3D Procedural Cave Generation

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**By**

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**Word count: XXXX**

This document is a template for your guidance. You don’t have to stick to it precisely. It may not suit your particular project. Modify it if you need to – but please discuss with your supervisor before making substantial changes to the organisation and content. Make sure you write about the all the individual elements mentioned in the assignment specification.

Paragraphs in red, like this one, are instructions and extra information. You must delete them before submitting your report.

This template document has a number of paragraph styles predefined. If you use them (‘Heading 1’, ‘Heading 2’ and ‘Heading 3’) and don’t alter them, then your report will automatically have properly numbered paragraphs and your table of contents will be automatically generated with the right page numbers. Use ‘Normal’ as the style for general text paragraphs in your document.

On this page (and I *really* hope this is obvious) you must replace the words “The Title Of Your Project”, “Your Full Name Here” and “202100000” with the correct information. You’d be surprised how often people forget to do this. Don’t be one of them.

You must also replace “XXXX” with the actual word count (excluding acknowledgements, abstract, table of contents, references and appendices) of your document.

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Delete these red paragraphs!

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# Project background and purpose

## Introduction

This project will focus on the procedural generation of caves within computers, it will explore methods of generating terrain in order to procedurally generate a cave system. Using a graphics API such as OpenGL in C++ to render and generate a procedural cave. It will compare different methods of procedural generation, their different purposes as well as their suitability for this project, what procedural generation is will also be researched and its differences compared to random generation.

## Objectives

This project aims to develop a working program that implements procedural terrain generation for caves and displays it through the use of a 3D environment. This will be useful as a project for developing the research of procedural generation of caves specifically rather than just procedural terrain generation in 3D. The motivation of this project is to further advance procedural generation in computer games/programs and more specifically procedural cave generation.

The primary objectives of this project are:

* Implement procedural cave generation in C++ using Perlin Noise/L-Systems.
* Render procedurally generated cave using a 3D graphics API such as OpenGL.
* Create program with user controls in order for the 3D environment to be observed properly, allow user to change the perspective.

If there is enough time during the project, the secondary objectives:

* Implement procedural terrain generation in C++ using Cellular Automata and compare to other methods used.
* Implement procedural generation at runtime to make the 3D world “infinite” and generate as the user moves.
* Add extra graphical enhancements to the 3D rendering such as more advanced lighting and texturing.

## Scope

The purpose of this project is to delve into the 3D aspects of procedural cave generation, there is a lot of similarities between 2D and 3D procedural generation but only 3D will be involved with this project. There are also a lot of different methods of procedurally generating terrain in computer graphics, the ones being looked into with this project will be Perlin Noise, L-Systems and optionally Cellular Automata. As mentioned, this project is about procedural cave generation in 3D, normal world terrain generation is similar to cave generation, but this will not be included in the project. Procedural generation is often used in video games, this project is focused on the technical side and will not use the procedural generation to create a game.

## Deliverables

The main deliverable will be a program that implements procedural cave generation within a 3D environment that is rendered using a graphics API, it will have user input for moving around the environment. This deliverable will be met if the final program displays a procedurally generated cave within a 3D environment that can be viewed by the user, the cave must be rendered properly and use shadows and lighting to make the cave generation visible. The generated cave must be the same each time based on the same input seed; it must not be random.

## Constraints

Are there *externally-imposed* requirements which you must comply with? What are they, and how will they impact on the project? Note that you having already decided to use a specific technology is not an externally imposed constraint – it’s you not making that decision with proper consideration. Note that there may not be any constraints on your project. Delete this section if that is the case.

Delete the red paragraphs and replace this one with your content (use the “Normal” paragraph style).

## Assumptions

If there are unknown elements or missing information relevant to the project, what assumptions will you make to account for these? How are these assumptions justified?

Delete the red paragraphs and replace this one with your content (use the “Normal” paragraph style).

# Project rationale and operation

## Project benefits

What benefits will a successful project bring, and to whom? Note that this is about the project’s content and purpose, not the fact that you are doing a project for your degree.

Delete the red paragraphs and replace this one with your content (use the “Normal” paragraph style).

## Project operation

How will you operate the project? Will you use a particular methodology for it and for any software or other development? How will you measure the success of your choice?

Delete the red paragraphs and replace this one with your content (use the “Normal” paragraph style).

## Options

What options are available to you for the tools, techniques and design parameters of your project? How will you evaluate them and make the best selection?

Delete the red paragraphs and replace this one with your content (use the “Normal” paragraph style).

## Risk analysis

What risks might affect the outcome of your project or its stakeholders? How severe are they, and what steps will you take to mitigate against them?

Delete the red paragraphs and replace this one with your content (use the “Normal” paragraph style).

## Resources required

What resources will you need for the project? Are any non-standard? Are they already available? What effect will it have if they are not available or are delayed, and how would you manage that?

Delete the red paragraphs and replace this one with your content (use the “Normal” paragraph style).

# Project methodology and outcomes

## Initial project plan

## Tasks and milestones

Present a realistic task list for the entire project, broken down to a suitable level of detail. Indicate milestones against which progress can be monitored. Make sure you include all the deliverables you mentioned earlier.

Delete the red paragraphs and replace this one with your content (use the “Normal” paragraph style).

## Schedule Gantt chart

Present a Gantt chart showing a schedule for all tasks, milestones and deliverables. Show dependencies amongst tasks. If you are intending to use SCRUM or other agile methods, be sure to go to the lectures involving project planning. Your time plan should cover the entire period of your project (and will therefore include the PDD preparation as a task and the PDD itself as a deliverable).

Delete the red paragraphs and replace this one with your content (use the “Normal” paragraph style).

## Project control

How will you manage the project day-to-day? How will its performance be monitored? How will you judge if it has been successful?

Delete the red paragraphs and replace this one with your content (use the “Normal” paragraph style).

## Project evaluation

How will you evaluate the project’s artefacts and overall outcomes? What user evaluation will you do? Do not underestimate the importance of this, and include clear details of how you will do the evaluation.

Delete the red paragraphs and replace this one with your content (use the “Normal” paragraph style).

# References

List any sources you have used for your background and introduction here. Make sure you use the proper referencing format.

Delete the red paragraphs and replace this one with your content (use the “Normal” paragraph style).

# Appendix a

You may use one or more appendices to add useful reference information which may be relevant to other sections of the report. Do not use appendices simply as a way of writing more than will fit into the main document word count. If you don't need any appendices, then delete this whole section

Delete the red paragraphs and replace this one with your content (use the “Normal” paragraph style).