以複合神經網路預測次態、環境並決定代理人行為
Predict next-stage state, environment and decide Agent behavior using composite neural networks

張偉治 Q36111281

1

Outline

- INTRODUCTION
- ENVIRONMENT CONTRIBUTION
- COMPOSITE MODEL ARCHITECTURE
- EVALUATION
- CONCLUSION
- FEATURE
- REFERENCE

2

Introduction

- Unlike playing games, the exploration of the map is open rather than sandbox
- According to human behavior, we can summarize the criteria and steps of survival from the changes in the environment and multiple experiences, and even predict the environment.
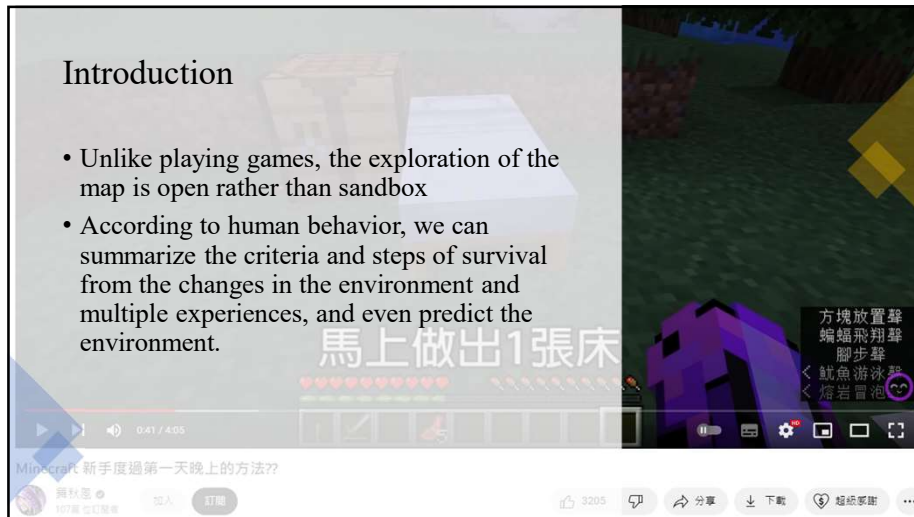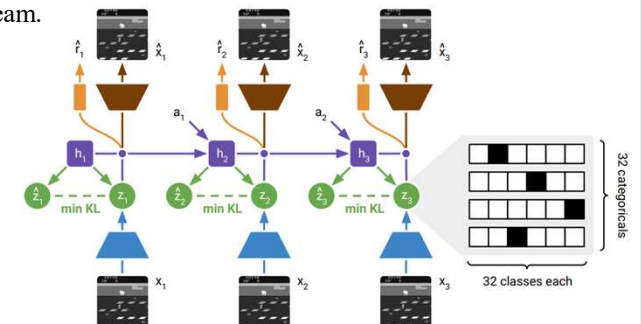

3

Introduction： Dreamer V2

- Through "state prediction" and "behavior decision", dream up a strategy in the dream.

4

Environment Contribution

- In order to distinguish it from the sandbox environment, we design Agent and Environment separately. The Agent can only know the surrounding environment from the current coordinates
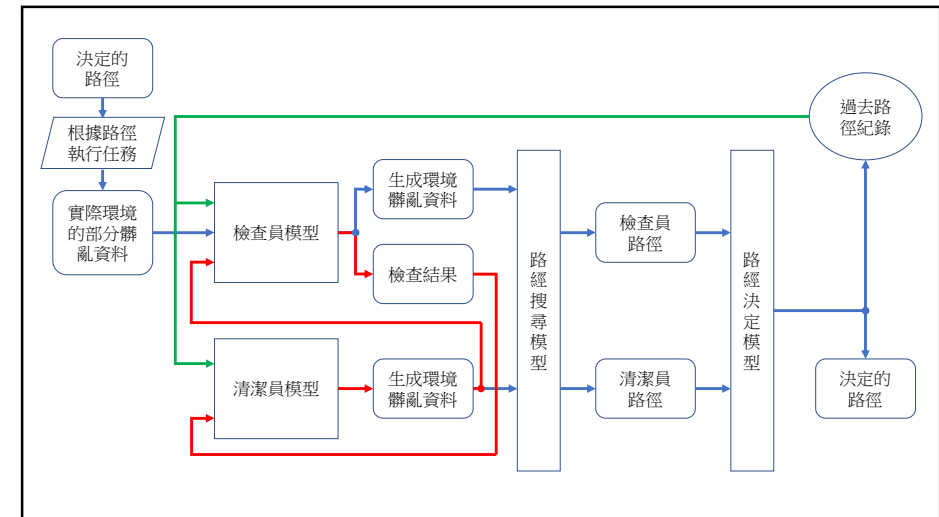- We design a map containing "boundary", "wall" and "reward" as the environment Agent living .

5

Environment Contribution（註）

- Reward的部分還沒設計，需要替環境增加reward屬性，並且合理分配reward、wall和boundary的上下關係
- agent的step也要增加獲得reward的獎勵設計
- 設計agent_get_env_full，這樣可以將agent的移動透過上帝視角做成動畫

6

Composite Model Architecture

7

8

Composite Model Architecture

- The picture above is the first version of the model architecture. We hope to use the GAN model and the RNN model to predict the location of the reward in the map, just like the sweeping robot finds dirt without using the greedy method.
- However, rather than from past path data, we should use "generated environment dirty data" as recurrent training
- At the same time, the output of the discriminator model is too complicated, which is not conducive to model establishment and training. Moreover, the traditional pathfinding algorithm in sandbox is not suitable for the exploration of open environments

9
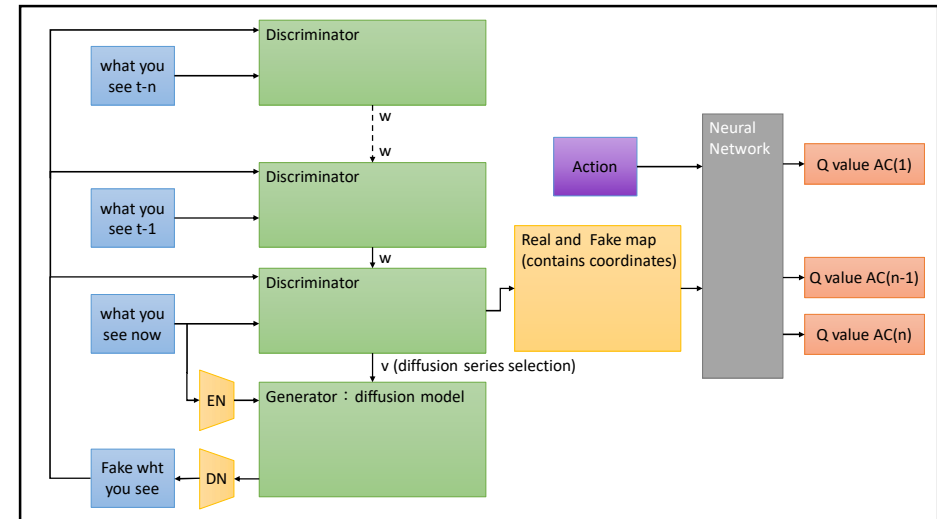
10

Composite Model Architecture

- We therefore modify our architecture using four AI models.
- First, we replace the traditional pathfinding algorithm with the DQN model, which can determine the next step of the Agent from the current state and past experience.
- We replace the Q table with a map with a special structure including "real see", "next see", "fake see" and "coordinates". Of course it is still a table, but the real see and coordinates make it have the meaning of a map.

11

Composite Model Architecture

- The RNN structure in the new version of the architecture diagram is much more reasonable than the previous version.
- We hope to use the diffusion model to implement the Generator in GAN, and then pass the past experience to the Generator through the multi-stage Discriminator, so that the Generator can have a variety of generation modes.

12

Composite Model Architecture

- Because our model is complex and needs to be combined with different models, we do not use rainbow models or open AI gym.
- Through the above model architecture, it can be deduced that the model will require a large amount of training time, so how to optimize it in the future will be the general direction of our model.
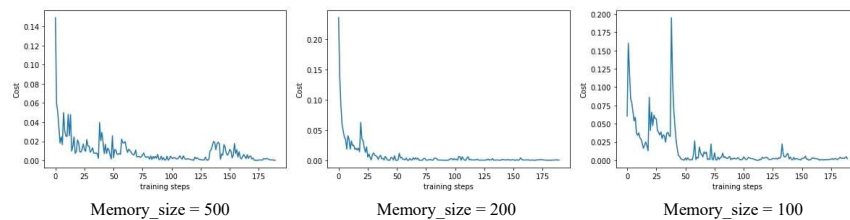
13

Composite Model Architecture（註）
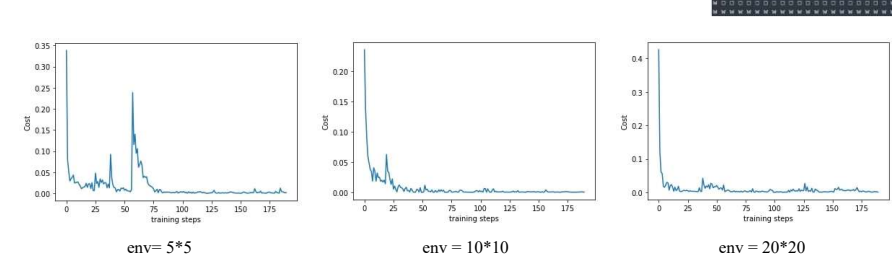
- 未來將座標包含進q table中，並進行實驗
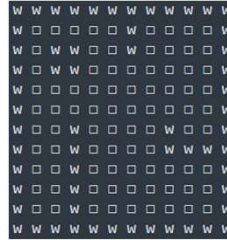
14

Evaluation

Compare different memory size

Memory_size = 500   Memory_size = 200   Memory_size = 100

15

Evaluation

Compare different map size (memory size = 200)

env= 5*5   env = 10*10   env = 20*20

16

Evaluation

Complex map
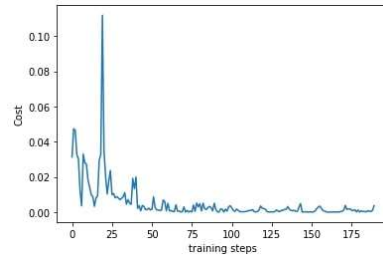
17

Conclusion

• Although using the journal format can make the experiment more logical and structured, but completing the final of the journal format while doing experiments at the same time will make the entire final work tied up.

18

Feature

• Referring to the research of NVIDIA researchers, transferring images to latent space and then performing switch concat with the features output by Discriminator can not only converge faster but also obtain richer complexity and details

19

Reference

1. https://arxiv.org/abs/2006.00900

2. https://arxiv.org/abs/1507.00814

3. https://arxiv.org/abs/1912.01603

4.https://developer.nvidia.com/blog/improving-diffusion-models-as-an-alternative-to-gans-part-2/

5. https://theaisummer.com/diffusion-models/

6. https://www.youtube.com/watch?v=a4Yfz2FxXiY

7. https://mofanpy.com/

20

Reference

8. https://towardsdatascience.com/what-are-stable-diffusion-models-and-why-are-they-a-step-forward-for-image-generation-aa1182801d46

9. https://zhuanlan.zhihu.com/p/70009692

21