Maze Generation Annotated Bibliography

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1 PITCH

I would like to examine maze generation algorithms for the purpose of generating more challenging domains for search algorithms to solve. Creating domains that challenge existing search algorithms can assist in the development of more robust search algorithms that can avoid certain pitfalls of existing algorithms. Additionally, mazes are widely understood and have efficient state changes, which can allow for more algorithm based examinations in the future. I would like to develop a system for rating the "hardness" of a given maze, as well as creating a maze generation algorithm that can generate mazes that have a higher or lower "hardness" rating.

2 ANNOTATIONS

A genetic algorithm for the picture maze generation problem

- Yuichi Nagata, Akinori Imamiya, and Norihiko Ono. 2020. A genetic algorithm for the picture maze generation problem.Computers & Operations Research 115 (2020), 104860.
  - Includes a section that defines some key terms. Should be useful for referencing in the future.
  - Includes a detailed procedure which should make replication easy. Also makes it easier to substitute steps in the process, or add new ones to the existing procedure.
  - Includes an experimental section. Experiments recorded the fit to an objective value, and the time it took to generate, as well as a section on non-image based mazes. Either section could hold value in constructing our own tests, whether or not I work with image mazes.

Design-centric maze generation

- Paul Hyunjin Kim, Jacob Grove, Skylar Wurster, and Roger Crawfis. 2019. Design-centric maze generation. In Proceedings of the 14th International Conference on the Foundations of Digital Games. 1–9.
  - Has a really nice related work section that includes a lot of other papers that cover some of the more basic techniques and groundwork that a lot of the other papers build off of. Great for referencing, and great for finding future reference materials.
  - Has a section of vocab which will be informative in the kind of language I use throughout my project.
  - Lists some attributes mazes have, which could be useful in designing experiments.

CS388 Methods for Research and Dissemination, , Earlham College

Evolving Cellular Automata for Maze Generation

- Andrew Pech, Philip Hingston, Martin Masek, and Chiou Peng Lam. 2015. Evolving cellular automata for maze generation. In Australasian conference on artificial life and computational intelligence. Springer, 112–124.
  - Uses image analysis to extract a set of attributes from the generated structures to compare against a set of goals. This could be useful in designing an experiment, or in training our own genetic algorithm.

How to generate perfect mazes?

- Victor Bellot, Maxime Cautrès, Jean-Marie Favreau, Milan Gonzalez-Thauvin, Pascal Lafourcade, Kergann Le Cornec, Bastien Mosnier, and Samuel Rivière-Wekstein. 2021. How to generate perfect mazes? Information Sciences 572 (2021), 444–459.
  - Provides a way to measure a maze's "fun experience" when solving, which is specifically tuned towards how a human would scan a maze. Could be useful when designing experiments/training a genetic system, etc.
  - Also includes other measures used by others, useful for above reasons.
  - Includes two novel algorithms for generating mazes. Could be fun to extend or optimize some of these.

Image-guided maze construction

- Jie Xu and Craig S Kaplan. 2007. Image-guided maze construction. In ACMSIGGRAPH 2007 papers. 29–es.
  - Breaks away from the standard grid based mazes, and entertains the representation of mazes as cell graphs. Many of the mazes they produce are curved, and in doing so create images. Could be used for making mazes look more interesting or more complex.
  - Outlines a number of techniques that can be used to alter how the mazes look. These can all be incorporated into creating more visually or even structurally complex mazes. I imagine something along the lines of linking sections of a maze with varying cell densities or irregular grid patterns could be very interesting, and may be an area less explored.

Intelligent Maze Generation

- Paul Hyunjin Kim. 2019. Intelligent maze generation. The Ohio State University.
  - This is a 250 page dissertation, so it may be wise to just read smaller chunks when needed rather than reading the whole thing all at once.
  - Includes a set of other research publications by the same authors which are related to maze generation, and may be worth a look.
  - Includes numerous sections on varying topics within the umbrella of maze generation. It covers numerous algorithms, a few representation types, generation types, techniques for specifying attributes, etc. It's quite dense, and

will likely provide a good reference tool for delving deeper into more specific areas of mazes.

Analysis of maze generating algorithms

- Peter Gabrovšek. 2019. Analysis of maze generating algorithms. IPSI Transactions on Internet Research15, 1 (2019), 23–30.
  - Ranks a few of the existing algorithms for maze generation based on the performance of a few agents released into their mazes. The techniques used by this paper could be used in generating the "Hardness" value I have interest in.
  - Includes a future work remark where they mention a few more complex maze generation algorithms that could be interesting to look into.

Spherical Maze Generation

- Xue Li and David Mount. 2016. Spherical Maze Generation. (2016).
  - Provides a look into generating mazes in non-2D space. Most of the paper seemed to be focused on setting up the graph that the maze was generated on, but the idea could lead to interesting ways to use 3D geometry to generate unique and varied cell graphs to generate mazes based off of.

Survey Paper on Maze Generation Algorithms for Puzzle Solving Games

- Ms Shivani H Shah, Ms Jagruti M Mohite, AG Musale, and JL Borade. 2017. Survey Paper on Maze Generation Algorithms for Puzzle Solving Games.International Journal of Scientific & Engineering Research 8, 2 (2017), 1064–1067.
  - Mainly serves as a concise and clear explanation of a few common maze generation algorithms. I don't see too much else coming out of this one for this project.