

MISQ Archivist

Using Eye Tracking to Expose Cognitive Processes in Understanding Conceptual Models

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Abstract

Conceptual models are used to communicate information about a domain during the development of information systems. In two experimental studies using business process models, we demonstrate how eye tracking can contribute to understanding the cognitive processes by which readers use conceptual modeling scripts to perform problem solving tasks. In the first study, we compare scripts generated using two process modeling grammars and demonstrate how attention paid to specific parts of scripts generated using grammar variations, and differences in visual association between parts of a diagram, account for task performance. In the second study, we use a combination of eye tracking and verbal protocol analysis to examine how visual association between parts of conceptual modeling scripts can indicate cognitive integration while performing problem solving tasks. The studies show that task performance can be explained with different mental processes, reflected in specific eye tracking behavior, where scripts developed following different rules invoke different cognitive processes. We show that attention can be measured by eye tracking and can explain task performance. In addition, we show that visual association (which is observable) between parts of a modeling script involves cognitive integration (which is not observable). This finding can be used to improve conceptual modeling grammars in several ways, including understanding the effects of alternative visual arrangements of models on how effectively they communicate domain knowledge for particular tasks, and guiding the design of visual modeling notations.

Keywords: Eye tracking, conceptual modeling, process modeling, cognitive processes, attention, visual association, cognitive integration, problem solving