Gaze-based Feedback in Assessing Media Relevance

Cheng-Ta Yang[1, *], Wen-Sheng Chang[1], Fan-Ning Cheng[1], and Wei-Guang Teng[2]

[1] Department of Psychology and Institute of Cognitive Science,

National Cheng Kung University,

Tainan 701, Taiwan

yangct@mail.ncku.edu.tw; {wenshengchang, cindy7753}@gmail.com

[2] Department of Engineering Science,

National Cheng Kung University,

Tainan 701, Taiwan

wgteng@mail.ncku.edu.tw

Abstract. As more and more data contents gathered on the Internet, the problem of data overloading has attracted many research interests. In view of this, it is crucial to understand the user behavior when s/he interacts with online contents. For example, a web page containing several entries for further exploration. Under the assumption that eye movement measures can be used to infer a user's cognition, we proposed a framework to estimate the relevance of an entry to the user's goal by recording eye movements as implicit feedback. Fourteen subjects volunteered to perform a rating task in which they were required to judge whether an image was relevant to a word. Results showed that the total fixation duration and the fixation count can be used to discriminate between the relevant and irrelevant conditions; in contrast, the first fixation duration cannot. In addition, the subjective rating and relevancy manipulation interacted on the total fixation duration. Converging evidence verified the assumption in the proposed framework.

References

[1] A. M. Kaplan and M. Haenlein, "Users of the World, Unite! The Challenges and Opportunities of Social Media," *Business Horizons*, Vol. 53, No. 1, pp. 59-68, January 2010.

[2] J. Teevan, E. Cutrell, D. Fisher, S. M. Drucker, G. Ramos, P. Andre, C. Hu, "Visual Snippets: Summarizing Web Pages for Search and Revisitation," in *Proceedings of the 27th International Conference on Human Factors in Computing Systems*, Boston, MA, p 2023-2032, April 2009.

[3] H. Lam and P. Baudisch, "Summary Thumbnails: Readable Overviews for Small Screen Web Browsers," in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, Prtland, Oregon, pp. 681-690, April 2005.

[4] A. Woodruff, A. Faulring, R. Rosenholtz, J. Morrsion, P. Pirolli, "Using Thumbnails to Search the Web," in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, Seattle, Washington, pp. 198-205, March 2001.

[5] B. Suh, A. Woodruff, R. Rosenholtz, A. Glass, "Popout Prism: Adding Perceptual Principles to Overview+Detail Document Interfaces," in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems: Changing Our World, Changing Ourselves*, Minneapolis, Minnesota, pp. 251-258, April 2002.

---

*Correspondence author

[6]   X. Xie, G. Miao, R. Song, J.R. Wen, W.Y. Ma, "Efficient Browsing of Web Search Results on Mobile Devices Based on Block Importance Model," *in Proceedings of the Third IEEE International Conference on Pervasive Computing and Communication*s, Kauai Island, HI, pp. 17-26, March 2005.

[7]   A. Blake and A. Yuille, "Active Vision. Cambridge," MIT Press, MA, 1992.

[8]   G. Underwood, "Cognitive Processes in Eye Guidance: Algorithms for Attention in Image Processing," *Cognitive Computation*, Vol. 1, No. 1, pp. 64-76, 2009.

[9]   B. J. Jansen, D. L. Booth, A. Spink, "Determining the Informational, Navigational, and Transactional Intent of Web Queries," *International Journal of Information Processing and Management:*, Vol. 44, No. 3, pp. 1251-1266, 2008.

[10]   D. E. Rose and D. Levinson, "Understanding User Goals in Web Search," in *Proceedings of the 13th International Conference on World Wide Web*,New York, NY, pp. 13-19, May 2004.

[11]   K. Fisher and S. Counts, "Your Brain on Facebook: Neuropsychological Associations with Social Versus Other Media," in *Proceedings of the Fourth International AAAI Conference on Weblogs and Social Media*, Washington, DC, 2010.

[12]   P. Sajda, L. C. Parra, C. Christoforou , B. Hanna, C. Bahlmann, J. Wang, E. Pohlmeyer, J. Dmochowski, "In a Blink of an Eye and a Switch of a Transistor: Cortically Coupled Computer Vision," in *Proceedings of the IEEE*, Vol. 98, pp. 462-478, 2010.

[13]   G. Buscher, A. Dengel, L. V. Elst, "Eye Movements as Implicit Relevance Feedback," in *Proceedings of the 2008 Conference on Human Factors in Computing Systems*, Florence, Italy, pp. 2991-2296, 2008.

[14]   J. Salojärvi , K. Puolamäki , S. Kaski, "Implicit Relevance Feedback from Eye Movements," in *Proceedings of Artificial Neural Networks: Biological Inspiratio*ns, Warsaw, Poland, pp. 513-518, 2005.

[15]   J. M. Henderson and A. Hollingworth, "Eye Movements, Visual Memory, and Scene Representation," *Perception of Faces, Objects, and Scenes: Analytic and Holistic Processes, M. A. Peterson and G. Rhodes, Eds.*, ed New York, NY: Oxford University Press, pp. 356-377, 2003.

[16]   R. N. Aslin, "Oculomotor Measures of Visual Development," *Measurement of Audition and Vision in the First Year of Postnatal Life: A Methodological Overview, ed: Westport, CT, US: Ablex Publishing*, pp. 391-417, 1985.

[17]   T. Farroni, M. H. Johnson, M. Brockbank, F. Simion, "Infants' Use of Gaze Direction to Cue Attention: the Importance of Perceived Motion," *Visual Cognition*, Vol. 7, No. 6, pp:705-718, 2000.

[18]   M. G. Glaholt and E. M. Reingold, "Stimulus Exposure and Gaze Bias: a Further Test of the Gaze Cascade Model," *Atten Percept Psychophysics*, Vol. 71, No.3 , pp. 445-450, 2009.

[19]   M. G. Glaholt and E. M. Reingold, "The Time Course of Gaze Bias in Visual Decision Tasks," *Visual Cognition*, Vol. 17, No.8, pp. 1228-1243, 2009.

[20]   S. Shimojo, C. Simion, E. Shimojo, C. Scheier, "Gaze Bias Both Reflects and Influences Preference," *Nature Neuroscience*, Vol. 6, pp. 1317-1322, 2003.

[21]   L. Itti, C. Koch, E. Niebur, "A Model of Saliency-Based Visual Attention for Rapid Scene Analysis," *IEEE Transactions on.l Pattern Analysis and Machine Intelligence*, Vol. 20, pp. 1254-1259, 1998.

[22]   J. K. O'Regan, H. Deubel, J. J. Clark , R. A. Rensink, "Picture Changes During Blinks: Looking without Seeing and Seeing without Looking," *Visual Cognition*, Vol. 7, No.1 , pp. 191-211, 2000.

[23]   W. Schneider and E-Prime: User's Guide: Psychology Software Inc., 2002.

[24]   O. Oyekoya and F. Stentiford, "Perceptual Image Retrieval using Eye Movements," *International Journal of Computer Mathematics*, Vol. 84, No. 9, pp. 1379-1391, 2007.