COMP1004 Essay

Student Name: Wang Ruijie; Student ID: 22103808D

For students of the department of computing, the games industry is a field worth noticing. The game industry has made an indelible contribution to the advances of the computer industry, computer engineering, and computer science. One apparent impact is that due to the game industry's overwhelming demand for performance, hardware updates such as CPUs and GPUs have significantly been stimulated [1]. Meanwhile, along with the breakneck pace of hardware, the game industry provides developing AI technologies with application scenarios to validate the practicality of AI [2]. Similarly, increasingly sophisticated AI technologies are also changing the game industry [3]. This essay will mainly focus on how AI technologies interact with the game industry.

Game designers realized that it is of great importance to create game characters with more humanlike manners [4]. To regulate NPCs' behaviors, finite state machines and decision trees are embedded for modeling, which constructs the basic AI structures. Concretely speaking, the two mechanisms determine under which conditions a current state of NPCs will be replaced by another, and the rules of the transformation of the states are pre-programmed [5]. If under a reasonable arrangement, NPCs' behaviors can be pretty logistic. Moreover, to display sophisticated movement such as pathfinding and steering in a complicated environment, the A* algorithm is applied to compute a long-distance route for NPCs and avoid being stuck by obstacles in their way. The A* algorithm's method is to precisely segment the game scenes into identifiable points and then search for the shortest path [6]. Although the methods mentioned above might be regarded as elementary, they formed the initial practical AI systems well before today's maturity of AI technologies.

Traditionally speaking, the most advanced AI technologies may only exist in laboratories. Nevertheless, with increasing consumer processors and graphics power, frontier AI technologies, including reinforcement learning, deep learning, and computer vision, are now making a difference in the game industry. By learning from trial and error, reinforcement learning gives AI an edge in the domain of strategy games with entirely rational methodologies [7]. According to Molineaux, Aha and Moore [8], the reinforcement system could retrieve relevant cases and estimate the result of applying each case's contents to current situations, significantly enhancing the game's challenge. Furthermore, based on the advanced genetic algorithm, another example of frontier application falls on the first-person shooter game. The genetic algorithm is especially appropriate for global optimization problems [9]. In FPS games, it is used for searching for an optimal solution to win in complicated scenarios. Usually, faced with various probabilities, AI might become confused. To alleviate it, researchers randomly generated many samples and considered their action preferences as their chromosomes. The chromosomes of the best-performing samples would be stored in a gene pool, while the chromosomes of the worst-performing samples would be eliminated. After iterations, which can be seen as evolutions and variations, an intelligent AI agency can eventually be trained and improved with time [10].

In conclusion, since the birth of the game industry, AI technologies have played their unique role in games. Also, the game industry's rapid development stimulates AI improvement. I hope their harmonious coexistence will create a better future for the further development of computer science and the computer industry.

References

[1] T.-M. Rhyne, “Computer games’ influence on scientific and information visualization,” Computer (Long Beach, Calif.), vol. 33, no. 12, pp. 154–159, 2000, doi: 10.1109/2.889099.

[2] J. Schaeffer, “A gamut of games,” The AI magazine, vol. 22, no. 3, pp. 29–46, 2001.

[3] A. Nareyek, “Game AI is Dead. Long Live Game AI,” IEEE intelligent systems, vol. 22, no. 1, pp. 9–11, 2007, doi: 10.1109/MIS.2007.10.

[4] D. Doherty and C. O’Riordan, “Evolving team behaviours in environments of varying difficulty,” The Artificial intelligence review, vol. 27, no. 4, pp. 223–244, 2007, doi: 10.1007/s10462-008-9078-1.

[5] A. Nareyek, “AI in Computer Games,” ACM queue, vol. 1, no. 10, pp. 58–65, 2004, doi: 10.1145/971564.971593.

[6] https://en.wikipedia.org/wiki/A*_search_algorithm

[7] G. Robertson and I. Watson, “A Review of Real-Time Strategy Game AI,” The AI magazine, vol. 35, no. 4, pp. 75–104, 2014, doi: 10.1609/aimag.v35i4.2478.

[8] Molineaux, Matthew, David W. Aha, and Philip Moore. "Learning Continuous Action Models in a Real-Time Strategy Environment." FLAIRS Conference. Vol. 8. 2008.

[9] https://en.wikipedia.org/wiki/Genetic_algorithm

[10] C. Liaw, W.-H. Wang, C.-T. Tsai, C.-H. Ko, and G. Hao, “EVOLVING A TEAM IN A FIRST-PERSON SHOOTER GAME BY USING A GENETIC ALGORITHM,” Applied artificial intelligence, vol. 27, no. 3, pp. 199–212, 2013, doi: 10.1080/08839514.2013.768883.