(22) Using eye tracking and psychophysiological methods to study spatial presence

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Abstract

This paper explores the benefits and promises of eye tracking and psychophysiological methods in measuring presence and relates them briefly to new types of applications in which the detection of presence is essential to the task of the user. Our starting point is the assumption that the degree to which people attend to a continuous stimulus flow is related to their state of presence.

There are several different ways to use eye tracking methodology to investigate spatial presence. The simplest way is to measure with eye tracking the degree to which the user's attention is distracted away from the media stimuli. Another possibility is to analyze which aspects of the mediated information the user looks at and the order in which different areas of media stimuli are processed. For instance, if the user feels present in the mediated environment, her attention is presumably directed most of the time to the relevant information. The third possibility is to classify attentional states to focused attention and distributed attention on the basis of eye fixation duration. It can be assumed that when the user is engaged in the mediated world she uses the distributed attentional strategy more often.

When the eye movement data is synchronized with the cardiac data, one can perform a fine-grained analysis of the relationship between the visual elements of the mediated stimulus and physiological responses. While eye movements provide a measure of the direction of attention, cardiac data (phasic heart rate deceleration, respiratory sinus arrhythmia) provide quantitative measures of automatic and controlled attention.

The methodology of studying presence presented in this paper has various benefits and promises for future research directions. First, presence may be measured as a continuous phenomenon. Second, more objective measures may be applied compared to self-report ratings of felt presence. Third, if it is possible to reliably and objectively detect the state of presence of a particular user of information technology, this information may be used in constructing new types of adaptive systems and human computer interfaces.