

**Title: Learning the dynamics of eye-hand movement in memory recall from videos**

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**Extended Abstract:**

We aim to understand the characteristics of human memory when they engage multimodal media such as TV drama videos. To do this, we have designed a game-like cognitive task, i.e. multimodal memory game or MMG. The participants of this experiment first watch a video episode (typically of 20 minutes long) once and then play a series of memory recall tests. In each test, the player is presented a query (e.g. a visual scene) and two candidate items (e.g. sentences). One of the two items is the matching one (e.g. the sentence corresponding to the query scene) and the player should choose one item by moving and clicking the mouse button. We trace the trajectory of the mouse movement while the players play the game. We also trace the eye movement of the player using a binocular eye-tracking device mounted on the head of the player. We have conducted experiments with 12 subjects and obtained 1440 eye-hand trajectories with average duration of 11 seconds each. To analyze the temporal dynamics of the user's eye-hand behavior, we have designed a dynamic Bayesian network. It has two observable nodes, one for the eye-gaze point and the other for the mouse position, and latent nodes that are to learn some hidden patterns of the player as the eye-hand positions are observed in sequence. In this paper we report on our preliminary results, where we found the temporal patterns that can distinguish the group of people who find the sentence-to-scene recall easier than the scene-to-sentence recall from other groups, and vice versa. The dynamic learning network approach enabled the discovery of the temporal dependency of the trajectories of eye and hand movements along with their coordination while static learning-based classification techniques could not do this.

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