# Esiea: Assignment

## Outline

This assignment is built around the undertaking of an experiment in virtual reality. We will define a simple hypothesis and create an experiment to test it. This approach is typical for the creation of all software and applications where the software is built, evaluated by it’s users and the results of the evaluation used to improve the software.

In this case we will be considering one of the key issues within virtual environments: user perception of distance. Building on the work we did earlier in this teaching unit we will seek to determine whether users estimate distance better in an environment that has a richer visual scene, or in an environment that is visually simple. Our hypothesis is therefore:

“Users of virtual environments can better estimate distance in a more visually enriched scene”

This means we also have a ‘null’ hypothesis that we are attempting to disprove, and which will be the fallback conclusion for the research:

“visual enrichment of a scene has no impact on the ability of users in virtual environments to better estimate distance”

To conduct this experiment you will need to create 2 virtual environments using the unity platform. Both should require the user to virtually travel the same route within the environment. In one the scene should be very simple, using basic shapes and basic materials. The second should require the user to virtually travel the same route, but in a scene that has a richer set of more refined objects and more varied use of material and texture. You may want to refer to the lecture on cognition and perception to determine shapes, colours and textures that support and enriched scene without introducing ambiguity and excessive cognitive load.

The path the users should take should be sufficiently complex that the end point is not visible from the starting position and should be hidden until the user is at least half way along the route. Both the start and endpoints should be clearly marked and the route should be easily identifiable (this is not a maze problem solving experiment). As the user travels along the path of the route they should be required to interact with at least two objects (ie click on the object and there will be some effect). These objects should be clearly identifiable and occur at the same position in both versions of your environment.

Users will not be timed for the completion of the route. Ideally you should base the route on a physical location you know well and can freely walk yourself to enable you to test your environments against your own perception of distance before releasing them for evaluation. An ideal solution would record the distance travelled by the virtual user and enable the user to record this on the completion of each route. However, you should be careful about how you present this information to avoid informing the user of the actual distance before the experiment is completed (ie you may want to encrypt the message you show to the user).

To evaluate your experiment you should send copies of both environments to two of your colleagues for them to evaluate. Ideally both qualitative and quantitative evaluation should be undertaken and the analysis of this reported.

As this is an experimental process you will need to consider the design of your experiment, and within it the product, before implementation and also show you have considered the ethics and risks associated with this. As part of your experimental design you should also define a clear data management and privacy strategy that can be communicated to the users before they engage in the experiment.

The submission for this assessment will be in the form of a report with a zipped copy of your allocation development project, a short (<3 min) video showing your environments and a self-assessment of your work against the marking scheme for this assignment. You will be assessed on the quality of the report only. The source code and video are to provide contextual understanding of your environments and validation, where needed, of what you have implemented. Assessment of the report will be based on UK National Qualification Frameworks criteria for level 7 (Masters) qualifications. Specifically these are:

1. Holder reformulates and uses practical, conceptual or technological knowledge and understanding of a subject or field of work to create ways forward in contexts where there are many interacting factors.
2. Holder critically analyses, interprets and evaluates complex information, concepts and theories to produce modified conceptions.
3. Holder understands the wider contexts in which the area of study or work is located.
4. Holder understands current developments in the area of study or work.
5. Holder understands different theoretical and methodological perspectives and how they affect the area of study or work.

And/or

1. Holder can use specialised skills to conceptualise and address problematic situations that involve many interacting factors.
2. Holder can determine and use appropriate methodologies and approaches.
3. Holder can design and undertake research, development or strategic activities to inform or produce change in the area of work or study.
4. Holder can critically evaluate actions, methods and results and their short- and long-term implications.

NOTE: This is draw directly from UK National Qualification frameworks documents and the term ‘Holder’ means the student who has completed this work.

The marking scheme is a criteria based grid, at the end of this document, that incorporates these into a banded marking scheme. You should use this for your self-assessment.

## Structure of report

The report should be approximately 6 pages (guideline 3000 words) written in English following the model presented (below). You should also include an appendix (upto 1000 words) on your riak assessment and ethical policy/approach.

## Materials

You are provided with a template Unity project that has a simple mouse/keyboard camera model as the basis for your application. You are also provided with a marking scheme (below) and a basic report template (below)

## Submission

The submission deadline for this assignment is the 17th May 2021. Submissions are to be in the form of a report, and single short (<3min) video demonstrating the environments created. A self-assessment of the work should be included (this should be in the form of a highlighted version of the marking scheme (below)

## Marking Scheme

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Very Poor | Poor | Acceptable | Good | Excellent |
| Criteria | 0-19% | 20-39% | 40-59% | 60-79% | 80-100% |
| Report | Minimal report that is under developed and incomplete | A functional report that describes the process of implementation but does not consider the wider project and how the work is contextualised in theory.  An incomplete or partially completed report missing substantial key sections and depth of argument | A report that considers the project (rather than product), but presents this in a functional narrative (ie. describing the process of enacting the project, rather than contextualising the work in theory)  A underdeveloped research strategy and methodology that is missing substantive key elements or depth of argument  An incomplete or partially completed report missing key sections and depth of argument | A well developed report that presents an analytical, scientific dissemination of the whole project in a structured and progressive form.  A developed research strategy and methodology that articulates the aim of the work, key research questions and objectives  A complete review of the project without any missing sections, but may have a lack of depth or argument | A excellent report that presents an analytical, scientific dissemination of the whole project in a clear and concise structured and progressive form.  A well developed research strategy and methodology that articulates the aim of the work, key research questions and objectives and grounds these well in background research  A complete review of the project without any missing sections and demonstrates a well developed argument |
| Implementation | Minimal modification of the template environment without incorporating any new assets or structures | Some modification of the template environment with a few new assets or structures  Little or no grounding of the design of the environment to theory or intent of the project | A functional environment that utilises the provided assets, and additional ones to create a basic, but working system  Some runtime errors may be evident  Some grounding in the background and theory of the work, but inconstantly applied | A refined functional environment that utilises the provided assets, and additional ones to create robust and effective experimental system  No runtime errors evident  Majority of aspects are grounded in theory and background research | A refined and effective environment that utilises the provided assets, and additional ones to create robust and effective experimental system  No runtime errors evident  Clear rational and evidence, from theory and background reading, provided for overall design of the environment and the functional aspects |
| Risk & Ethics | No consideration given | Minimal consideration in general terms without reflecting the specific risks and ethical issues of this project | Consideration and a developed risk/ethics assessment, but lacking grounding in research or theory.  No specific consideration for key aspects of the project and user involvement  Little/no consideration of data protection and personal information | A robust, functional risk and ethical assessment, with a clearly articulated policy  Clear and well defined provision of information to the users on the risk and ethical policy for the data gathering and experimental process  Consideration of data protection and personal information | A grounded (in research) risk and ethical assessment, with a clearly articulated policy  Precise provision of information to the users on the risk and ethical policy for the data gathering and experimental process  Full consideration of data protection and personal information |
| Experimental Process | No functional experimental process reported | A basic experimental process reported that does little to link to accepted theory or background research.  Under planned approach to either/or the conduct of the experiment, collection of data, analysis of data  Data analysis and collection have little grounding in the research aim or objectives | A considered experimental process reported that has some to link to accepted theory or background research.  A planned approach to the conduct of the experiment, collection of data, analysis of data  Data analysis and collection grounded in the research aim or objectives | A refined experimental process reported with good linkage to accepted theory and background research.  A well planned approach to the conduct of the experiment, collection of data, analysis of data that considers sources of error and ambiguity  Data analysis and collection grounded in the research aim or objectives | A very refined experimental process reported that connects all aspects to accepted theory and background research.  A refined approach to the conduct of the experiment, collection of data, analysis of data that considers, and mitigates, sources of error and ambiguity  Data analysis and collection grounded in the research aim or objectives |

For your self-assessment you should indicate which column you think your work best fits against for each row. Please place and ‘s’ in the box you select

When I come to mark the work I will indicate the band for each criteria with a ‘l’. I will also provide you with feedback in the form of upto 3 points of consideration (things you may find useful for future work) and a brief overall summary of my assessment of the work.

Evaluation of final mark will use a centre weighted approach. In essence I will draw a vertical line through the average of my scores for each set of criteria. This ‘line’ will then define the overall mark for the work reported rounded to the nearest 5%.

## Final note

Remember this is about the experiment, not creating a perfect set of virtual environments. As such the report, the research and critical thinking that go into it are the most important aspects of the work. Plan your time well and think ahead to the evaluation process to make sure you have enough time to complete this, analyse it and review the outcomes.

Good Luck

## Report Structure

Your report should be written in 3rd person, past tense. It should use clear and concise English, that is impersonal and objective.

Below is a guide to the structure of the report. This is typical of most scientific writing in the computer science domain. You may wish to use an alternative structure, but will still need to address the criteria of the marking scheme. Ideally there should be no code within the report. Remember, you are reporting on the project (ie the whole experiment and it’s context), not just the product (development of the application)

1. Introduction (guide approx. 500 words)

This should present the problem domain and outline the general approach you are taking. Within it you should cover the key elements of:

* What are you doing, this should end with a definition of the project aim.
* Why are you doing it (ie how does this fill a hole in understanding/why is it a good time to do this now). This part should conclude with a presentation of the key research questions
* How are you going about it (Methodology). This should be a high level, strategic view (forward looking)of how you will approach the project and conclude with a small set of objectives, covering the whole project, that are both progressive and measurable.

1. State of the Art (guide approach 1000 words)

The state of the art (background) contextualises the problem against existing research. In this you should conduct your own research (academic journal and conference papers) to provide a background to your study and evidence/justify the decisions you have made in the development of your experimental design. You should conclude this section with a summary of how this background research influences the choices and decisions you make for the design and implementation of the experiment, and the nature of the environments you create

1. Design (guide approx. 500 words)

This should cover the design of the experiment, not just the application(s). As such it should cover the process by which you define your experimental method, determine the content and form of the virtual environments, how you will evaluate these and how you will evaluate the results. You should also present and discuss your ethical and risk assessments here. This should also include a description of your data handling strategy.

1. Implementation (guide approx. 500 words)

This section should review your implementation of the experiment (not just the development of the applications). Source code should not be used, but a discussion of the problems and challenges should be presented.

1. Evaluation (guide approach 250 words, but may have substantial additional tables and charts)

Present the results of the evaluation with a simple and direct commentary of these (problems, observations from the data, etc) and the direct analysis of this. This part should not include any interpretation or discussion of the outcomes of the experiments.

1. Discussion (guide approx. 750 words)

The discussion is where you present your contextualised interpretation of the experiments. These should refer back to your introduction and state of the art sections and may draw on the data within the evaluation section to evidence the outcomes these against the outcomes of the experiment. You should also review your experimental design/method and to reflect on the merits of this with a possible discussion on what you might change if you were to do this again and/or what has succeeded well or not performed as expected.

1. Conclusion (guide approach 250 words)

In the final section you should draw a short conclusion that relates the outcome of the experiment to the original hypothesis and present ideas for possible future work in this area.

Appendix: Risk and Ethics (upto 1000 words)

This section should give a clear presentation of the risks, to users, in the project and the strategies to mitigate these. It should also present a review of the ethical treatment of gathering, storing (and deleting) and processing data associated with the work.