"Match-Three" is a typical puzzle video game where the player manipulates tiles in order to make them disappear according to a matching criterion. The matching criterion is that there are at least three tiles of the same type adjoin each other [1]. A field has a N×M matrix of spaces, where in N and M are integers greater than three, and wherein each space of the matrix includes one of a plurality of different items. Then an object is allowed to exchange to the nearest object once three are three or more identical items results in the items . Finally these items would be removed from the field.

Because "match-three" games are very simple games with a very limited number of rules, even the younger children or the elder people can easily understand the rules. Then these "match-three" puzzle games become more and more popular. Bejeweled, Candy Crush Jelly Saga and Ruby Blast are the most famous "match three" puzzle games that the number of downloads from app store have more than billions of times [2] [3]. According to the reported by Wall Street Journal in 2013, nearly 15 million people in Western countries were addicted to Candy Crush Saga [4]. These data show that people are enjoy playing "match-three" puzzle games. The one of most significant aim of playing game is to obtain a great player experience(PX). However, it is not easy to evaluate the player experience using any device or other physical experiments.

Elisa and her group members has introduced a great experiment design and analytical method for measuring enjoyment which had been identified as a central component of the player experience [5]. However, PX has various, overlapping concepts so that it is difficult to develop valid measures and a common understanding of game enjoyment. Firstly, they structured the review of 87 quantitative studies into general methodological observations in an experiment. Then according to the "Purpose of the studies", "Participants", "Games and Genre", "Study setting, gameplay duration and game metrics", and "Measuring point of the critical element of experiment" these five aspects, more in-depth measures taken by the institute. Finally, the determining factors affecting the enjoyment of the game are Game System, Player and Context and Relationship between enjoyment and other PX components such as flow, presence and immersion. Thus immersion is great critical factor of a great player experience.

Then Christopher Jefferson and his mates had performed an experiment on an automated generation of puzzles named Combination solved by constraints, which indicated that the fun and immersing computer games could be generated by constraints [6]. They explained how all the levels of Combination were generated, checked for correctness and rated for difficulty completely automatically through the use of constraints. Then they found that running the Constraint Programming a number of times using different variable orderings then averaging the result could provide a more satisfactory player experience. Finally, this application was released in the iTunes and gained a great commercial success and received good reviews.

Bibliography

[1] J. Juul, "Swap Adjacent Gems to Make Sets of Three: A History of Matching Tile Games," *Artifact journal,* vol. 2, 2007.

[2] C. C. Saga. [Online]. Available: https://play.google.com/store/apps/details?id=com.king.candycrushsaga&hl=en_US. [Accessed 18 June 2018].

[3] C. C. Saga. [Online]. Available: https://itunes.apple.com/us/app/candy-crush-saga/id553834731?mt=8. [Accessed 17 June 2018].

[4] W. S. J. Staff, "Why 15 Million People Are Addicted to Candy Crush," The Wall Street Journal, 22 May 2013. [Online]. Available: https://blogs.wsj.com/digits/2013/05/22/why-15-million-people-are-addicted-to-candy-crush/. [Accessed 17 6 2018].

[5] E. D. Mekler, J. A. Bopp, A. N. Tuch and K. Opwis, "A systematic review of quantitative studies on the enjoyment of digital entertainment games.," in *Proceedings of the 32nd annual ACM conference on Human factors in computing systems.*, 2014.

[6] C. Jefferson, W. Moncur and K. E. Petrie, "Combination: Automated Generation of Puzzles with Constraints," in *In Proceedings of the 2011 ACM Symposium on Applied Computing*, ACM, 2011.