Strategies and eye movement of an expert in a video-game

Hidemi Ogasawara (hidemi@sccs.chukyo-u.ac.jp)
School of Computer and Cognitive Sciences, Chukyo University; 101 Tokodate, Kaidu-cho
Toyota, Aichi 470-0393 Japan

Takehiko Ohno (takehiko@brl.ntt.co.jp)
Communication Science Laboratories, NTT; 3-1 Morinosato, Wakamiya
Atsugi, Kanagawa 243-0198 Japan

Introduction

The purpose of this study is to explore human cognition in dynamic environment. Using a video-game, "Pac-man" (Fig.1), we have found the process of acquiring the expertise, which included the play strategy shift from a safer defensive strategy to a risky offensive one (Ogasawara & Ohno, 1999). These play strategies require different information acquisition strategies. To explore the relations between the play and information acquisition strategies, we examine again the player's eye movement data in Ohno & Ogasawara (1999).

Case

"Pac-man" is a game that a player controls Pac-man to eat dots while escaping from ghosts. If Pac-man eats one of four extra large dots (PPs), it becomes "strong" and can attack the ghosts for a limited time. The killed ghosts are transferred to the center of the screen and re-join the game. The game ends if the player cleared all dots on the screen or all Pac-men were lost. The game was implemented on Sun Sparc 10 with an eye mark recorder, NAC EMR-NC. One undergraduate student participated in this study. One session of the task usually included five games. The participant performed 24 sessions with one session in a day.

Result and Discussion

The sessions were divided into four periods (6 sessions/period) in the following analysis. The subject showed the similar play strategy shift as the previous subject (Ogasawar & Ohno, 1999) in the early periods of the 80 sessions. For the eye mark data, we examined the distance among Pac-man, the ghosts, and the eye mark. The result showed a tendency that the subject looked less around the Pac-man as he played more games.

Next we examined the details of the strategies and eye movement. One of the offensive strategies observed in the previous study was to move Pac-man to the center area after the consumption of PP. This strategy gives chances to kill ghosts twice: Pac-man can kill ghosts nearby, and after moving closer to the center it can kill once again the reappearing ghosts. But it is risky because Pac-man's "strong" time might be expired on the way to the center. This strategy was also observed in this study. For example, for PP (LR) in the lower right corner this type of strategy was observed more frequently in the later session (from the 1st to the 4th period, 0%, 7.1%, 42.3%, 25.0% respectively). The four squares in Fig.1 show distributions of the player's eye marks in Pac-man's "strong" time after the consumption of the PP, from the 1st to the 4th period respectively. The eye marks are more concentrated around the PP and the center area as the periods progressed. The same tendency was observed for the other PPs.

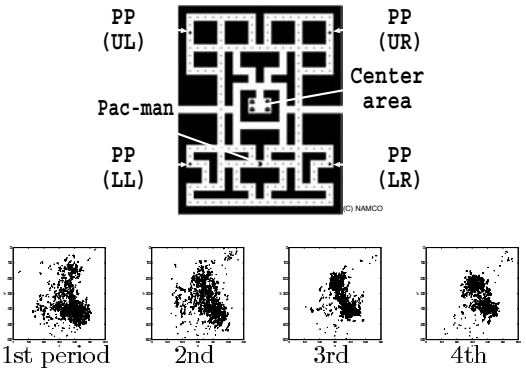

Figure 1: Display for "Pac-man" and distribution of eye marks after consumption of PP(LR)

These results indicate that the play expertise in this case involves the acquisition of the play strategy of paying less attention on Pac-man and shifting it to the score-gaining but risky moves.

References

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