Individual reflection on creating an environment in Unreal Engine 5

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Figure 1: *Real-time rendered screenshot of the final environment.*

1 Introduction

The aim of our group project in the course 3D Computer Graphics (TNM061) was to create a small game level inspired by the game Mirror's Edge released in 2009 to get a better understanding of creating game assets and deeper knowledge of the process and limitations of creating a video game environment. Furthermore, to get some insights into one of the most powerful game engines on the market, Unreal Engine 5 (UE5). The result can be seen in **Figure 1.** It also includes a full set-up character allowing a traversal of the level by a player. The project was executed by Jesper Larson (jesla966), Eric Edelo (eried124), and Julian Voith (julvo429).

1.1 My role and responsibilities in the project

It is hard to define definite roles for this project because everybody was doing multiple things simultaneously and in cooperation with each other. Roles also shifted over time with the progression of the project.

However, my first role/responsibility was forming a group with the interest of creating a real-time graphics environment in UE5. This led to contacting people and scheduling initial meetings to discuss ideas for the project and what type of environment it is going to be. Scheduling meetings and keeping track of open tasks were one of my roles throughout the project including identifying and planning of necessary tasks. Nevertheless, this was also partially covered by the other group members.

In addition to the project management-related roles and responsibilities and besides gathering the required knowledge and hands-on experience for the game engine and modeling tool Maya, I was responsible for creating a part of the environment's assets, populating the environment, and implementing a fully functioning character with animations and controls.

Each member also was in the role of being a reviewer to peer review created assets and work.

2 Experiences of working with this group

Initially, the project group size was 4, which was later reduced to 3 people. The experience within the team ranged from none (myself) to some experience in modeling, and remarkable experience.

The reason for the reduction of the group size was, that one of the initial group members was barely participating and contributing to the project and its goal. Hence, together with the lecturer it was decided to continue without this person. These circumstances required other project members, including myself, to compensate for that.

Apart from this issue, the overall experience was very good. Since we had a very experienced group member, it made it easier to compensate for the lack of an additional member. However, the huge gap in experience, sometimes led to misunderstandings when communicating technical information due to a different level of knowledge. This was resolved by addressing this topic but also with my increase in knowledge over the period of the project.

It was easy to work with the group and everybody had the same interest and quality standards for the final deliverable.

3 My contributions to the project

At the beginning of our project, the team decided in the initial meeting to create a game level inspired by an existing game title. Hence, initial ideas/games for the project were discussed. I proposed Mirror's Edge as a reference which then was chosen after being evaluated to be a good fit for the overall goal.

Together with Eric and Jesper, I searched and evaluated different environments/parts of Mirror's Edge. For this task, multiple screenshots of different levels of the game were gathered and discussed.

After settling on the reference level, I needed to gather knowledge and hands-on experience with UE5 and Maya.

In the next step and collaboration with the other group members, I analyzed the designated reference level to identify key assets which are needed to assemble the 3D environment. 12 key assets were identified, which of the following I created in Maya:

- Elevator Doors
- Normal Doors
- Television
- Abstract Art Sculpture
- Stair steps

The modeling process also included the reduction of complexity (i.e., fewer vertices and edges) where necessary, the assignment of material slots, and the creation of proper UV maps.

After completion and peer review of the created assets and peer reviewing others' assets, everybody imported their object into the group's UE5 project.

Once imported, I created the materials for the above-listed assets, based on the references the group had. For that task, Physical Based Materials in UE5 were used. Basic materials but also materials with textures were created. The used textures and a small number of materials were sourced from the Quixel Bridge Plug-in within the engine.

The final step after modeling was importing the level to the project and populating it. The level was divided between Jesper and me. Each one of us populated around 50% of the environment.

An additional feature we wanted to implement was a character that can be controlled by a player to traverse our 3D environment. While implementing this feature, I aimed to have a character that includes basic animations and controls. The character model and animation files were sourced from the unreal engine's marketplace.

To make this character model into a playing character, I needed to create a character blueprint that handles the camera position, movement speed, and general controls of the character. For the controls, however, input actions and mappings needed to be defined in the first place. Then by using the blueprint system, the character controls can be set up with suitable graph nodes and connections. I implemented controls for walking, running, jumping, and crouching, but also to zoom in and out with the camera. The character was then imported to the level through a Player Start object and by adding a Game Mode object.

The final step to set up a character in UE5 is adding proper animations. Motion capture animations were used which are also accessible through the marketplace. To ensure proper transitions between different animations, I created Blend Spaces for running and crouching. For Example, the Blend Space for running covers the transitions between the animations for standing, walking, and running in respect of the current movement speed. Hence, crouching required a different type of animation set, two Blend Spaces were needed. Those Blend Spaces were then added to an animation blueprint that tells the character which animation or Blend Space is triggered in which circumstances (e.g., for jumping).

The final project was then documented by the team in the form of a summary and presentation.

4 Improvements for the next project

For the next project, improvements can be viewed from two different perspectives. A technical and interpersonal perspective.

In terms of technical improvements, more advanced practices like ray tracing and texture channel packaging could be used. But also, the selection of the engine could be different.

Unreal Engine is without a doubt a very powerful engine but also very intimidating and complex for beginners and a small team. Without people with prior experience in game development, it would probably not have been possible to set up this kind of project in the given time frame and team size. Here I would probably step towards different engines which have a lower entry barrier and are easier to use.

The interpersonal improvements rather go towards the issue we had with one of our former group members. Here we waited a bit too long to communicate the issues we encountered. For upcoming projects, the communication and resolution of such issues should start sooner. Here we were too optimistic and waited too long to resolve the issue.

5 Conclusion

In conclusion, I learned a lot in terms of 3D modeling, the process, and the limitations when it comes to building a real-time 3D environment. I had exceptional group members who already had a lot of experience which I was able to leverage and learn from. I'm incredibly happy with the outcome of the project.