Digital Prototyping DECO7230 Prototype 1

Statement of Originality

Statement of Original Work: I certify that the concept of the prototype, part of the prototype scene in Unity, and the logic on how to give different feedbacks is my own original work. In the construction of this prototype, I also used various external resources, which include the race car object from the asset store, the sound file from the asset store, Unity online tutorial, YouTube tutorials and the help from the Unity forum. All the external sources I used in prototype one construction will be listed below.

[1] Black race car object in prototypeScreen : PP Super Car 01, Pink Planet Studios; retrieved from [Unity Asset Store] https://assetstore.unity.com/packages/3d/vehicles/land/pp-super-car-01-228682, Last Accessed 29/8/2022

[2] Sound effect in the background when hitting obstacles : Grenade Sound FX, MGWSOUNDDESIGN; retrieved from [Unity Asset Store] https://assetstore.unity.com/packages/audio/sound-fx/grenade-sound-fx-147490, Last Accessed 31/8/2022

[3] The if statement in barrier1.cs : Unity forum answers, user Yinja provide the solution, retrieved from https://answers.unity.com/questions/769723/how-can-an-object-detect-what-hit-it.html, last accessed 31/8/2022

[4] The code that help the camera follow the car object in Camera.cs : Unity tutorial, retrieved from #3 Add an offset to the camera position at https://learn.unity.com/tutorial/1-3-make-the-camera-follow-the-vehicle-with-variables?uv=2020.3&projectId=5caccdfbedbc2a3cef0efe63# , last accessed 31/8/2022

[5] The codes that obtain the keyboard inputs in DriverControl.cs: Unity tutorial, retrieved from https://learn.unity.com/tutorial/lesson-1-4-use-user-input-to-control-the-vehicle?uv=2020.3&projectId=5caccdfbedbc2a3cef0efe63#5cbe3969edbc2a191e639152, last accessed 31/8/2022

[6] The codes that move the vehicle in DriverControl.cs: Unity tutorial, retrieved from https://learn.unity.com/tutorial/1-2-move-the-vehicle-with-your-first-line-of-c?uv=2020.3&projectId=5caccdfbedbc2a3cef0efe63#5ce33718edbc2a232e231e45, last accessed 31/8/2022

[7] The code the change the vehicle direction in DriverContro.cs: Unity tutorial, retrieved from https://learn.unity.com/tutorial/lesson-1-4-use-user-input-to-control-the-vehicle?uv=2020.3&projectId=5caccdfbedbc2a3cef0efe63#, last accessed 31/8/2022

[8] The if statement in the bottom of DriverContol.cs : Unity forum answers, user Yinja provide the solution, retrieved from https://answers.unity.com/questions/769723/how-can-an-object-detect-what-hit-it.html, last accessed 31/8/2022

[9] Audio volume if else statement in DriverControl.cs: Unity documentation, retrieved from https://docs.unity3d.com/ScriptReference/AudioSource-volume.html, last accessed 31/8/2022

[10] Application of sound effect when hitting objects in DriverControl.cs: YouTube tutorial, retrieved from https://www.youtube.com/watch?v=UVI6bwldPio, last accessed 31/8/2022

Basic Details

Full Name: Chi Heng Jeffrey Hui

Student Number: 46587590

Practical Session: Thursday 10:00am to 12:pm

Tutor: Tahlia Slater

Document Title: Prototype 1 Statement of Delivery

The Concept

Most of us had experienced long distanced driving, and we know long distance driving can drain your energy easily, as you need to stay focus on the road for long period of time. Long distance driving and fatigue driving are common terms that are linked to each other frequently. Fatigue driving for long hours can be very dangerous, and we can see it caused many accidents. To solve the problem, we need to design a comprehensive system that can keep drivers awake when drivers are not paying attention to the road. The system also needs to give appropriate feedbacks to drivers in different situations. For instance, the system will give temperature feedback and sound feedback to drivers when the fatigue level is low. Conversely, the system will give vibration feedback and more aggressive sound feedbacks to drivers when their fatigue level is high. The aims of the system are to keep drivers awake when they fall asleep, but also main a good user experience.

The Purpose of this testing round

In the concept section, it mentions the system that solves the problem needs to give appropriate feedbacks to drivers in different situations. To achieve this requirement, the system will use driver's fatigue level data as input and provide different feedbacks accordingly. Increasing the feedback level progressively is one of the approaches that I will use in the system to reach the goal. In prototype one, the research question is to find out what is the most effective way to provide feedback? Is providing the same feedback every time when the system is triggered a better approach? Or increasing the feedback intensity progressively a better approach to catch? This is the aspect I want to evaluate on my concept. In addition, I also construct a hypothesis before the testing session, the hypothesis will be "Increasing feedback intensity is not required. A system with high feedback intensity is always capable in all the scenarios."

Through people using the prototype, I want to find out does the progressive feedback system do a better job on stopping the testers from making the same mistake when comparing with a single feedback system. Also, I want to find out how the testers feel about the user experience on the progressive feedback system. By having answers to these questions, I can understand the effectiveness of the system and how people feel about the system, which will help me to improve my concepts in future iterations.

In the construction of the prototype, there are many important things to include, for instance, an appropriate context to accommodate the prototype elements, the main object to apply user's input, different feedbacks, and the feedback mechanisms. These components can help me to create a complete prototype for the testing session.

On the other hand, there are things I need to exclude in the construction of the prototype. For instance, I need to reduce the complexity of my prototype, since complex prototype is not easy for the testers, which may create more difficulties during the testing session, and we may not get what we are looking for. There are different ways to reduce complexity, in example, make the flow of the prototype more straightforward, reduce unnecessary inputs, and avoid sophisticated inputs.

The Form of the prototype

Description of the prototype: The prototype is a model of a car simulation game. In the prototype, testers will use the up, down, left, and right keys to control the movement of the vehicle. The testers need to drive the car from the yellow area to the read area. During the process, the testers need to avoid hitting the obstacles. If the user hit the obstacle, the system will provide feedbacks to testers. The system gives different feedbacks when the times of hitting the obstacles increase.

Screenshots, Photographs of physical artefacts, interaction diagrams should be included here, these should also be accompanied by explanatory text.

Prototype Screenshots:

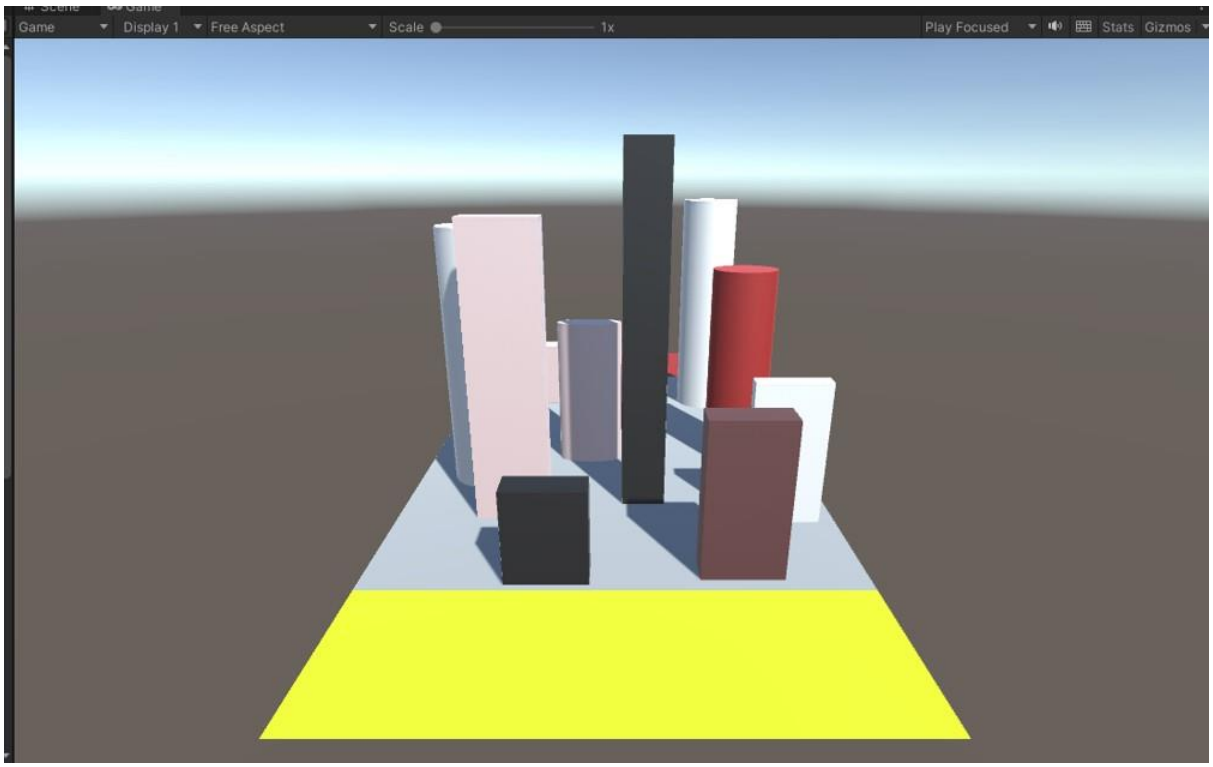


Image 1: This image is the setting of the prototype. I used 3D objects in Unity to create the setting. The 3D objects include plane, cube, and cylinder.

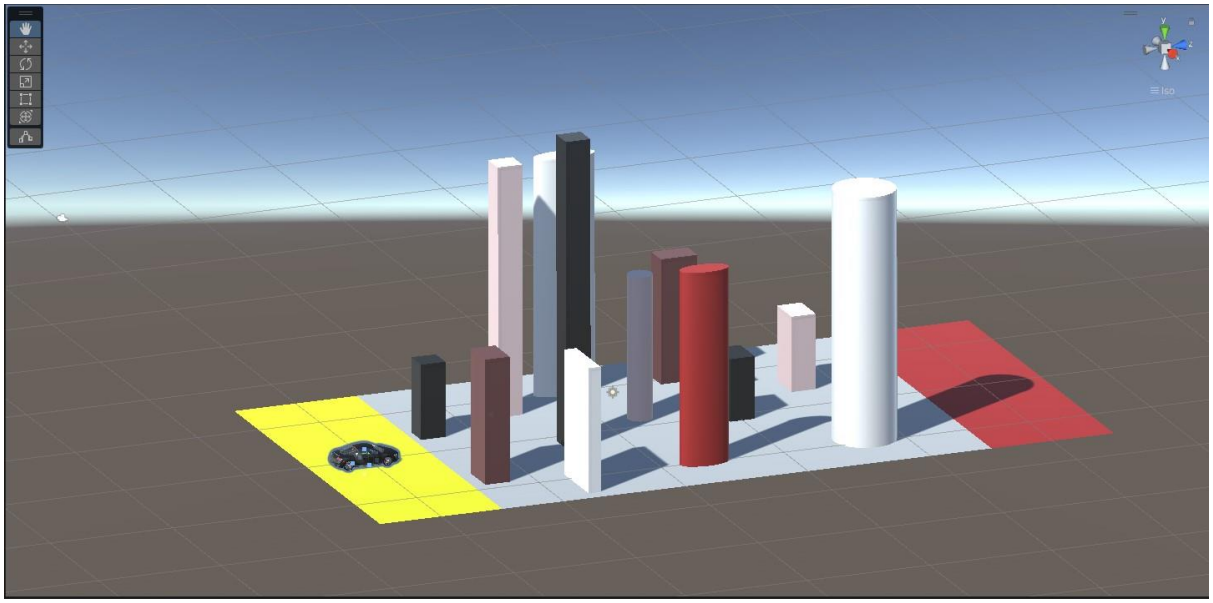


Image 2: This is the completed prototype. As it shows, the car is at the yellow area, which is the starting line. The car needs to get to the red area without hitting any 3D obstacles in the setting.

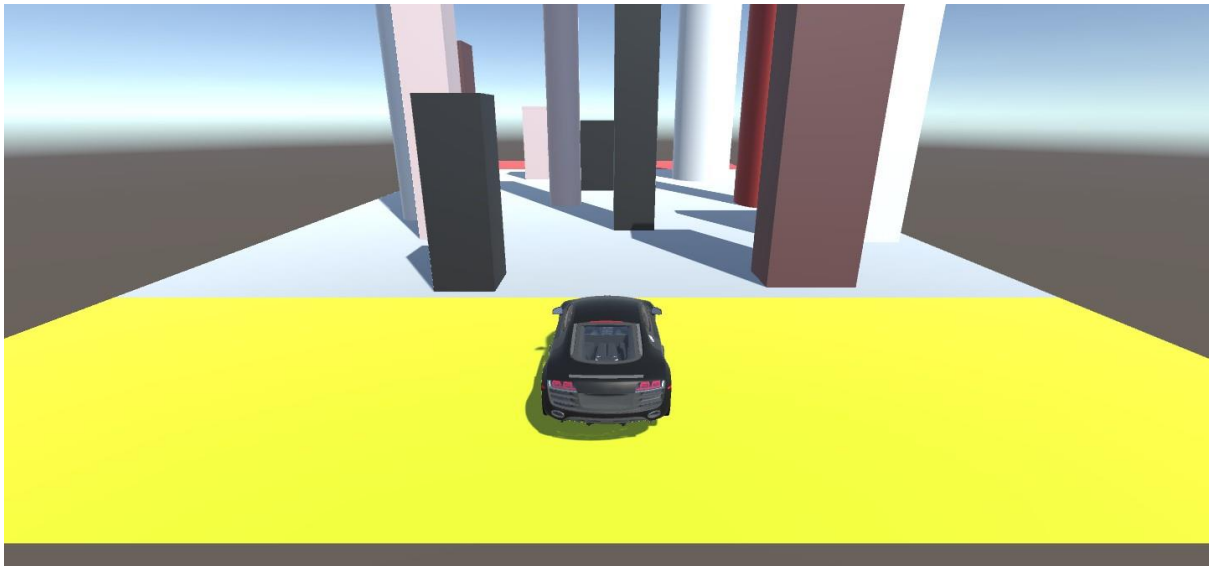
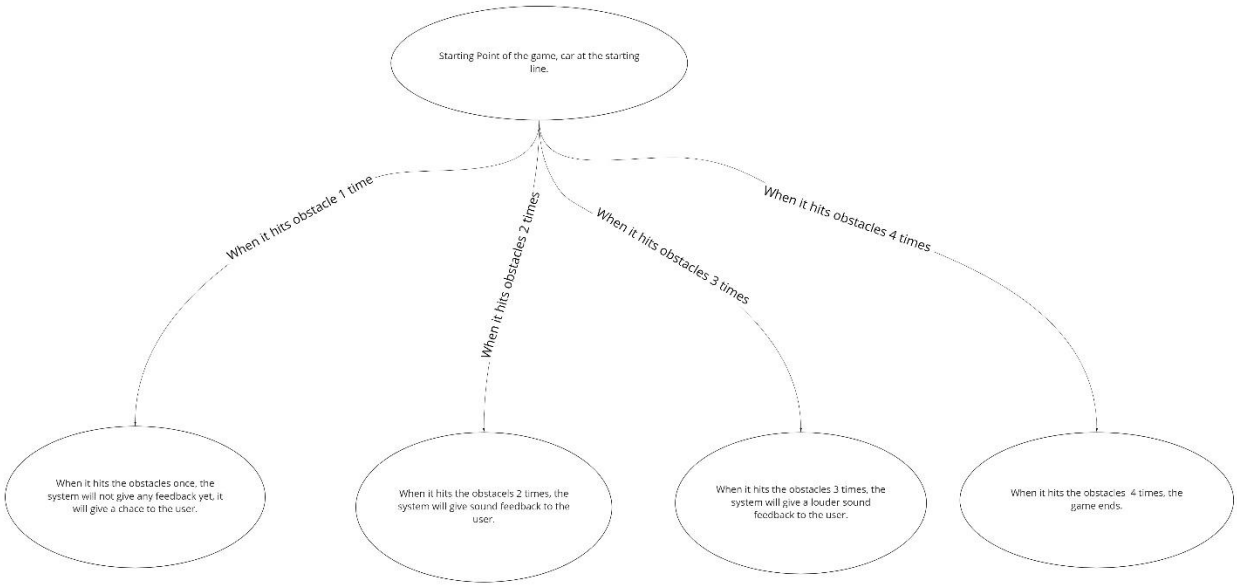


Image 3: The picture shows what you can see after pressing the start button. I adjusted the coordinate of the main camera, which gives tester a first-person point of view when driving the car. I believe this will give a better angle to testers when they test my prototype.

Interaction diagrams (Screenshots/photographs):



Img4: This is a diagram which shows the interaction between the testers and the prototype. This diagram shows how feedbacks change when hitting times change. This diagram shows how the progressive feedback system works in the simulation.

The Testing Approach

Agenda:

1. Introduction on the prototype
2. Explain on how the testing session runs
4. Tester will start the tasks
5. Ask general questions about the tasks they just did
6. Ask deeper questions that relates to the research questions.

Process:

When testers enter the breakout room, the first thing I did was introducing my prototype to them. I explain what the prototype is about, and I explain how the testing session runs. Testers need to complete 4 trials in the testing session. In the first run, testers need to hit one obstacle. In the second run, testers need to hit two obstacles. In the third run, testers need to hit three obstacles. In the fourth run, the testers need to hit four obstacles. After explaining how the session runs, I will start the session, the tester will do the tasks. When the tester completes the tasks, I will ask them some general questions about the test they just did. Following, I asked more specific questions that align with my research questions.

Method for evaluation: I used observation and interview as the evaluation method during the testing session. For observation, I focus on the facial expressions and the verbal feedback when testers are working on the tasks. Information obtained from observation are useful since these are the first impressions from the testers, which are considered as natural and realistic feedbacks. This information is usually less biased. On the other hand, I interview with testers as well. I started with some general questions first. For instance, I asked testers what feedbacks they realize and what are the patterns they can observe. I asked these questions, since I want to ensure the testers understand the prototype, so I can ask deeper questions in the following stage. After asking some general questions, I will move to deeper questions. For instance, does increasing the feedback intensity keep you away from the obstacles, does increasing feedback intensity affect your performance in the testing process, and do you think increasing the feedback intensity give you more information when you are doing the test? These are the deeper questions I asked to answer my research questions.

Evaluation Outcomes & Reflection

Results of the evaluation: After testing my prototype and conducting the evaluation, I realize most testers feel the progressive feedback system is more impressive than a single feedback system. They feel it is a more innovative way to provide feedbacks to users. The testers agree increasing the feedback intensity is a better reminder to them since single feedback doesn't differentiate the differences when the violation times increase. Testers think increasing the feedback intensity will help them to pay more attention to what they are currently doing.

Conclusions can you draw about the concept from the results: From the results above, we can conclude testers of my prototype agree providing feedbacks progressively is a better approach to remind participants since it is more informative and responsive. From this conclusion, we can say having a single feedback system is not always the best, and I can deny the hypothesis I made in the early stage.

Changes I will make to my concept in response to the evaluation: Based on the evaluation results, it indicates people think increasing the feedback intensity when the time of hits increase is a better approach. In this case, I may make some changes to make the concept more effective. Here are some examples. Currently, I only predefined two levels on the feedbacks, which are low mode and high mode. I can add medium level to the feedback system as well. The medium level will provide intermediate feedbacks to drivers. For instance, the steering's temperature will get colder, and the ring time of the alarm will increase to 20 seconds. By adding one level of feedback, the system can give more accurate feedbacks to drivers, which will make the system more effective.

Whether the prototype I created was sufficient to test what I wanted to test: In prototype 1, the objective is to validate whether increasing the feedback intensity progressively is a good system for the concept. To help myself to find out the answer, prototype 1's design mainly

focusses on how to respond users' feedback in different situation. The evaluation results and testers response successfully answer my research question, so I prototype 1 is sufficient to test what I want to test.

Testing Plan

In the remaining time of the course, I need to complete 2 more prototypes, the following paragraphs explain my plan.

Prototype 2

Aspect I want to test in prototype 2: In the fatigue driving warning system, it totally relies on the sensors to detect drivers' movements and motions. The detected information will be used as the input, which will determine what kind of feedbacks will be given to the driver. Collecting input automatically by the system itself is a good design, since it doesn't require use's attention when they are driving. But there are drawbacks as well, for instance, most system cannot guarantee they will do the right thing all the time, system misinterpretation can happen. In this case, I want to test whether automated input by the system better or input by users better. Better means the accuracy on judging the driver's condition and provide the right feedbacks. This is the aspect I am interested to validate in prototype 2.

Prototype 3

Aspect I want to test in prototype 3: In the fatigue driving warning system, the system will base on user's condition to provide different feedbacks. When you observe it carefully, drivers will receive multiple feedbacks at once. For instance, when you are in low mode, you will receive both sound feedback and temperature feedback. When you are in high mode, you will receive both sound feedback and vibration feedback. Combined feedback seems effective, as it involves different kind of feedbacks. During my thinking process, I also question myself, will providing one feedback at a time make a better concept. Based on this question, I will use prototype 3 to validate the effectiveness between single feedback and multiple feedbacks. By the end of prototype 3, I will be able answer this question and make corresponding changes if needed.

Miro Link

https://miro.com/app/board/uXjVPaR0jqc=/?share_link_id=557051423139

Video Link

https://youtu.be/ESvUNyNtF3w