Week 8

- Week to do list

  ☒ implement my own algorithm

  ☑ read some papers

1. This week the main work still is to get the progress of code programming. Last week I have fixed all problems from the old papers.
2. Then I read two papers about Game AI, [1] and [2]

GAME AI

The procedural generation of levels and content in video games is a challenging AI problem. Games need to be beatable as well as fun and enjoyable to play. Often we want to make constraints satisfied or objectives maximized.

[1] "Intentional Computational Level Design"

Problem: Building and evaluating levels that focus on core mechanics is complicated, and automating the process is largely an unsolved problem. We want the generator can automatically verify that the level meets the requirements.

Main idea: The author address the problem of creating levels that are not only playable but also revolve around specific mechanics in the game.

Method: The author used constrained evolutionary algorithms and quality-diversity algorithms to generate small sections, and used three different simulation approaches: Limited Agents, Punishing Model, and Mechanics Dimensions. Limited Agents uses two separate agents to generate levels, one is "perfect" while the other is also a perfect agent but limited in some mechanic-based way. Punishing Model uses one perfect agent but with two different forward models, one is normal while the other is punished for causing certain mechanics during play. Mechanics Dimensions generate passable scenes using the perfect agent and recording every mechanic that fires during that playthrough.

Related Knowledge: Feasible-Infeasible 2-Population (FI2Pop), Constrained Map-Elites

Result: These results were evaluated by members of author's team through playing the generated levels themselves and capturing their observations. Each approach has its own advantages and disadvantages. The "Limited Agent" is the simpler and faster than the "Punishing Model".

References

[1] Ahmed Khalifa, Michael Cerny Green, Gabriella Barros, and Julian Togelius. Intentional computational level design. *arXiv preprint arXiv:1904.08972*, 2019.

[2] Michael Cerny Green, Ahmed Khalifa, Gabriella AB Barros, Andy Nealen, and Julian Togelius. Generating levels that teach mechanics. In *Proceedings of the 13th International Conference on the Foundations of Digital Games*, page 55. ACM, 2018.