Evaluation Report Group 14

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Chapter 1

Introduction

We are group 14 consisting of the group members Casper Venlet, Dunga Bakker, Floris van Adrichem and Thom van den Hil. We have chosen for the parcel delivery problem. The problem consists of a network of nodes with a number of packages, distinct transport costs between nodes and fixed costs for establishing hubs (distribution centres). In addition, the data set also provides multipliers for the collection costs for a package going from a node to a hub, the transfer for a parcel going from a hub to another hub and the distribution costs for a parcel going from a hub to a node. The main aim of the report is to answer the question: "What is the cheapest way to place hubs and connect all the nodes, such that all packages get delivered?"

In Table 1.1, the division of tasks over each group member is laid out.

Task description	Group member
Creating intuitive/heuristic algorithms	Thom van den Hil
Creating an ILP for the transportation problem	Dunga Bakker, Floris van Adrichem
Creating an ILP for the extended problem	Dunga Bakker, Floris van Adrichem, Casper Venlet
Coding the intuitive/heuristic algorithms	Thom van den Hil
Coding the ILP for the transportation problem	Casper Venlet
Coding the ILP for the extended problem	Casper Venlet
Make Python store the results	Thom van den Hil
Visualize results	Thom van den Hil
Creating a problem expansion	Floris van Adrichem
Title page	Floris van Adrichem, Dunga Bakker, Thom van den Hil
Abstract	Dunga Bakker
Nomenclature	Dunga Bakker, Thom van den Hil
Chapter Introduction	Floris van Adrichem
Chapter Transportation Problem	Casper Venlet
Chapter The ILP Model for Transportation Prolem	Dunga Bakker, Floris van Adrichem, Thom van den Hil
Chapter Heuristic Algorithms	Thom van den Hil
Chapter Results	Thom van den Hil
Chapter Problem Expansion	Floris van Adrichem
Chapter The ILP Model for the Extended Problem	Casper Venlet
Chapter Conclusion	Dunga Bakker
Chapter Bibliography	Floris van Adrichem
Appendix A Datasets	Casper Venlet, Floris van Adrichem
Appendix B Python Implementation of Algorithms	Everyone
Report layout	Floris van Adrichem
Poster layout	Floris van Adrichem, Thom van den Hil
Poster contents	Dunga Bakker, Floris van Adrichem, Thom van den Hil
Give feedback on draft report group 3	Floris van Adrichem, Thom van den Hil
Receive feedback on draft report from group 3	Dunga Bakker, Casper Venlet

Table 1.1: Division of tasks.

Chapter 2

Planning

The rough planning of the project was first created on the 28th of April, which consisted mostly of a general outline of the compulsory deadlines and possible side events. At the point of construction, we found it a bit difficult to properly divide up the labour because we did not have a clear idea of how much work was going to be put into every part of the project. We decided instead to properly plan out when we were going to have meetings to discuss our progress. Except for the exam week from the 16th to the 20th of May, we had two meetings every week. This really helped to get us to focus and set clearer deadlines for smaller parts of the project.

Another reason why our strategy was quite efficient is that it made the turnaround time for pieces of text really fast. This gave us more time to properly read through every piece of text that was written, and quickly point out flaws or new insights.

Looking back, it might have been better to more effectively plan in the creative process for the poster. Due to the deadlines of the poster and the final report occurring in the same week, all our attention mainly went out to the report, which left us with only about 3 days to properly work on the poster. This gave us quite a bit of stress, but in the end, we do not find that the quality of our poster suffered because of this problem.

Another problem arose when we tried to create extra data sets to test our algorithms on. This idea kept getting postponed for 2 weeks until we had to cram this construction into the final few days. Obviously, it would've been better to construct these data sets as early as possible, as it would've allowed a more thorough analysis of their algorithmic results.

All in all, our planning managed to work out pretty well. While some issues came to surface, they were not problematic enough that the quality of our work suffered. Our general planning strategy was very thoughtful and worked for the majority of problems that came up.

Chapter 3

Project Management

We had no problem managing the project. We had one or two meetings that had to be moved but these meetings were moved online without any problems. If there were different opinions on how to manage the project we would talk about these opinions at the next meeting. This way everybody could say what he wanted to say about the project and everybody felt like they had an input into the project. The only slight problem we had was at the end of the project when had too little time to do all the things we wanted to do. But by prioritising correctly we finished to most important things on time so we could still put those things on the paper. in conclusion, we managed the project well and most things we planned were done on time.

Chapter 4

File Management and Communication

In our Quality plan we handed in at the beginning of the project, we wrote down how we were going to communicate and how we were going to save our files. For file management, we did exactly what we wrote at the beginning of the project. All our files have the same naming convention, namely "Week [Week number] [day of the month]-[number of the month]" followed by the name of the file. We saved most text files in a Google Drive that was accessible by all the group members. For Python files, we used a GitHub that was also accessible to all the group members. We wrote the paper in Overleaf, and this way everybody could write at the same time without having to merge files afterwards. We mostly followed our Quality plan for the way we communicate. We had a Google Calendar with all the deadlines and meetings scheduled. We had meetings twice a week, and this way everybody always knew what everybody was doing and if anybody had a problem we could talk about them at the meeting.

The biggest communication plan in the Quality plan that did not work out was the use of Trello. We wanted to use Trello to manage the tasks that needed to happen. It turned out that two meetings in a week made Trello very redundant, and thus we stopped using it after around 2 weeks. All tasks were divided at the meetings and because we made minutes for every meeting, everybody could find what there had to do for the next time anyway.

In conclusion, we mostly followed our one Quality plan, and thanks to this our file management and communication went smoothly.

Chapter 5

Quality

To ensure the quality of products, every text that was written for the project was double-checked by at least one other group member. This was especially useful, not only to catch grammatical or spelling mistakes, but also to analyse general logic in our mathematics. We tried to make every part as readable as possible without a background in mathematics, and by letting someone read it without having written it themselves, they are able to look at it a lot more clearly.

Furthermore, we tried to make sure that every major part of the project, mainly parts like the writing of the ILP chapter, was handled by at least 2 members. Having only one person tackle these difficult tasks may be daunting, which leads to procrastination. On top of that, multiple people working on the same task allows them to bounce their ideas off of one another, which leads to a general higher quality of work and faster production.

Lastly, at the final stage of the project, we made sure to reread and re-analyse our products. Quite a few errors, both in our writing and in our mathematics, were caught at this stage, and this definitely increased the quality of our final report.

All in all, our measures were quite effective. It allowed many problems to be solved more quickly and many errors were caught before they became problematic.

Chapter 6

Evaluations of Each Others Work

In Tables 6.1 through 6.4, the peer review from each group member is given.

By Casper	Casper	Dunga	Floris	Thom
Punctuality	n.v.t.	Goed	Goed	Goed
How you handle problems	n.v.t.	Goed	Goed	Goed
Personal input/drive for the project	n.v.t.	Goed	Goed	Goed
Manages deadlines well	n.v.t.	Goed	Goed	Soms iets te veel hooi op de vork genomen; verder goed
Communication to the group	n.v.t.	Goed	Goed	Goed
Quality of produced work	n.v.t.	Goed	Goed	Goed

Table 6.1: Peer review Casper Venlet.

By Dunga	Casper	Dunga	Floris	Thom
Punctuality	niet altijd op tijd maar dat is niet zijn schuld	goed	goed	goed
How you handle problems	goed	goed	goed	goed
Personal input/drive for the project	algemeen goed als de vergadering te lang duurt raakt hij afgeleid	goed	goed	goed
Manages deadlines well	goed	goed	goed	wil vaak te veel waardoor hij in tijds nood komt
Communication to the group	goed	goed	goed	goed
Quality of produced work	goed	heeft problemen met goed schrijven	goed	goed

Table 6.2: Peer review Dunga Bakker.

By Floris	Casper	Dunga	Floris	Thom
Punctuality	Sometimes late but usually not his fault	Good	Good	Good
How you handle problems	Good	Good	Good	Good
Personal input/drive for the project	Very good, he implemented a lot of code	Very good, he wrote a lot for the ILP.	Obviously, my personal input was a bit lower	Very good, he made all node diagrams and timing figures.
Manages deadlines well	Was a bit late with text on the final day	Good	Good	Missed a few deadlines (minute submission etc.)
Communication to the group	Good	Good	Good	Good
Quality of produced work	Good	Sometimes made writing mistakes	Good	Good

Table 6.3: Peer review Floris van Adrichem.

By Thom	Casper	Dunga	Floris	Thom
Punctuality	Good, although once or twice too late	Good	Good	-
How you handle problems	Very good, often asked for input from Dunga with regards to the ILP	Good	Good	-
Personal input/drive for the project	Good	Very good	Very good, regardless of his dire circumstances	-
Manages deadlines well	Good	Good	Good	-
Communication to the group	Good	Very good, often offered help	Very good, often offered help	-
Quality of produced work	Good	Good, besides spelling and grammar	Good	-

Table 6.4: Peer review Thom van den Hil.

Chapter 7

Personal Experiences

7.1 Dunga Bakker

I liked this project a lot, it was fun to learn about ILPs. I also liked to think of ways to solve the problem with different algorithms. My experience working in this group was pleasant. Everybody did what they said they were going to do and most of the time we were all on the same page. Sometimes we disagreed about the way we were going to do things but in the meetings we had twice a week, we could talk about the differences and squash the disagreements. In the end, we had very little time left to finish the paper because we wanted to increase the number of datasets and write about them. Time management isn't my strong suit but thanks to a group that was better at planning than I am time management for this project went better than I expected. I didn't like that we had two formal meetings twice a week. We could have done the same thing with one formal meeting and just talked to each other for the rest of the week when we had trouble.

In conclusion, I liked working with this group and I learn a lot about ILPs and how to linearise formulas.

7.2 Floris van Adrichem

I personally quite enjoyed working on this project. It was both fun and informative, as I feel I learned a lot about applying ILP strategies and other algorithms. I think that most of the knowledge I obtained during this course will be very applicable in research and also for possible jobs later on.

Due to personal circumstances, I was unable to attend the course for 2 weeks and was only able to participate at a lower capability afterwards. I believe that our group handled my absence perfectly. I didn't feel alienated for being gone for so long, and I feel that I contributed a pretty decent amount of work to the project as well. In the end, it worked out pretty well for me.

In my opinion, every group member contributed a pretty equal amount of work to the project, and that is very important to me. I have very few complaints about our process, most of it boiling down to surface-level remarks which do not really matter. Everything worked out as I would've expected it to, and I really enjoyed working with this group on this project.

7.3 Casper Venlet

I was expecting the project to be quite similar to the Modelling-A work. This turned out to not be true at all, I felt like we had more freedom to work with the problem and it was overall more interesting work.

As a group, we had to be more organized after going from working in pairs to working in groups of four, which we did very well. In a project like this things can go very wrong if only one of the members does not do their work, which luckily didn't happen at all.

We were able to communicate well and kept to a quite strict schedule which allowed us to not have to do most of the work during the last few weeks, so there was never a lot of stress involved when it came to the deadlines that had to be met.

The work that I personally had to do was definitely not easy, but it was personally manageable and if I ever needed help I knew I could just ask, either over text or during the next meeting we held. To top it all off I felt like the project we delivered is of more than sufficient quality and it shows that we put plenty of work into it.

7.4 Thom van den Hil

My overall experience of the teamwork and the project was pleasant. The other group members were driven and you could ask anyone for help. Especially Floris van Adrichem provided a lot of value, regardless of his dire circumstances.

Integer Linear Programming strikes me as a powerful mathematical tool since I personally enjoy optimizing things, which made it interesting to learn. It did come with a fair bit of difficulties since the construction of the objective function for the ILP was quite tedious. Further, the runtimes were slow, which hindered us in our progress since these runtimes meant we had to wait for hours before we could interpret the results and modify the input to wait yet another hour in the case of the large data set. In hindsight, we should have taken a step back and realised that our choice of variables was the bottleneck since it resulted in a bloated model and duplicate paths. That is why I am happy we decided to eventually ask our supervisor Bart van den Dries for help (even though it was near the end of the project), who gave us the required insight to significantly simplify the model and reduce the runtimes, which assisted us with the formalisation of the ILP for the problem expansion.

Admittedly, the meetings contributed more practicality than I initially thought. The meetings mainly provided a lot of structure resulting in clear agreements. However, I do think the meetings should have been spaced out more as the first meeting of the week was generally on Tuesday and the next again on Thursday resulting in a short sprint,

consisting of Tuesday and Wednesday. If for whatever reason we do not work on the project during this sprint, the meeting on Thursday becomes futile.

My biggest pitfall during this project was not prioritising more strictly and underestimating how long things will take. For example, I probably spent around an hour too long on perfecting the visualisation of the graphs, which could have also been spent on writing a chapter and 'waited' hours add up over time. Another example is the poster, where we decided to typeset it in LaTeXand use a package that we had never used before and felt clumsy to use. Using a different package or moving to another tool entirely such as Microsoft Publisher would have possibly saved us some time. Furthermore, I would have liked to expand more on comparing the performance and practicality of various algorithms by for example analysing the effects of varying the multipliers. Finally, we aimed to largely finish the report for the draft, while in reality, the draft report consisted of around half the content in the final report. The extent to which the draft was finished was nonetheless a personal improvement in comparison to Modelling-A.

Chapter 8

Conclusion

After ten weeks of hard work we can conclude that the project went well. Our communication was great, we planned our methods of communication at the start and were able to keep using these methods throughout the project to work together efficiently. We worked with a tight schedule where almost all deadlines were still met, so we did not fall behind on the project at any point. Keeping track of all the work we had done was no problem, as we were able to upload everything we worked on in a shared Google Drive/GitHub. We enjoyed working on this project, which is quite important as well. And possibly most importantly, everyone is happy with the final product.