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1. Alpha Report

1.1. Progress

At this point, most of the implementation work is done. We are happy with the progress we made since the interim report. We finished all the desired targets (besides the mini-missions) and as well some of the high targets. In retrospective, the project plane and the targets we defined was a good starting point and helped us a lot to keep track of our progress. One point that changed quite a bit from the project plan, was the assignment of the work. We think that is natural if you are not familiar with the other team members and in detail with their skills. Now we are looking forward to let other persons play the game and get their feedback. This will be especially helpful in balancing the game and maybe tweak some of the game elements. We hope that they will enjoy the game as much as we do.

Figure 1 Current version of the graphical representation of Munich at the beginning of the game.

1.1.1. What is missing?

Overall, we can say that nothing essential is missing. All the things that are not yet finished would just be elements that would be nice to have, like mini-missions or achievements. They would not change the core of the game. Nevertheless, they are some areas, which would definitely profit from more time. One example would be the overall atmosphere of the game. We did not have enough resources to create some background story or some sort of story arc in the game. At the moment, the player is just thrown into the game world with a short introduction, what happened and what they need to do. More time could be spend to let the player be more engaged with the game world and feel even more the thrill to fight the virus. Another example would be the simulation of the citizens and the virus, which could be

made more complex and enhanced. Beside these reasonable elements, some features were just out of scope for our project and the time we could spend, like to implement an online highscore or even some sort of cooperative game mode.

1.1.2. What is done?

After describing what is missing, this subsection is focusing on what we achieved. And as we already said we are quite satisfied with it. The structure of this subsection is similar to the one in the interim report chapter. This means that we will describe what we finished until this point of time. We will orient us on the targets we have described in the first chapter. Targets that we already described in the interim report, will just be shortly mentioned.

Representation of Munich As we stated in the interim report, we are using the data of "'Open Street Map"' to generate the game world procedurally. In comparison to the interim report, we are using much more elements/tags to generate the world. Landuse is now better visualized and we added 3d trees to the map as a visual highlight. All this adds more variety to the map and helps the player to better orient in the game world. Furthermore, the emitted light changes based on the state of the game. The art style is more darker and serious with only few coloured highlights like the hospitals or the research buildings. We think this fits very well to the game setting. In the post-processing pipeline we added a tilt shift filter to the game to get some sort of miniature effect. In summary, we finished the desirable target in this area. We think that the visual aspect of our game is quite good. It could be enhanced of course by more details, but we do not think this necessary for the game to work, maybe even hinder the player to see the core game mechanics.

Simulation: Crowd and Virus In comparison to the interim report, we made the biggest step forward in this area. The routing table algorithm was successfully implemented and is working smoothly. The tables are generated offline and at the beginning of the game the pre-calculated tables are just loaded. Furthermore, daily routines were implemented. Therefore, every citizen has a home, a working place and some leisure place, which changes randomly. The citizen is moving between these three places and stays their for a certain time. This is controlled by our time implementation, which gives us a 24 hour-cycle. It is possible to adapt the game speed in three steps from normal to very fast. We added a simple adaptation to the virus. Based on how close the player is to the cure, the virus is more randomly choosing his path. Overall, we finished all desired targets. We are satisfied on how the citizens behave and think this should be sufficient for our gameplay. Nevertheless, we could definitely improve the daily routines by adding more variation and heuristics to the citizens and as well to the virus.

Player Interactions and User interface Over the complete implementation phase, we worked continuously on the enhancement of the user interface and the feedback for the player. As we described in the interim report, we are still satisfied with the design, the art style and how we implemented the interaction. From the interim report until now, a lot of new elements were added to the user interface. Especially, a lot of feedback mechanism for the player were implemented like popups and tooltips. In more detail this is described in the

next section and as well in previous chapter. Overall, we definitely reached the targets, we had described for this area.

Resource Management, Research Ladder and Upgrades As we hoped in the interim report, we were able to finish all the work in time and even finish work from the high target. We have a fully functional research tree with different areas and interdependences between research elements. The player can upgrade the capacity of the hospital, increase the healing chances, decrease the likelihood that the virus is spreading from one person to another and much more. Therefore, the player has many different possibilities from which they can choose. Upgrades for the hospitals and research facilities are working fine. The resource management satisfies our needs and is thanks to design revision now much more easier to understand and to balance as we think. With regarding to the balance of this components, we think that the playtesting will help us a lot and let us find the right cost values for research, upgrades and other player actions.

Sound Design One area that we not really had in mind was the sound design of the game. We only had stated this as a high target and had no time allocated in the project schedule. But playing the game we realized that it would be important to have music and as well sound effects in the game. Therefore, we added this to our list with elements that we want in the game. Firstly, simple sound effects were added to player actions like sending out an ambulance or placing a detector. Then sound was added to the notifications to make the player more aware that something happens that needs the attention of the player. Lastly, we added some simple dynamic music, which changes if the infection rate reaches some threshold. This is simple, but we think that this helps a lot to get the player more engaged. In the end, we are happy that we invested the time in the sound design and reached as well the high target to some degree.

Miscellaneous They were some minor things we implemented as well. It is possible to choose from different difficulty levels. We added a very simple tutorial to the game as an introduction for the player. Furthermore, players get some statistics after finishing the game to see how well they did.

1.2. Interaction

For the alpha release we finished the GUI parts, improved UI usability and add more feedback for the player as mentioned in the prior section.

1.2.1. User Interface

We finished to research menu from the interim release, added a start and end menu including a text tutorial and match statistics. During playtesting we noticed, that emitting medic troops is a very clicking-intensive tasks, so we added a shortcut for the player to send the nearest troops to the marked waypoint. Furthermore, we implemented controls to dynamically adjust the gamespeed to slowdown or speedup the simulation to avoid stalls when waiting for resources to come up.

As the game has an initial learning curve for the players and it might be hard get an overview

Figure 2 The game after some time played. The light is shifting and is getting more and more red.

over the different menus and interactions in the first games, we tried to support them with a text tutorial and tooltips on hovering the UI elements. The tutorial covers the basic game mechanics with winning conditions, controls, explanation of the buildings and the research tree.

An important aspect is also consistent feedback for the players, which we implemented via text and audio notifications.

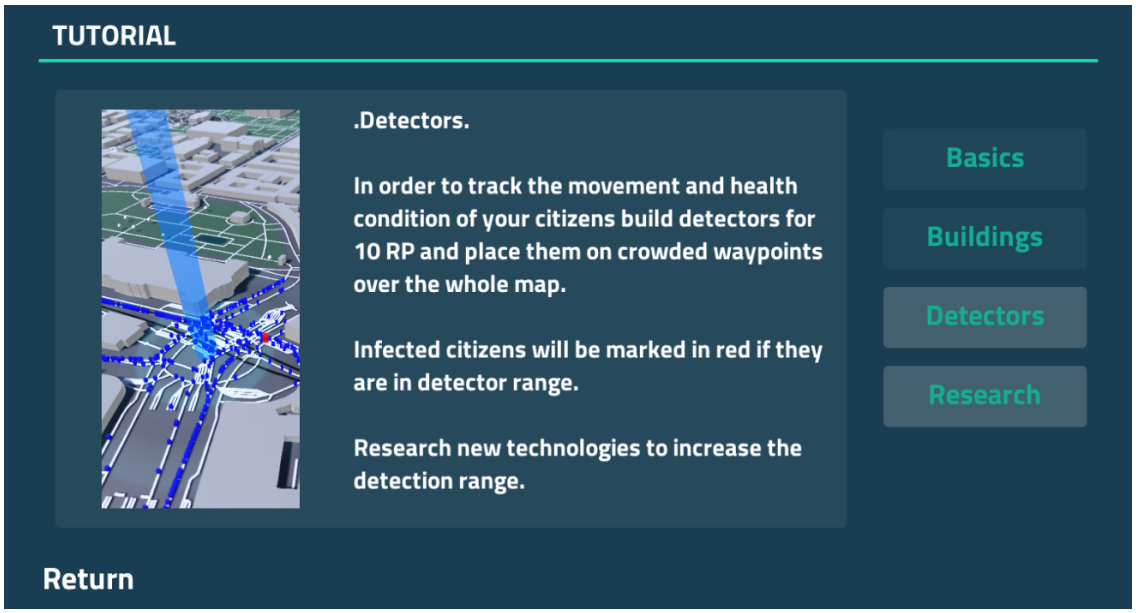

Figure 3 UI tutorial: Text based tutorial to help the players to quickly get an overview over the main game mechanics

1.2.2. Gameplay

We already settled our core game mechanics in the interim release. As a quick recap: our core game is focused on detecting and healing infected citizens by building detectors at specific waypoints in the city and emit medic troops to waypoints for bringing infected persons into hospitals, where they can be healed. We tried to enhance the game experience in the alpha release by adding more content in terms of research possibilities, hospital and university upgrades. This hopefully encourages the players to replay the game and keep them interested. Fig. 4 shows the research tree which has 3 subbranches for different research sectors allowing the player have more influence on the gameplay. The last node of each tree will slowdown the virus spreading permanently, which should be motivation for the player to take focus on spending points in research. With the different upgrade possibilities balancing becomes quite tricky and we will have to make further adjustments during the playtesting.
Beside that, we improved the visual representation of the city to reflect the current game status better and tried to catch the atmosphere of a spreading virus by adding visual and aurally effects as seen in Fig. 2.

Figure 4 Research tree: Tree based research ladder to unlock new skills with research points

1.3. Challenges and Implementation

For our game, we implemented a central control unit, which is responsible for organizing central parameters like simulation speed, research progress and the percentage of infected citizens. Several controllers, which are responsible for one aspect of the game each, can interact with these data. The UI controller displays the GUI and manages player input, as mentioned in the above section. The sound controller plays notification sounds and music

clips depending on the current state of the game.

Another controller is responsible for the simulation of the citizens. To save computing resources, they are divided in groups, of which only one is simulated in each frame. First, if a citizen is not already moving and its time for him/her to start moving, one of the predefined goals is chosen depending on the time of the day. Then, each citizen with an assigned goal moves towards the next street corner. Once such a point is reached, the next corner is chosen according to a table stored at the current one. Each time a citizen reaches a new corner, the simulation controller calculates, whether he/she is infected, depending on whether there are other infected citizens nearby. Finally, each infected citizen has a certain probability to die.

1.3.1. Challenges

The first challenge we encountered in the second phase of implementation was how to implement the routing tables. Because the map of Munich, which we use, contains more than 50.000 streets, we couldn't simply store all combinations of start and goal nodes. We solved this by combining for each node all sequences of successive nodes, whose best path leads through the same neighbor. To farther reduce the number of necessary entries, we sorted them according to their representation in the k-d-tree.

Another challenge was the missing connectivity of the data. Some streets used different nodes than others to represent the same position. Others formed sub-graphs, which were not reachable from the main street map, e.g. in parks. We approached the former problem by combining nearby nodes and the latter by removing the sub-graphs.

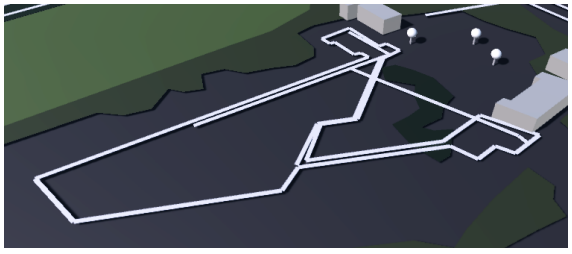

Figure 5 These streets are not connected to the main graph.

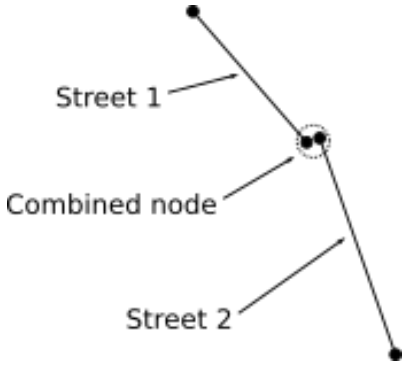

Figure 6 The nodes between the two streets are combined to a single node.

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