

# Logbook

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# 1 LP3

## 1.1 Week 1

### Problems

During the first week no major problems were encountered.

### Proposed Solutions

### Reflections

The team feels that they have sufficient guidance in which tool to investigate for the product development. Each and everyone also feels satisfied with being assigned a static role throughout the whole project.

### Meetings

An introduction meeting was held the first day of the course, as well as a secondary meeting to do some general planning and work-assignment. The first meeting with our supervisor was held.

### Interim Goals

Everyone should familiarize themselves with the relevant tool we are using and the protocols and tools related to their specific role within the project.

### Description of Individual Performance

- **Martin Blom**  
I spent my time mostly looking at tutorials and getting to know Unity. I also worked on fixing templates for documentation since i have the role of Secretary.
- **Felix Jönsson**  
Brushed up on my Scrum knowledge since I was assigned as the team's Scrum Master. Also installed necessary tools and did some "Hello World" projects of varying difficulty in Unity.
- **Hannes Kaulio**  
This week I mainly watched unity tutorials.
- **Arvid Nyberg**
- **Marcus Schagerberg**  
I focused on administrative tasks such as preparing the time report and setting up a CI/CD for autocompilation of LaTeX documents. In addition to that I setup a document structure in Overleaf.

- **Jakob Windt**

This past week I spent my time mostly on getting to know Unity. For example, I made a simple program where the user can move around on a flat surface, as well as jump. Furthermore, I spent some time in Overleaf, creating a template for the weekly logbook.

## 1.2 Week 2

### Problems

We have not encountered any problems yet, however our supervisor noted that we might get a lot of merge conflicts in the future since we are working in the same Unity project.

### Proposed Solutions

Our supervisor recommended that we create one scene in Unity for each developer and that all developers work solely in their own scene to avoid merge conflicts. We setup the Unity project like this with an additional main scene where we will put the result itself.

### Reflections

The team feel more confident in being able to use Road Architect as a tool for drawing our maps, which led to the whole team investing more time in understanding how it works.

### Meetings

We had a supervisor meeting and a planning and setup meeting.

### Interim Goals

We set our first product development sprint goal, "Enable one car to follow lanes in two simple road maps". We also set a goal to be able to send in the first draft of our project plan to our supervisor early this week for feedback.

### Description of Individual Performance

- **Martin Blom**  
This week I spent my time mainly on writing in the project report, collecting relevant data from sources and exploring Unity further.
- **Felix Jönsson**  
This week I wrote on the Problem and Method section of our project plan, read a lot of papers regarding relevant topics for our product. Familiarised myself with the Unity asset Road Architect and set up my development environment for Unity (VC, IDE integration, etc).
- **Hannes Kaulio**  
This week i mainly wrote on the project plan, specifically the problem section. I also started getting familiar with the road architecture source code and coded a little bit.
- **Arvid Nyberg**  
This week I was quite busy with other things so I haven't been able to put

down the work I intended. I acquainted myself with the course a little bit more and started working on societal and ethical aspects in the project plan. On Friday I participated in the meeting.

- **Marcus Schagerberg**

I continued with some administration and setup of our documentation, but spent most of my time looking into the Road Architect asset. We have looked into this asset briefly since it allows us to create road systems easily. It is also very powerful with support for creating intersections and bridges for example as well as modify the terrain.

I looked into the development possibilities for the asset since we need additional features such as creating lines for each lane that we need to use for our vehicles as a guide line that they should follow while driving. I was able to add that feature to the asset and figured out more of how it works so I now feel confident that we can use Road Architect in our project.

- **Jakob Windt**

I spent my time about 50/50 between writing the project planning report and doing research about Unity. During the research I found out about tools like Unity's UI Toolkit and Unity's New Input system.

To test these features I created a 2 simple Unity projects. The first project allows the user to move around as a rolling cube, which I made to test the input system. The second project was a very simple UI using the toolkit.

For the project planning report, it was decided that I should write the purpose and limitation sections, which I completed.

## 1.3 Week 3

### Problems

Main problems this week took the form of making our modified third-party assets handle intersections, and setting up a Unity to organization to allow future asset purchases to be available for the whole group.

### Proposed Solutions

The proposed solution for solving the Unity Asset situation is for one group member to do proper research to find the most efficient way for group asset managing. To solve the intersection problems, it was decided to have every group member test the lane creation on their own computer since the results seem to vary between group members.

### Reflections

Overall a good first development week, still some hick-ups regarding different set up of varying tools. Since we started working early on the project plan we've had to receive feedback from the supervisor two times already.

### Meetings

Supervisor meeting and numerous remote in-official developer meetings throughout the week

### Interim Goals

We sent in our draft of the project plan to our supervisor and received feedback as planned. The goals for this week's sprint were mostly met, however the features were developed in separate branches so they will need to be merged together in order to create a working version that includes all the new features.

The goals for next week are based around our goal for the first iteration, which is to have working autonomous vehicles. Next week we will for example implement algorithms for lane switching so that the vehicles can transfer between different lanes and also roads through intersections.

### Description of Individual Performance

- **Martin Blom**

I have done a lot of exploration of assets and testing their compatibility with the current version of unity (and sharing them). I was also meant to do the road networks for testing but ran into problems/bugs with road architect. Road architect now needs further evaluation of functionality before work can precede. Lastly I polished my sections in the planning report and did my usual duties as the secretary.

- **Felix Jönsson**

Did some further modifications of the scrum board. Had a lot of issues with git and different development set up but should be mostly fixed now. Implemented a player controlled car that the player control via keyboard. Reviewed feedback and added new text to Problem, Method and Ethical Considerations in the project plan.

- **Hannes Kaulio**

I have mainly worked on graph generation this week. I added a weighted graph representation from a road architect road system. I developed a graphical debug view for the graph that clearly shows how all roads are connected. I also wrote an A\* implementation that can find the shortest path to a node.

- **Arvid Nyberg**

- **Marcus Schagerberg**

I have worked on improving the lane generation by making it support intersections as well as looped roads. Furthermore I have supported in the development of creating a road network graph to allow the vehicles to navigate. Finally, I implemented two algorithms for making the vehicles follow lines. One that works using physics and vector arithmetic to steer towards the line, and a more performance optimised version that simply moves the vehicle between the points on the line.

- **Jakob Windt**

My main focus this week was to implement a camera switching system. The system I created allows the user to map cameras to key binds, as well as UI overlay buttons that will change the users POV. This UI is also the basis we'll use to implement a future development UI. After finishing this, I started looking into Blender, which I thought was a good tool to use to create road signs etc for the project. However, after creating some road signs, we found an asset that included all European road signs, as well as an editor for them which we decided to use instead. Lastly, I also spent some time cleaning up my sections in the planning report.



## 1.4 Week 4

### Problems

This week Arvid Nyberg dropped out of the project.

Road Architect was identified as being unstable for some use cases, and bugs were found when trying to construct road networks of certain types.

### Proposed Solutions

The team split the work of Arvid among the members and planned ahead, keeping in mind the reduction in capacity. As he was responsible for the project report, it was decided to share that responsibility among all members.

In order to combat the instability of Road Architect it was decided to develop a road generator in-house. This will also improve the performance of the simulation as it will be possible to implement more efficient code for the parts that are needed within the project scope.

### Reflections

The team has made good progress in creating an MVP, with simple road generation, a functioning car (with "realistic" physics), and four-way intersections.

### Meetings

Weekly supervisor meeting on Monday, and then an additional meeting on Wednesday for the team to discuss how to move away from the Road Architect asset.

### Interim Goals

The goals for next week will be similar to those of last week for some tasks, as we now need to redo the work in our own road generator. Other than that, we will aim to start working on the communication between vehicles and other entities, such as traffic lights.

### Description of Individual Performance

- **Martin Blom**

This week I mostly tested the stability of Road Architect and concluded it was not at a functioning level. This put a stop to most tasks I had assigned myself, so instead I focused on getting our assets bought.

- **Felix Jönsson**

Fixed documentation after receiving feedback from supervisor and added text to the sections Problem, Method, and Societal and Ethical aspects.

Implemented a camera system, different cameras, and input manager in our application.

- **Hannes Kaulio**

This week i started out rewriting the physics of the car to use the new asset, Edy's car physics. Then i spent the rest of the time on trying to implement intersection creation.

- **Marcus Schagerberg**

I was focusing on creating a new road generator to use instead of Road Architect. I focused on a simple UI where you can create new road systems and roads, and creating the road meshes with support for multiple lanes.

- **Jakob Windt**

During this week, I spent most of my time implementing traffic lights. I created a controller that would pair up traffics light to determine what type of intersection they're in. From this information, each individual traffic light would switch it's lighting to match what was asked from the controller. I wanted to implement a way for a car to trigger the traffics light to change colors, but decided to wait until this week, since we're unsure on how to implement.

## 2 LP4