SCHOOL OF SIMULATION AND VISUALISATION THE GLASGOW SCHOOL OF ART

SimVis Masters Project Proposal 2022

Name:	John Shields
Master's programme:	Serious Games and VR
Date:	25/04/2022

1. Project title & Supervisor(s)

Note: MSc Medical Visualisation & Human Anatomy students should identify two supervisors – one at each of the School of Simulation and Visualisation (GSA) and at the College of Medical, Veterinary and Life Sciences (GU)

Title: ***The Celestial Beyonds***

Supervisor(s): Dr. Sandy Louchart

2. Provide a project summary in **no more than 100 words**

This project aims to be a 3D game that allows the player to explore space and different planet hubs. The main theme of the game will be exploration and discovery with action events for battling enemies along the way. The player will be accompanied by a companion with an A.I. chatbot system that will assist them on their space quest. The idea behind the game is to heavily involve A.I. through the companion, enemies and the world itself. A.I. will be the main research aspect and a core component of the game's development. This project will try to show how A.I. can make games more interactive and realistic.

3. Research questions and/or problems. What do you want to find out? (**100 words maximum**)

- How can Artificial Intelligence implementation improve a Games interaction with the Player?
- What role does Artificial Intelligence have in terms of gameplay interaction?
- Can Artificial Intelligence make for a realistic Game Character that can interact with Players for an authentic experience?

These questions are all closely tied. All of them focus on how the implementation of A.I. can improve the game for the player's experience. Rather than have the experience set for the player by the game being all *hardcoded* this approach will aim to make the player's experience vary each time they play as the A.I. will be constantly learning and changing the experience.

4. Research aims and objectives. What do you hope to achieve? (**100 words maximum**)

This project has two aims; Develop a 3D, space hub explorer game with A.I. technologies. Second is to study and analyse the A.I.'s performance throughout the game to learn how it is actually affecting the player's experience.

Objects:
1. Carry out a literature/contextural review
2. Design and develop the game
3. Study and analyse the A.I.'s responses and results
4. Report on how the A.I. performs from previous objective
5. Highlight important areas for future research and potential

5. Research rationale. Why do you think this project is worth doing? (**100 words maximum**)

Working with A.I. technologies can be hard to predict as the output result can be loosely controlled and may not always have the same answer. This project aims to utilize the technology to improve the player's experience by having unpredictable events happen in the game to enhance how they play and how the game world will change by being in control of A.I. This will study the use of A.I. and compare it to more traditional ways of development methods such as hardcoding and pre-set values that can never change themselves..

6. Research context. Very briefly summarise the relevant literature and practice within your particular field of enquiry? (**200 words maximum + references**)

Artificial Intelligence (A.I.) is huge in games, from maze and world generation, NPCs, chatbots, enemies and pathfinding. A.I. relies on redominant paradigms/algorithms. These include Reinforcement Learning, Deep Learning, Deep Reinforcement Learning, Montre Carlo Tree Search, and Evolutionary Algorithms (Risi, S. and Preuss, M., 2020).
NPCs have always piqued the interest of experts in the gaming industry, since a poorly implemented NPC may detract from a game's realism. In general, NPCs are any characters in a game that are not controlled by the player. According to experts in the area, creating an adaptable and intelligent NPC necessitates the use of a variety of methodologies and the evaluation of a large number of ideas (Edwards, G., Subianto, N., Englund, D., Goh, J.W., Coughran, N., Milton, Z., Mirnateghi, N. and Shah, 2021).
There are two types of Machine Learning (ML) and A.I.: supervised and unsupervised learning. As previously stated, supervised learning occurs when the supervisor is aware of the output and the training data is labeled as such. Methods like decision trees and classification, which, as the name implies, categorise data into meaningful categories, are used in supervised learning. This type of artificial intelligence/machine learning is employed in-game creation on a regular basis (Skinner, G. and Walmsley, T., 2019).

References:

Risi, S. and Preuss, M., 2020. From chess and atari to starcraft and beyond: How game ai is driving the world of ai. *KI-Künstliche Intelligenz*, *34*(1), pp.7-17.

Edwards, G., Subianto, N., Englund, D., Goh, J.W., Coughran, N., Milton, Z., Mirnateghi, N. and Shah, S.A.A., The Role of Machine Learning in Game Development Domain-A Review of Current Trends and Future Directions. In *2021 Digital Image Computing: Techniques and Applications (DICTA)* (pp. 01-07). IEEE.

Skinner, G. and Walmsley, T., 2019, February. Artificial intelligence and deep learning in video games a brief review. In *2019 IEEE 4th International Conference on Computer and Communication Systems (ICCCS)* (pp. 404-408). IEEE.

7. Research methods. What procedures and/or analytical processes might you use to answer your questions? Justify your choices. Identify areas where you will need further training. (**500 words maximum**)

Designing and development will be focused on the core functionality first to ensure a smooth user experience. This requires a list of objectives to achieve first. To ensure core functionality, a prototype will be developed and tested by creating a scenario in a tutorial form. This process will be focused on Test Driven Development to plan a smooth development phase. From my undergrad, I've learned that the development methodology Agile is quite helpful for development. I will apply this methodology by completing the project's objects in sprints (week by week). Agile is meant to be flexible, which is perfect for a project like this as design changes can happen throughout development by having to improvise in some situations.

8. Proposed project outcomes and impacts. (**300 words maximum**)

The overall outcome of this project is to create an immersive, realistic and enjoyable experience for its players. The A.I. technologies will aim to improve the game throughout each playthrough. Also, the A.I. will aim to make the game more interactive for the player and be a helping hand when in need.

Once implemented in the game the A.I. will be tested and analysed to see if it is actually improving the experience for the player and not damping it. This study will bleed into data analysis where the A.I.'s results and output will be studied to ensure it is doing its purpose.

The overall experience will hope to achieve an impactful experience for its players by evolving them as must as possible and making them feel welcome in the game's world. Also to show how powerful A.I. can be in a game than having everything (for lack of a better word) 'pre-rendered'.

9. What specialist facilities, equipment, or software might you require? What other resources will you need? Include people if you require access to particular specialists or collaborators. How will you access them? (**300 words maximum**)
Note: If you require specialist equipment or resources, discuss these with your supervisor. In some cases you may be responsible for sourcing this yourself.

Unity or Unreal
3ds Max/blender - Modelling
PhotoShop
A.I. - Pathfinding, Machine Learning and Neural Networks.
Python - Tensorflow
Fl Studio (Music)
Game console controller

3ds Max/blender will be used to create the environments of the scenarios with 3D modeling and realism will be a big factor in these environments to give the best experience.

For version control and a backup GitHub will be used to store the project should anything go wrong it will always have a backup. GitHub will also be used to mark the milestones of the project from the backlog of commits detailing every update done to the project.

10. Risks. What are the major risks that affect your project and what steps will you take to avoid or ameliorate them? (**100 words maximum**)

One risk I will have to deal with is the unpredictable results of the A.I. technologies. As A.I. basically has a mind of its own it will be a risk to rely on it for accurate results. I aim to overcome this risk with research and further analysis of the results.

Another risk is that this project could have too big of a scope and will be hard to keep within the time limit. Will enough preparation, research and time management will hopefully be avoided as this can have a huge impact on the final product.

11. Project timeline. Briefly sketch out a high-level project timeline in an appropriate format (e.g. Gantt chart or table).

Weeks:	1	2	3	4	5	6	7	8	9	10	11	12	13
General Research	▮												
Research Questions		▮											
Literature Review Draft		▮	▮										
Project Proposal and Ethics Form			▮										
Finalize Lit Review				▮	▮								
Drafting of Chapters						▮	▮						
Designing						▮	▮						
Development								▮	▮	▮	▮		
Testing & Evaluation											▮		
Comparing and Anlysing Report											▮		
Finalize Chapters										▮	▮	▮	
Proof Reading											▮	▮	
Supervisor meetings	▮	▮	▮	▮	▮	▮	▮	▮	▮	▮	▮	▮	▮
Submission													▮

12. Ethical Approval

A separate form – Ethical Approval Form 1 – will be made available and must be completed by all students when submitting their final project proposal. Please refer to the form and associated guidance.

Submitted by student _____ Date _____

Agreed by supervisor _____ Date _____

Agreed by supervisor _____ Date _____