

## (6) Rendering Quality and User Cognition: An Experimental Study

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### Abstract

The effect of rendering quality on spatial cognition is investigated. A between groups experiment was carried out to explore the effect of rendering quality (flat-shaded vs photorealistic radiosity rendering) on object-based memory recall and memory awareness states. The general premise of this research focuses on 'how' tasks are achieved, rather than only on 'what' is achieved. Interestingly, results revealed a higher proportion of visually induced recollections associated with the flat-shaded condition. This finding follows similar findings in two previous studies that demonstrated that the less 'naturalistic' interaction interface also provoked a higher proportion of visually induced recollections (Mania et al. 2003).

### Experiments and Results

The experimental space, consisting of two interconnected rooms that included primitive objects (boxes, sphere, pyramids), was rendered either flat-shaded or using radiosity rendering. The computer graphics simulations were displayed on a stereo Head Mounted Display with head tracking. 16 participants across two conditions of varied rendering quality completed a memory task after exposure to the experimental space. Participants described how they completed spatial recollections by selecting one of four choices of awareness states after retrieval. These reflected the level of visual mental imagery involved during retrieval, the familiarity of the recollection and also included guesses, even if informed (Tulving, 1985). Experimental results revealed variations in the distribution of participants' awareness states across conditions while, task performance failed to reveal any. In particular, there was a higher amount of correct visually induced recollections associated to the flat-shaded condition compared to the photorealistic radiosity condition. By decreasing the degree of 'realism' of the rendering (visual fidelity), participants -paradoxically- adopted visually induced recollections. Achieving high fidelity could incorporate the need for similar awareness states between a real-world task situation and its computer graphics simulation. Something less 'real', therefore, less computationally expensive but more demanding because of its novelty or variation from 'real' may restore a more 'naturalistic' awareness state. There was no effect of viewing condition upon the presence dataset as measured by the SUS questionnaire (Slater et al., 1998). How the degree of 'reality' of the motor response or rendering quality relates to presence assessments (if at all) remains an open research question.

Tulving, E. (1985). Memory and Consciousness. *Canadian Psychologist*, 26, 1-12.

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Slater, M., Steed, A., McCarthy, J., Maringelli, F. (1998). The Influence of Body Movement on Subjective Presence in Virtual Environments. *Human Factors: Journal of the Human Factors Society*, 40(3), 469-477.