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:	27/05/2022

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*** - (How A.I. implementation can support companionship in Serious Games)

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, discovery and companionship with action events for battling enemies along the way. The player will be accompanied by a companion with an A.I. chatbot system in the form of a follower/companion 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 support companionship in Serious Games.

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?
- How can Artificial Intelligence implementation support companionship in Serious Games?

These questions are 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 *hard coded* 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, action and 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 research and a literature/contextual review
2. Design and develop and deploy the game
3. Study and analyse players' perception of the A.I. implementation
4. Reports on 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 utilise 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**)

Serious Games are games designed to serve a purpose other than entertainment. Serious gaming, like VR, is being employed in various fields, including education, health care, marketing and other industries. Since serious games are entertaining, engaging, and immersive, they have the edge over other learning modalities (Poos, J.M., van den Bosch, K. and Janssen, C.P., 2017).

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).

Although technological aspects of the embodiment can efficiently aid social connections with people, it is uncertain whether this conclusion applies to AI created for social goals, such as AI companions. Human social views of an AI companion may be especially crucial for generating a socially meaningful encounter because AI companions can be advantageous for persons seeking company. This study explores the social presence and warmth of an AI companion, which are vital in forming companionship and relationships, in order to address the importance of social and relational perceptions of an AI companion. This study investigates whether an AI companion's perceived social presence and warmth interact with the influence that the AI companion's embodiment has on perceptions of the AI companion (Merrill Jr, K., Kim, J. and Collins, C., 2022).

References:

Poos, J.M., van den Bosch, K. and Janssen, C.P., 2017. Battling bias: Effects of training and training context. Computers & Edu- cation, 111, pp.101-113.

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.

Merrill Jr, K., Kim, J. and Collins, C., 2022. AI companions for lonely individuals and the role of social presence. *Communication Research Reports*, *39*(2), pp.93-103.

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**)

First, a Literature Review will be conducted to study past and relevant literature that will aid the development of the project. The review's research and context will be focused on A.I. Technologies with research on Serious Games, Path finding, Machine Learning, Neural Networks, A.I. Chat bots and A.I. companionship in order to address the research question and build a foundational structure of knowledge for the development process.

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 Textbox environment level in order to prototype the character models, player's and follower's/companion's functionality A.I. implementation, player and enemy combat and basic UI. This process will be focused on Test Driven

Development to plan a smooth development phase. This development method will include working on parts of the game in sprints that will be tested repeatedly throughout the development process. This method will ensure the game is up to scratch with performance and experience for its players. Using this method will also be a smooth process for debugging when implementing new features as it is tested repeatedly throughout development it will gain robustness with new features to avoid conflicts and errors. Lastly, using this process will allow for a build, test and deploy method. This involves building the game for WebGL, testing it and then using that tested build for deployment through the Unity Cloud.

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), which works hand-in-hand with Test Driven Development. 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.

Evaluation will be carried out on the A.I.'s performance in response to the experience players' get from the game. Also the game will be evaluated for usability to ensure the baseline is a playable and fun experience.

The game will be built for WebGL to make the game widely accessible to voluntary testers and the game's users and players. Having this game as a WebGL build will also work with the cloud deployment of the API server for the Python A.I. Chat bot as they will both be able to send requests and responses to one another over the internet.

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 much 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 w/ WebGL
Unity Services - Cloud Building and Game Deployment
3ds Max/blender - Modelling
Mixamo and Unity Animations - Rigging and Animating Characters and Objects
PhotoShop
3rd Party Assets: Sketchfab, TurboSquid, Unity Asset Store & Mixamo
A.I. - Pathfinding, Machine Learning, Neural Networks and Chatbots
Python w/ Flask
Heroku - to deploy Python Flask App - API Server for A.I. Chatbot
Fl Studio (Music & Audio)
Game console controller

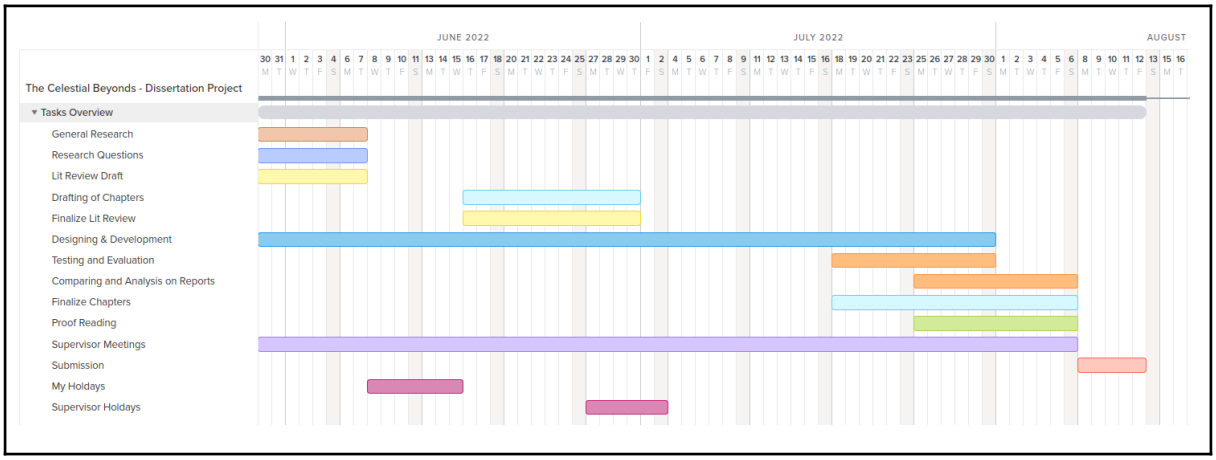
3ds Max/blender will be used to create the environments of the scenarios with 3D modelling and realism will be a big factor in these environments to give the best experience.

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).



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 _____John Shields_____ Date __27/05/2022__

Agreed by supervisor _____ Date _____

Agreed by supervisor _____ Date _____