Infrastructure Management Game

Level 1

Prof. Dr. Jürgen Hackl

September 22, 2021

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1 Introduction

1.1 Overview

Infrastructure systems are the backbone of our society. They are an integral part of our lives. Without roads, electricity, freshwater or the internet, our lives would not be the same. Although we use them daily, we hardly think about how they work and what measures are necessary to maintain their functions. In this project, you will develop a game that deals with the maintenance and management of our infrastructures and brings this closer to the player. As an infrastructure manager, the player has to manage a given water supply system. He has to choose from various maintenance measures and find the optimal strategy to allocate his limited resources to different assets. As a game developer, it is your task to develop realistic assets with which the player can interact. Your primary focus is on different degradation processes and failure mechanisms that the player has to fight successfully. Besides the graphics, you also have to develop animations and interactions to bring the game to life. Game development is an iterative and interactive process. Although each of you will work on your own asset, teamwork is allowed, even encouraged.

1.2 Project Details

The project aims to develop a game asset that will be part of an infrastructure management game. The game asset will be part of a water supply system. In the first semester (level 1) you will deal with the game design of the assets (appearance, functions, attributes, interactions, costs, etc.). In the second semester (level 2) you will deal with the creation, programming and implementation of the assets.

1.2.1 Level 1

Level 1 deals with game design and ends with presenting the final asset concept at the end of the semester. Level 1 starts with exploring different games to get an overview of different game mechanics, styles, game systems, platforms. This is followed by research into potential game assets, i.e. the components of the supply network that could be used for the game. After this research, each of you will be assigned a game asset, which you will develop over the course of the semester so that it can be implemented in Level 2. This includes the collection of reference materials, plans, costs as well as the elaboration of the functions that this asset provides to the system. Since the game concept is based on the degradation and failure of the individual assets, suitable failure mechanisms must be found that can be represented in the game engine (i.e. mathematical models). In addition to the failure, we need maintenance measures that counteract or eliminate the damages. Since the player has only a limited amount of resources at his disposal, you need information about the costs, time, material, etc., needed for the maintenance measures. All this information is collected and processed at the end of level 1 to form the basis for the work in level 2.

1.2.2 Level 2

Description for level 2 will follow later

2 Assessment and marking of the Project

2.1 Experience Points

XP	Grade [%]
1000	100
700	90
500	80
400	70
300	60
250	50
200	40

Table 1: Experience vs Grade.

The evaluation of the project is based on experience points gained. Table 1 gives an overview of how experience points can be converted into percentage points. Experience points are accumulated throughout the project. The number of experience points gained depends on the performance. You can carry out different tasks with varying degrees of complexity. The tasks are divided into so-called badges, which are assigned to specific subject areas.

In total, you can achieve 1100 experience points in level 1, 900 through badges and 200 awarded by me as a bonus.

2.2 Badges

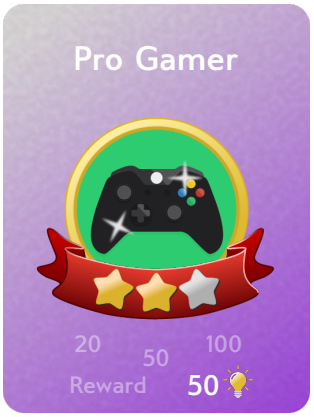

Figure 1: Sample badge *Pro Gamer* with two stars obtained.

Tasks that are necessary for a successful evaluation of the project are thematically divided into so-called badges. For each badge, there are three different levels of difficulty, which are marked by stars. To get a certain number of stars, you must fulfil specific criteria for each badge (criteria can be found here). According to the number of stars, there are corresponding experience points. For example, one star in figure 1 corresponds to 20 experience points, two stars to 50 experience points and three stars to 100 experience points. The number of experience points per star may vary from badge to badge. Experience points per star are not accumulated, i.e. if you reach three stars as a *Pro Gamer*, you will receive 100 and NOT 20 + 50 + 100 experience points.

2.3 Leader-board

An anonymous leaderboard with the current number of stars and experience points is published online at regular intervals.

2.4 Continuous Evaluation

You can earn badges in different orders. It is also possible to improve badges afterwards. For example, in week one, you complete the tasks to make one star. In week four, you have some time to work on the task from week one and earn your second star.

2.5 Work Plan

Basically, it is up to you when you do your badges, but I suggest the following work plan that you can follow.

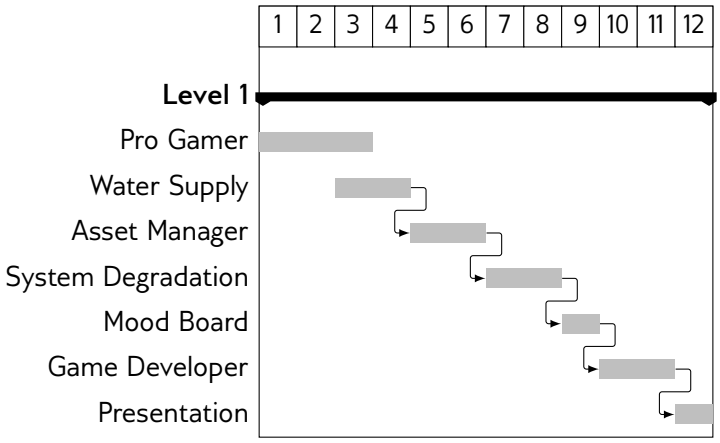

Figure 2: Gantt chart of level 1.

The project guidance I offer will follow this work plan. This means that questions on the particular topics will be dealt with in the respective weeks.

2.6 Overleaf

Your work takes place online. You will receive an Overleaf document from me by completing the corresponding tasks. Overleaf is an online text editor for LaTeX. You will work with LaTeX for this project. If you have never heard of it, don't worry, I will give you a short introduction at the beginning of the project and support you during the project.

3 Badges

In level 1, you can gain nine badges.

3.1 Pro Gamer

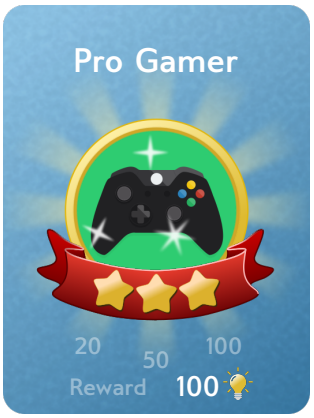

Figure 3: Pro Gamer.

To create an excellent game, you need to know the subject matter. That's why you'll get to grips with several Infrastructure and City Builder games by playing them.

- ⋆ Your task is to find and play 3 Infrastructure Management and City Builder games. You are free to choose the game platform (e.g. PC, PS4, IOS, Android, etc.). Please note that there are also excellent open-source and free-to-play games that are worth playing. For each game, write a summary of 250 to 300 words maximum, covering the following aspects, among others: what is the concept, how is the game design, what are killer features of the game, what is the game loop, what are magic moments, what are game features that fit your project, etc. For each game, include 2 in-game screenshots that best describe the game.
- ⋆⋆ In addition to the above, choose 1 essential game asset for each game and describe it in detail in 250 to 300 words maximum. What is its function, how is it integrated into the game, what animations take place, what different states can such an object take, what are the most essential elements, how can the player interact with this asset, change it, etc. For each game asset, include 2 in-game screenshots that best describe the asset.
- ⋆⋆⋆ In addition to the above, play 2 additional games and analyse 2 essential game assets for each of these additional games. Attach the corresponding 8 images.

3.2 Water Supply

3.3 Asset Manager

3.4 System Degradation

3.5 Mood Board

3.6 Game Developer

3.7 Presentation

3.8 Feedback

3.9 Social Media