DUET 2012: Dual Eye Tracking in CSCW

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Abstract

Dual eye-tracking (DUET) is a promising methodology to study and support collaborative work. The method consists of simultaneously recording the gaze of two collaborators working on a common task. The main themes addressed in the workshop are eye-tracking methodology (how to translate gaze measures into descriptions of joint action, how to measure and model gaze alignment between collaborators, how to include gaze in multimodal interaction models, how to address task specificity inherent to eye-tracking data), empirical studies involving dual eye tracking and more generally future applications of dual eye-tracking in CSCW.

Author Keywords

Dual eye tracking, methodology

ACM Classification Keywords

H.5.m [Information interfaces and presentation (e.g., HCI)]: Miscellaneous.

General Terms

Human Factors, Measurement

Workshop Themes

Dual eye-tracking allows researchers to capture attentional behavior at a level of *temporal granularity* that has a

much higher resolution than traditional behavioral measures (e.g. interface actions, utterances). What can low-level gaze and fixations tell us about higher level cognitive activities? How and to what level of detail does gaze data need to be aggregated to reliably reflect collaborative behavior? What existing methods for behavioral modeling can be reused with gaze data?

In addition, the availability of audio, biological and motor sensors allows to combine gaze and other behavioral signals into a *multi-modal signal*. How is gaze combined with other communication modalities (particularly speech but also gestures) and can the multiplicity of modalities possibly help to recognize intentions from gaze patterns ?

Collaboration and *joint attention* is about gazing together on the same object of attention. Alignment of gaze is central to defining convergence of attention. The spatial and temporal definitions of together still need to be defined as statistical variables that reflect some aspects of collaborative gaze behavior. The definition of a basic set of standard variables and normalization methods should facilitate the exchange and comparison of results among researchers in the field.

Because gaze is *task specific*, it is difficult to generalize results across settings and to compare different theoretical and methodological approaches. Gaze traces strongly depend on the visual nature of the task representation. What are relevant task typologies that can be used to organize and compare findings from eye-tracking studies ? What can be learned from task independent features (e.g. fixation duration or dispersion)?

It is a *technical challenge* to use eye-tracking with off the shelf shared applications (e.g. a shared text editor, a programming IDE, a collaborative spreadsheet). The

definition and tracking of areas of interest for instance is not straightforward as the geometry of the shared applications is dependent on the devices that display them. Areas of interest should be tailorable to refer either to small elements (tokens, words, verbs, nouns, etc.) or larger aggregates (paragraphs, pages, etc). What impact does task specificity have on recording dual gaze (e.g. how to compute alignment in relaxed WYSIWIS situations)?

Most applications of dual eye tracking in CSCW research concern controlled lab experiments about *referential communication*. The technique is especially useful to understand the interplay of speech and deictic gestures (e.g. pointing, selecting, or in mobile situations, moving about in the scene and postural orientation).

In more complex tasks and settings the challenge is to understand how gaze patterns relate to higher level cognitive and communicative processes. Specific *gaze signatures* might be typical for certain levels of reasoning (e.g. about concrete of abstract aspects of the task, about cognitive or metacognitive aspects), levels of expertise, roles in the interaction, or certain communicative actions (e.g. providing an argument, asking a question).

Finally, the techniques developed and knowledge gained from dual gaze studies will inform the design of *gaze awareness tools* that allow to display gaze based information from one user to the other. Open questions concern the display modalities (on demand vs. automatic), the display format (real-time vs. summarized), the way users handle errors and imprecision and how awareness tools are complemented by explicit deictic references.

Papers submitted to the workshop are available online at: http://www.dualeyetracking.org/duet2012/.