ORTA DOĞU TEKNİK ÜNİVERSİTESİ
MIDDLE EAST TECHNICAL UNIVERSITY

INFORMATICS INSTITUTE

EyeTR 2019

Symposium on
Eye Tracking Research and Applications

Held at:

METU Informatics Institute
Conference Room 124

EyeTR 2019
Symposium on Eye Tracking Research and Applications

EyeTR 2019 aims at bringing together researchers who work on eye tracking, who employs eye tracking as a research methodology, and who develop new paradigms of eye tracking. The eye tracking community worldwide have well-established conferences, such as ETRA (Eye Tracking Research and Applications) in the US, the ECEM (European Conference on Eye Movements). There are also eye tracking meetings that have been conducted regularly within the framework of larger conferences. The target audience of EyeTR is researchers in Turkey and neighbor countries.

This year's symposium includes valuable speakers from various universities, including the host (METU, Middle East Technical University), METU Northern Cyprus Campus (NCC) and Yıldırım Beyazıt University in Ankara. The topics of talks range from group eye tracking to reading, team cognition and neuroscience.

The symposium also serves as the closing meeting of the TUBITAK 1001 project, "Multiuser Eyetracking Platform for Social Gaze" (116E570). The project has been funded by TUBITAK (The Scientific and Technological Research Council of Turkey) on 15/06/2017 for 24 months. The project researchers are Dr. Cengiz Acartürk(PI), Dr. Murat Perit Çakır, Dr., Dr. Serkan Küçükşenel, Dr. Sinan Kalkan. Dr. Gün R. Semin is the project advisor.

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Symposium Program

Time: Wednesday, June 12, 2019
Location: METU Informatics Institute, Conference Room 124

09:30 Opening Talks
Prof. Dr. Deniz Zeyrek Bozşahin (METU Informatics Institute Director)
Prof. Dr. Cem Bozşahin (METU Informatics Institute, Cognitive Science Program)

09:45 – 10:15 Eye Tracking as a Methodology for the Study of Cognitive Systems
Assoc. Prof. Dr. Cengiz Acartürk (METU Informatics Institute, Cognitive Science Program)

10:15 – 11:00 Eye Tracking Scanpath Analysis on Web Pages
Assoc. Prof. Dr. Yeliz Yeşilada (METU NCC, Psychology Program)

11:00 – 11:30 Coffee Break

11:30 – 12:00 Interactive Team Cognition: Study of Collective Intelligence and Collaboration in Organizational Sciences
Asst. Prof. Dr. Murat Ulubay (Yıldırım Beyazıt University, Business School)

12:00 – 12:30 Group Eye Tracking (GET) as a Research Paradigm for Team Cognition
Assoc. Prof. Dr. Cengiz Acartürk (METU Informatics Institute, Cognitive Science Program)

12:30 – 14:00 Lunch Break

14:00 – 14:50 Fundamental Visual Processes in Word Recognition and Reading
Prof. Dr. Timothy Jordan (METU NCC, Psychology Program)

14:50 – 15:30 Eye Movement Control in Turkish Sentence Reading
Ayşegül Özkan (METU Informatics Institute, Cognitive Science Program)

15:30 – 16:15 Towards a Multimodal Model of Cognitive Workload through Synchronous Optical Brain Imaging and Eye Tracking Measures
Asst. Prof. Dr. Murat Perit Çakır (METU Informatics Institute, Cognitive Science Program)

16:15 – 17:00 Closing at the Conference Hall

Eye Tracking Scanpath Analysis on Web Pages

Assoc. Prof. Dr. Yeliz Yeşilada

METU NCC, Computer Engineering Program

Eye tracking has been used in improving the design and usability of web pages, and in the research of understanding how users navigate them. However, there is limited research in eye tracking data analysis, especially in eye movement sequences (i.e., scanpaths). Our latest work looks into how scanpaths can be clustered to identify a path that is trending among a group of users. In this talk, I will present our research that can help you better analyse user behaviour and experience, the overall validity of our approach, some important applications of our research and future directions.

Interactive Team Cognition: Study of Collective Intelligence and Collaboration in Organizational Sciences

Asst. Prof. Dr. Murat Ulubay

Yıldırım Beyazıt University, Business School

This study proposes a research program and experimental paradigm to study team cognition as a collective activity and process, to explore its dynamics by observing emergence of cognition as communicative interaction of team members. Distributed (Hutchins, 1995) and Extended Paradigms (Clark, 2008) of cognition are offered as two theoretical and research approaches that can be employed in the study of the teams and their collective cognitions in Organizational Behavior (OB) field. Surprisingly and until very recently in OB, the cognition dimension of the teams are studied in an input output (I/O) research paradigm where cognitive activity is perceived as knowledge content and the studies are carried out by making initial measurements of these content and team related constructs and then testing the hypothesis by means of post experimental measurements. For example overlapping mental models (Mohammed & Dumville, 2001, p. 90) in Team mental models, TMM theories, or shared memory of coordinative information (Transactive memory systems, TMS theories) (Moreland & Argote, 2003) where the dynamics and events of of collaborative thinking is not considered as constructs in these hypotheses and analyses (Figure 1). An interaction team cognition (ITC) (Cooke et al. 2013) based research and experimental paradigm will be offered to correspond critical communicative team interactions to the dynamic evolution of team's shared cognition of the problem/task and unveil the mechanisms of emergence of team cognition as a process.

References

Clark, Andy (ed.) (2008). _Supersizing the Mind: Embodiment, Action, and Cognitive Extension_. Oxford University Press.

Cooke, N. J., & Gorman, J. C. (2009). Interaction-based measures of cognitive systems. Journal of Cognitive Engineering and Decision Making,3, 27–46.

Hutchins, E., & Johnson, J. (2009). Modelling the Emergence of Language as an Embodied Collective Cognitive Activity. Topics inn Cognitive Science, 523-544.

Group Eye Tracking (GET) as a Research Paradigm for Team Cognition

Assoc. Prof. Dr. Cengiz Acartürk

METU Informatics Institute, Cognitive Science Program

The design of any multiuser eye tracking platform (in this case GET, the Group Eye Tracking platform) should consider the infrastructure design for synchronous collection of multiple gaze data and the design of synchronous visualization on the screens. The GET platform employs a web socket server-client architecture in its recent form. On the server side, it listens to the ports and broadcasts the data to the clients. On the client side, it listens to the ports, visualizes incoming data and sends the data to the server. This presentation introduces the GET platform and the studies that have been conducted by employing the platform.

Eye Movement Control in Turkish Reading

Ayşegül Özkan

METU Informatics Institute, Cognitive Science Program

The complexity of saccade generation processes is mostly captured by current eye movement control models. However, they do not provide a mechanism for empirical findings which suggest that there is an effect of sound coding in reading. The theoretical framework proposed by the current study incorporates phonological processing with one of the successful guidance by attentional gradient model of reading, SWIFT (Saccade-generation with inhibition by foveal targets – Engbert, Longtin, & Kliegl, 2002; Engbert, Nuthmann, Richter & Kliegl, 2005). It is assumed that phonological processing of a word starts at the preprocessing phase and detailed phonological representation of it accessed upon lexical access which is held until its integration to text and preparation for articulation is completed, in oral reading. These assumptions were tested with two Linear Mixed Models (LMMs): LMM of Fixation Speech Interval (FSI), and LMM of First Fixation Duration (FFD). Results imply that phonological processing during reading influences FSI and FFD values. The relationship between FSI and FFD values, on the other hand, suggests that there is modulation of eye-movements in response to the post-lexical processing, which manifests itself in FSI values.

References

Engbert, R. L., Longtin, A., & Kliegl, R. (2002). A dynamical model of saccade generation in reading based on spatially distributed lexical processing. *Vision Research, 42*, 621-636.

Engbert, R., Nuthmann, A., Richter, E. M., & Kliegl, R. (2005). SWIFT: A Dynamical Model of Saccade Generation During Reading. *Psychological Review, 112*(4), 777-813. doi:10.1037/0033-295X.112.4.777

Towards a Multimodal Model of Cognitive Workload through Synchronous Optical Brain Imaging and Eye Tracking Measures

Asst. Prof. Dr. Murat Perit Çakır

METU Informatics Institute, Cognitive Science Program

Recent advances in neuroimaging technologies have rendered multimodal analysis of operators' cognitive processes in complex task settings and environments increasingly more practical. In this study, we utilized optical brain imaging and mobile eye tracking technologies to explore the behavioral and neurophysiological differences among expert and novice operators while they operated a human-machine interface in normal and adverse conditions. In congruence with related work, experts tended to have lower prefrontal oxygenation and exhibit scan patterns that are better aligned with optimal task sequence with shorter fixation durations as compared to novices. These trends were further strengthened in the adverse condition where the operators were prompted with an unexpected error message. Comparisons between hemodynamic and gaze measures before and after the error message indicated that experts' neurophysiological response to the error involved a systematic increase in bilateral dorsolateral prefrontal cortex activity as accompanied by an increase in gaze fixation durations, which suggests a shift in their attentional state from routine process execution to problem detection and resolution. The novices' response entailed an increase only in the left dorsolateral prefrontal cortex with a decreasing trend in fixation durations, which indicates a possible switch to a visual search mode to seek out possible cues to make sense of the unanticipated situation. Overall, these results suggest that eye movement characteristics and prefrontal hemodynamics could effectively complement each other for neuroergonomic applications that require the monitoring of cognitive workload and expertise development in the field.