initial models we will use and develop further, and we have to select a common programming language, as we have now used both Julia and Python in our work.

2.3 Remaining tasks

After developing a few versatile models with which we can schedule most of the floorball series formats in Finland, we will need to combine the smaller submodels into one model. This model should be able to take the participating teams and series specific constraints as input. The output contains the tournament schedule and match schedules inside tournaments in a specified format. We will need to consult the Finnish Floorball Federation to decide between the trade-off between optimal distance minimization and the efficiency of our model. In addition, we need to validate the results of the model, create model documentation, and write the final project report.

3 Updated project schedule

There are only minor changes in the project schedule, seen in Figure 1, compared to the schedule given in the initial project plan. Due to time constraints, the start of the user interface creation is postponed by four weeks, and the start of the final report writing is postponed by two weeks.

4 The updated risk management plan

Scenario	Probability	Consequences	Mitigation actions
Risks relating to the model			
All constraints cannot be included in the general model.	High	Model cannot be used for every age group and series.	As many series are considered as possible. Considering features that are present in most of the series.
Risks relating to teamwork			

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Scenario	Probability	Consequences	Mitigation actions
Inefficient scheduling of the project (e.g. Too much time is allocated for considering different models); uneven shared workload between team members.	Medium	Decreased quality of deliverables and model. Some team members might be overloaded.	Project manager focuses on scheduling and sharing tasks evenly. Also, team members contribute to efficiency by being active.
Schedules do not hold; workload stacks up to the end of the course.	High	There is no time left for validating the model or producing a practical tool for the client's need.	Project manager makes sure that this is not the situation. Everyone's responsibility is to finish tasks before the deadlines.
For some reason, someone is not able to deliver effort.	Low	Other team members need to work more; overloaded team.	Open communication within the project team. Also, checkups every now and then.
Risks relating to communicating and working with the client			
Final model does not match client needs.	Low	The client cannot utilize the model.	Everyone focuses on the client's needs. Open communication with the client.
The client is not committed to the project.	Low	The project stays on hold or proceeding is very limited.	Active communication with the client.

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Scenario	Probability	Consequences	Mitigation actions
Model and the corresponding tool are so complicated that the client does not have the ability to use them.	High	The client cannot utilize the model and needs to acquire resources to use it.	Focusing on building the model on cost efficient platform. Creating instructions and focusing on documentation.

Table 1: Risk scenarios for the project

Table 1 contains the updated project risk list. Compared to the initial project plan, two risks related to the model were removed:

1. Too large space for feasible solutions, too many inefficient solution decisions. → Model becomes inefficient.
2. Model provides practically unoptimal solutions. → The model is not usable in practice.

Risk 1 was removed because we have obtained feasible solutions with our initial models. Risk 2 was removed as the solutions provided by the initial models have been practical.

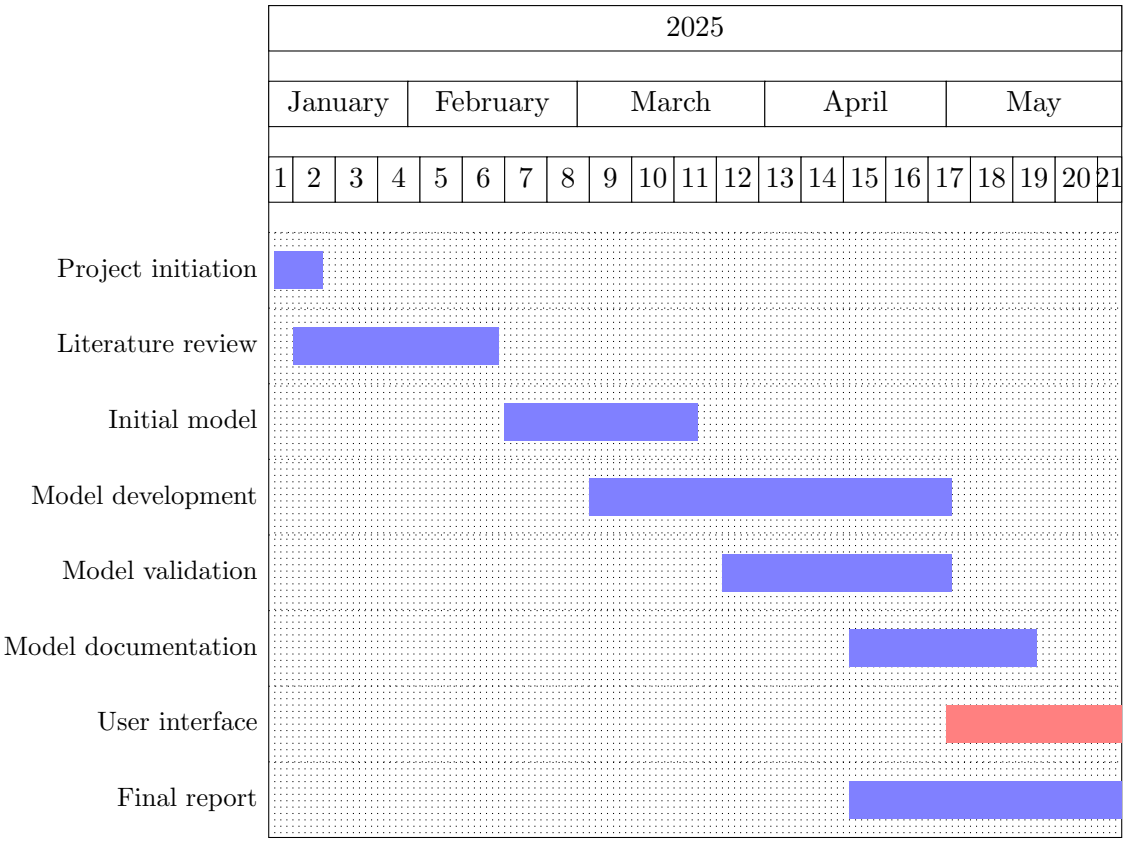

Figure 1: Project schedule

Due to the overall workload of the team members, we updated the probability of workload stacking towards the end of the course from medium to high. In addition, we updated the probability that the final model does not match the client's needs from medium to low because we have been able to maintain good communication with the client. In Table 1, the changed probabilities are marked with red color.

References

[1] Jaakko Paavilainen. Salibandyn otteluasettelun optimointi Itä-Suomessa. Bachelor's thesis, Aalto University School of Science, 2024.