Driver Reaction Times in Virtual Reality (Experimental Research Project)

Aim:

The aim of the project is to investigate how different scenarios can positively or negatively effect a driver's reaction time whilst driving a car. On average 5 people die on the road per day in Great Britain, see [1], this project aims to provide research that can help to reduce that number (via: data to fuel government regulations, or data to encourage new software/hardware for cars to be invented).

Objectives:

1. **Create** a 3D environment within Unity, using a combination of premade 3D assets and 3D objects created by myself within different 3D design software (Blender).
2. **Design** and choose an art style for the 3D environment. Could be simple block shapes (more cartoony but easier to program & build) or be realistic (more difficult but may improve results).
3. **Review** literature pertaining to different studies in the same field [2], [3], as well as the data on the various causes of crashes [4] so that the test can be relevant.
4. **Decide** what the main features are that need to be implemented in the test. These can be to potentially distract the driver, to try and improve the drivers focus, or to impair the driver in some way (handsfree phones, noisy passengers, relaxing music, loud music, visual indicators, visual impairment, etc.)
5. **Program** a functioning program that can be used for experiments to gather quantitative results (reaction times, accident percentages, questionnaires, etc.)
6. **Test** the program, and fix any major bugs.
7. **Organise** and **perform** a live experiment using the software with various participating people, will not only need to advertise the test properly but carry it out in an organised way where it is done efficiently and fairly (may need to do a practice test with less people weeks/months before the official experiment).
8. **Analyse** the testing data and figure out what conclusions can be taken, as well as any critiques/errors that could be done better in the future.

Milestones:

- Basic project draft outline & presentation created – due 15th November 2019
- Presentation performed – due TBA (late November 2019)
- Design (UML diagrams, sketches, etc.) – due 29th November 2019
- Start Coding in Unity – start date 29th November 2019
- Main 3D models made/acquired (to design brief) – due 20th December 2019
- Object & application functionality framework complete – due 3rd January 2020
- Practice experiment & bug testing (alpha test) complete – due 31st January 2020
- Application & runnable scenarios (child runs in road, etc.) finalised for experiment with bug from the previous testing fixed – due 28th February 2020
- Room bookings and time slots arranged for main test. – due 6th March 2020
- Main experiment (beta test) – due 20th March 2020
- Draft Dissertation – due 24th March 2020
- Results recorded from the test & put into graphs/diagrams. – due 27th March 2020

- Code finalised – due 24th April 2020
- Potential for an additional smaller test to be done with the final application within this window, if needed – 24th April 2020 to 15th May 2020
- Dissertation finalised (allowing time for review of: spelling, references, data, etc.) – due 15th May 2020
- Final Submission – due 26th May 2020

Pros/Cons:

Pros	Cons
I have used Unity before, and know the UI very well. Hence, I will not waste time learning new software in order to get on with my project.	I have not got very much experience in 3D modelling or 3D modelling software.
There are many different 3D assets that can be used, as long as I receive permission, so I do not have to make every 3D model myself.	It will be hard for me to find an incentive for people to come to test my application, companies usually use a money but I don't think I can necessarily do that as a student.
I am very comfortable with object-oriented programming, as well as programming in C# (as it is very similar to java which we have done intensively over the course).	Apart from designing and creating the program to run during testing, there are not many technical aspects involved that I have learned from the course. – might be too simplistic?
I have been involved in a serious car crash before and I know of many young people who have to (who are luckily still alive) so it is something that I feel passionate about.	I do not have any experience in programming for Virtual Reality, as well as experience using Virtual Reality. I will need to get experienced in this area fairly quickly (although Unity has wonderful tutorials and a very user-friendly VR integration).
This would be very fun to create and test out with others, would be a great experience.	
It could provide research data that could help to save lives in the future.	

References:

[1] https://www.brake.org.uk/facts-resources/1653-uk-road-casualties - 2017 report on road casualties.

[2] https://trimis.ec.europa.eu/sites/default/files/project/documents/DRIVEIN2.pdf - 2016 report on driver cognitive distraction (tested with VR)

[3] https://trl.co.uk/driving-simulator - DigiSim overview of their driving simulations.

[4] https://www.aceable.com/safe-driving/car-accident-statistics/ - US driving fatality data (2007 – 2012)