MGAI Assignment 1 Procedural Content Generation

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1 Introduction

In this assignment we want you to familiarize yourself with Procedural Content Generation. Minecraft is a host to many interesting AI challenges, such as village generation[2] (see Figure 1[1]), or co-operative natural language interaction[1]. You will be generating a House in Minecraft.
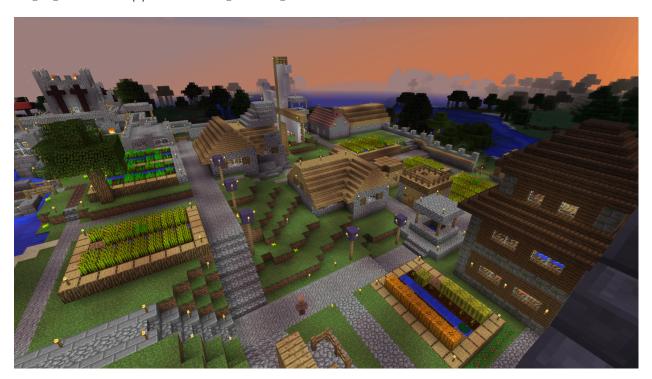

Figure 1: Entry from the Generative Design in Minecraft Challenge (GDMC). This village was constructed algorithmically and not drawn manually. It serves as an example here for what PCG can do.

2 Required Setup

First of all grab a copy of Minecraft 1.16.5. Note that we of course discourage to do that via third-party launchers, such as TLauncher, that allow you to download the official Client from the official minecraft website, without owning an account. After setting up Minecraft 1.16.5, follow the instructions to set up the GDMC HTTP-API Mod[2]. It will enable you to modify your world via Code.

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[1] https://mikecgreenblog.wordpress.com/2018/05/31/the-generative-design-in-minecraft-competition-gdmc/
[2] https://gendesignmc.wikidot.com/wiki:submission-httpserver

3 Your Task

Your code will procedurally generate a building in the build area[3]. Your building should smoothly integrate into the existing world. So do not clear all blocks in a bounding box, but make sure your algorithm attempts to scan the selected environment, and places its structures in a fitting way. This is the difficulty and essence of Procedural Content Generation! Adaptability to the infinite possiblities that RNGesus might throw at you.

Moreover, you will be writing a scientific report. There you will make the intentions behind your architectural design clear, and reference inspirations and applied algorithms to achieve your goal.

Your generated structure should include at least the things below, but more can only be better.

- A house of a specific architectural style

- Interior decoration

We expect you to attempt to implement these things in a way that the world is believable. Believable in the sense that, e.g., a house should not spawn directly in the middle of an ocean where it would not be reachable. And ideally, you do not alter the area where it should be placed, but of course if you are in the middle of a jungle and there is no continuous free space to put your structure due to too many trees, you are allowed to make free space.

Again: take randomness into account! The result of your program shall not always produce the exact same thing 1:1 within a bounding box, but instead adapt and vary! Not 1:1 means your house should also vary, by placing some windows or other things a little different every time they are placed. The keyword is **Procedural Content Generation**, not place given structure at point X,Y,Z.

4 Submission

Make sure to nicely document everything that you do in the report. Your final submission consists of:

- Source code for a python program that will call the GDMC HTTP API at localhost:9000 and integrate a House believably into the world.

- A self-contained scientific pdf report with figures, **references**, etc. The page amount we expect of you might vary depending on your layout. This report contains an explanation of the techniques you applied, how you addressed believablity, **multiple** example figures showing the adaptability to different worlds, and overall conclusions.

If you have any questions about this assignment, please visit our lab sessions on Thursdays where we can help you out. In case you cannot make it, you can post questions about the contents of the course on the Brightspace discussion forums, where other students can also read and reply to your questions.

The deadline for this assignment is the **11.03.2021**.

5 Grading Criteria

Your grade for the assignment will be made up of:

- 25% Believability

- 25% Aesthetic

- 25% Randomness / Variation of Procedurally Generated Content

- 25% Report

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[3]https://github.com/nilsgawlik/gdmc_http_interface/wiki/Interface-Endpoints#get-the-build-area

References

[1] Julia Kiseleva et al. "Neurips 2021 competition iglu: Interactive grounded language understanding in a collaborative environment". In: *arXiv preprint arXiv:2110.06536* (2021).

[2] Christoph Salge et al. "Generative design in minecraft (GDMC) settlement generation competition". In: *Proceedings of the 13th International Conference on the Foundations of Digital Games*. 2018, pp. 1–10.