**Assessment submission 1: Dissertation Proposal**

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| **Student name:** | Calum Lindsay |
| **Student number:** | 21010093 |
| **Project title:** | The unexplored potential of L-Systems in 3D Games  Where have L-Systems been under-utilized in 3D Games?  The fringe of L-System exploration in 3D Games |
| **Supervisor:** | Magnus Tullock |
| **Partner college:** | Shetland or Orkney? |

**Project summary/overview**

What is the product? What is your goal? What is the justification for your project? This should include a rough overview of the requirements, both functional and non-functional. There is no need for detailed scoping at this stage. [300 words]

Goal is to explore existing uses of L-Systems in games and pioneer new approaches and/or new avenues of exploration.

Functional requirements:

* Explore the current literature
* Implement existing solutions that seem to have scope for differing approaches, propose differing approaches and attempt to implement these new approaches.
* Propose solutions in areas previously unexplored or where limited exploration has taken place.
* Implement new solutions in unexplored / limited exploration areas
* Critically analyse the outcome of the created implementations against other examples and natural phenomena (where appropriate)
* Present and discuss proposed solutions, problems encountered and future work

Non-functional requirements:

* Performance of solutions should be reasonable for use in 3D games
* 3D Application for demonstration of solutions
* Interface for modification of algorithm properties

Justification:

* L-Systems have seen some limited exploration and use in 3D games
* There is likely a lot of potential in these unexplored or under-explored areas
* Creating new techniques using L-Systems could improve PCG in certain areas in terms of performance, quality and/or believability.

**Previous work**

Short summary and discussion of previous work known (not a full literature review yet). [200 words]

* The original book <http://algorithmicbotany.org/papers/abop/abop.pdf>
* Combining genetic algorithms to evolve plants <https://link.springer.com/chapter/10.1007/978-3-319-90418-4_2>
* Dynamic Animation of L-System plant growth <https://nccastaff.bournemouth.ac.uk/jmacey/OldWeb/MastersProjects/MSc09/Hampshire/thesis.pdf>
* Generating 3D plants <https://www.scitepress.org/PublishedPapers/2009/17853/pdf/index.html>
* Plants that grow and then die <https://www.niclab.mx/portal/sites/default/files/SemanticDeathInPlantSimulationUsingLindenmayerSystems_0.pdf>
* Procedural cities <https://web.archive.org/web/20060114082225/http://www.vision.ee.ethz.ch/~pmueller/documents/procedural_modeling_of_cities__siggraph2001.pdf>
* Scenario Generation in U.S. Marines Fire Support Team Training games <https://dl.acm.org/doi/pdf/10.1145/1814256.1814262?casa_token=I6F3PwIIPH4AAAAA:Z2hq2C4LhggWv_tSDT-TcD9ETnl0m2HOJidyqCw-ocniSOFOo0O3noGsophBzSQk8f8WI2SszWAcxQ>
* Volumetric Spaceship generation <https://dl.acm.org/doi/pdf/10.1145/3520304.3528775?casa_token=7MOs98nNai0AAAAA:uSQgCc8x3ttin0TiPVI1fvd0pSMtNW2dfx58NTSt3GDJ9bWYb59Fse3slkaIeJgihCmeyD9tb-hsBQ>
* River delta generation <https://core.ac.uk/download/pdf/322445609.pdf#page=132>

**Technologies**

Proposed technologies to be used (with student’s level of experience/expertise with each) and justification (including brief discussion of alternatives). [100 words]

* Unreal Engine – No previous student experience. Extensively used in industry, Student is familiar with C++. Alternatives: Unity, Godot, Custom Engine. Justification: Provides performance and reduces time spent creating graphics code not directly applicable to the goals of the dissertation
* C++ - Student has 12 years of hobby-based experience. C++ is industry standard for high performance-oriented code and the student has a reasonable proficiency using it.

**Development methodology**

Proposed development methodology and justification (including brief discussion of alternatives). [200 words]

Kanban board combined with Scrum inspired sprints. Alternatives waterfall requires a specific final goal. Justification: Agile makes the most sense where the destination is not completely known, and the tasks’ timescales are difficult to predict.

Research Methodology: due to the nature of the research this will be mixed with a combination of observations, experiments and statistical analyses.

**Project plan/timeline**

Proposed timeline with major milestones. (No need for a formal Gantt chart, although that could be good. Whether it’s text or a diagram, this needs to be clear and reasonably detailed.) [100 words or equivalent in diagram]

**I feel like I probably need some more detail here but I’m unsure with the proposal being as open as it is?** Especially on the specific timing of anything! I will probably do this as a Gantt chart for clarity.

Sept – Oct - Literature review

Sept – Nov – Familiarization with Technologies to be used and initial development of demonstration application.

Nov – Dec – Exploration and prototyping phase.

Jan – Apr – Development of suite of final demonstration algorithms and integration with demonstration application.

Apr – May – Comparison of results to previous techniques, compilation of dissertation outcomes and final write up of dissertation.

**Supervisor meeting arrangements**

How often? When? How? (Phone? Skype? Face to face?) We need a commitment to a weekly meeting.

(Every / Every Second) (Wednesday / Thursday) Afternoon for (30 mins / 1 hour) using Microsoft Teams.

**Ethics**

Have you read the UHI Research Ethics Framework? Have you completed a REC1 or REC1-D Student Application for Ethical Approval form and submitted it along with this proposal? Are there any ethical risks in your project?

I haven’t looked at this yet but will do ASAP, **I don’t think I should have any ethical risks due to the fact that my proposed dissertation doesn’t require any volunteer participation?, unless it is required from a marking point of view in which case maybe I could get subjective opinions on the quality of the content generated?**

**Reference list**

List all references cited above, following the UHI Student Referencing Standard.