Can an Unknowing Participant distinguish between Procedurally Generated and Human Designed Interiors?

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***Abstract*—What's the problem? What am I looking at? How does that help solve the problem?**

Opening, Challenge, Action, Resolution

Attempt to see if procedural generated interiors can be percieved as human designed. Comparing the two together and see if participants prefer the procedurally generated designs.

I. Introduction

Urban open world games such as Grand Theft Auto V [1], The Division [2] and Batman: Arkham Knight [3] have such large built-up areas for players to venture in. However, only a few handpicked buildings in these large cities are accessible and have modelled interiors leaving the others to be blocked off for decorative purposes. This could be resolved by modelling and designing each room in these cities, but this would become incredibly impractical. Other issues with this can lean towards rendering and the storage of such heavily dense areas.

Procedural Generation

Procedural Generation (PCG) refers to automatically creating content using algorithms [4]. PCG has many applications in video games, some notorious examples being the world/cave generation in Minecraft [5], the character, civilization and world generation in Spore [6] and the procedural texture and music generation in .kkrieger [7].

Using PCG, this largely time-consuming task of designing room interiors can be automated. **And can possibly help maintain a player's immersion within the game.** An issue with this however is that PCG tool's can be seen as boring and repetitive [8].

Through my literature review though I have found many implementations and techniques of Procedural Interior Generation (PCIG), none of these get compared to Human designed interiors.

This study looks to see if a participant is able to tell the difference between Human designed and AI generated interiors.

II. Literature Review

This literature review has two sections. The first will go on to explain different techniques that have been used to procedurally generate interiors. An

This section reviews literature on different Procedural Interior Generation (PCIG) techniques and the comparison of Artificial Intelligence to Humans.

Start of this section should be a small introduction on my literature review.
Perhaps I should end the literature review as to why they are important? Yes, so I can lead into why testing PCIG against human designs is an untapped market.

A. Procedural Interior Generation

Multi-Agent System: Go on to talk about the different papers I have "read" about Procedural Interior Generation. What techniques/algorithms they used etc. etc. [9]

Rule-Based Layout:

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B. Artificial Intelligence Compared to Humans

This is going to be a little more difficult to right about, as I haven't read a paper on this so far. And I have only managed to find 3 papers that talk about this, but I am not sure that they could be entirely relevant.

III. Research Question

From the above sources, I have formed **actual research question that's totally not wip anymore**

A. hypothesis & null hypothesis

Hypothesis stuff...

IV. Artefact

A. What will be made

AI that procedurally generates interior at runtime in a predefined room size and access to pre-made furniture assets.
Will be later compared with human designed interiors (being given the same room size and assets)

B. How will I ensure Quality

Quality control. Roadmap? Unit Testing? Integration testing?

C. How will I create it

The AI will be made in the Unity game engine (Version 2020.3.12f1)

D. Why will this answer the questions

Haven't figured that out yet chief

V. Research Methodology

A. Experimental Design

B. Limitations

Time, resources

C. Sampling Plan

Sample size, sampling method

D. Data management plan

Managing, collecting, & storing data

E. Data Analysis

Something to do with R

F. Ethical Considerations

I plan to not commit war crimes I promise

VI. Appendix

Data analysis code, supporting screenshots, system development life-cycle, list of unit tests & testing plan

References

[1] Rockstar North, "Grand Theft Auto V." [PC Game] Rockstar Games, Steam, 2013.

[2] Massive Entertainment, "The Division." [PC Game] Ubisoft, Steam, 2016.

[3] Rocksteady Studios, "Batman: Arkham Knight." [PC Game] Warner Bros. Interactive Entertainment, Steam, 2015.

[4] J. Togelius, E. Kastbjerg, D. Schedl, G. N. Yannakakis, "What is Procedural Content Generation? Mario on the borderline," *Proceedings of the 2nd International Workshop on Procedural Content Generation in Games*, no. 3, pp. 1 – 6, 2011.

[5] Mojang, "Minecraft." [PC], 2011.

[6] Maxis, "Spore." [PC Game] Electronic Arts, Steam, 2008.

[7] Farbrausch, ".kkreiger." [PC Game] Farbrausch, 2004.

[8] T. Short and T. Adams, *Procedural Generation in Game Design*, ch. Managing Output: Boredom Versus Chaos, pp. 13 – 21. CRC Press, 2017.

[9] T. Germer and M. Schwarz, "Procedural Arrangement of Furniture for Real-Time Walkthroughs," *Computer Graphics Forum*, vol. 28, no. 8, pp. 2068 – 2078, 2009.