Dissertation Defense

Modeling User Attention and Interaction on the Web

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Abstract: Analysis of user attention and Web page examination behavior, collected with specialized eye tracking equipment, has offered numerous insights about how online users examine content of the Web pages and remains a valuable tool for Web researchers and developers. Unfortunately, eye tracking technology is currently available for relatively small scale user studies, due to its high costs and the effort associated with participant recruitment. In this thesis we develop several alternatives to eye tracking for studying user attention and behavior. We start by introducing ViewSer - a method based on idea restricted focus viewing, that allows measuring attention for thousands of participants. Then, we develop a probabilistic model that infers most likely position of users gaze on the screen from user interactions and web page content. Our model outperforms current state of the art for gaze position prediction that only uses behavioral signals. In addition to the methodological contributions, this thesis develops several important applications in web search and medical domain. First, we describe a scalable approach for extracting frequent mouse cursor movement patterns from large scale cursor data. Second, we demonstrate how these patterns could be used to improve quality of search relevance estimation and search result ranking. Third, we show that attention measured with cursor and viewport position could be used to improve automatic summarization. Lastly, we show how restricted focus viewing could be adapted to develop an automated diagnostic of memory impairment that could be administered over the Web anywhere in the world. Together, the techniques developed and evaluated in this thesis substantially advance the state of the art and enable novel important practical applications.

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