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When eye see you: Gaze and joint attention in human interaction

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Topic and Goals

Gaze behavior provides fundamental mechanisms for sharing mental states such as goals and desires and helps to ground communicative content. In order to establish common ground in verbal and non-verbal interactions, interlocutors often need to acquire knowledge about their interaction partners' focus of visual attention by following their gaze and, in turn, have to direct their partners attention to their own target object or location. Responding to or leading someone's gaze to a location or an object of interest results in a situation of joint attention - a referential triad between two individuals and some entity in the environment. As people often look at what they attend to and where they intend to act, joint attention is considered fundamental to an understanding of other minds and the interaction with other individuals.

Joint attention plays an important role in numerous social-cognitive processes, including Theory-of-Mind (Tomasello, 1995), perspective taking (Moll & Meltzoff, 2011), and processes relating to learning and memory from early infancy throughout adulthood (Kim & Mundy, 2012). However, despite extensive research in virtually all areas of cognitive science aiming at an understanding of behavioral functions, cognitive processes, and neural mechanisms of joint attention, there is a plethora of unresolved questions. The interplay of the development of joint attention and language during infancy (Baldwin, 1995) or the relation between joint attention and the perception of other persons (Frischen, Bayliss, & Tipper, 2007) are among those. Finally, the neural circuits subserving our ability to engage in joint attention have been investigated only recently because appropriate methods to study gaze-based face-to-face interaction in real-time have only recently been made available (Redcay et al., 2010; Schilbach et al., 2010).

In addition to its role in social cognition, seeing and following or directing someone else's gaze is crucial for effective language learning (Morales et al., 2000) and language processing in adults (Clark & Krych, 2004; Hanna & Brennan, 2007; Staudte & Crocker, 2011). Monitoring each other's gaze behavior supports the understanding of what the interlocutor is saying or understanding (Richardson & Dale, 2005; Hanna & Brennan, 2007) and fosters the synchronization of interlocutors in discourse (Garrod & Pickering, 2004). Thus, initiating or establishing joint attention at a chosen point during dialog can be a powerful means to augment and modulate linguistic content.

Finally, severe impairments in multiple aspects of social

cognition and communication are among the core symptoms of autism spectrum disorders (ASD). Due to the broad impact of joint attention on social and communicative skills, its study has become a major focus in the empirical research on ASD. The majority of this research is dedicated to understanding the implications of mutual and triadic gaze for the development of skills related to communication among typically developing individuals and those with ASD (Mundy, Gwaltney, & Henderson, 2010; Redcay et al., 2012).

Overall, this workshop aims to explore how traditionally separate research areas such as social cognition/neuroscience, psycholinguistics, human-computer interaction and developmental psychology contribute to an understanding of the general phenomenon of gaze-following and joint attention from all these different perspectives – and how these fields can benefit and learn from each other, e.g. by comparing different approaches and methodologies.

Relevance to the the CogSci Conference

Recently, there has been an increased interest in psycholinguistics and human-computer interaction as well as in social cognition and ASD research to investigate human communication processes in more interactive settings. In particular, scientists have tried to extend their theories and experimental designs by the visual presence and the induced dynamics of an interaction partner in order to accommodate the complex non-verbal behavior that typically accompanies and greatly influences linguistic interaction. The domain of gaze has aroused particular interest as single acts of looking combine perception and action in social encounters. By establishing joint attention, for instance, gaze behavior guides the exchange of goals and desires which are critical motivations for communication. However, experiments incorporating such complex and dynamic yet crucial aspects of human interaction are difficult to implement and a challenge to traditionally very controlled procedures. In this workshop, we would like to gather researchers from related fields and bring them closer together by providing a platform for exchanging theories and approaches as well as methodology that is suited for investigating the use and effect of gaze in human interaction (e.g. Redcay et al., 2010; Saito et al., 2010; Wilms et al., 2010). All related fields are core areas of cognitive science and our research questions are currently of high interest in the field (as partly reflected also by the invited symposium Joint Action).

Suitability of the Organizers

Dr. Maria Staudte has a background in psycholinguistics and human-agent-interaction and has published in established journals and conferences such as Cognition, HRI, and the An-

nual Conference of the Cognitive Science Society. Her interests have focused on studying how humans use (each other's or an artificial agent's) eye-movements in order to ground references in a shared environment, to infer (referential) intentions, and to predict upcoming action. Ulrich Pfeiffer has a background in linguistics, psychology, and social neuroscience and studies the behavioral functions and neural correlates of gaze behavior in real-time social interactions using a combination of novel and innovative interactive eye-tracking and neuro-imaging methods. He has published in established journals such as *Frontiers in Psychology*, *Social Cognitive and Affective Neuroscience*, and *PLoS One* and wrote a book chapter on eye-tracking methodology. He has further co-edited a Research Topic Issue in *Frontiers in Neuroscience* titled *Towards a Neuroscience of Social Interaction*.

Target Audience & Participants

The target audience of this workshop are researchers from all subfields of cognitive science that have an interest in the study of gaze behavior in interaction and communication. We expect a large audience of approximately 30-40 participants.

(Invited/Keynote) Speakers

The following high-profile researchers have confirmed to give keynote lectures:

- Dr. Andrew Bayliss, University of East Anglia, on "*Gaze cueing: The influence of observing averted gaze on attention and affective evaluations*"
- Prof. Susan Brennan, SUNY Stony Brook, tbd
- Prof. Peter Mundy, University of California at Davis, on "*The Interaction of Joint Attention and Communication: Cognitive and Neurocognitive Factors*"
- Prof. Elizabeth Redcay, University of Maryland, on "*Brain systems supporting joint attention behaviors in typical development and autism*"

In addition to the keynote lectures, we solicit submissions of abstracts (around 350 words) related to the workshop topic from all areas of the cognitive sciences. We intend this workshop to last a full day of which four 50-min slots would be dedicated to the keynote lectures. Besides an opening session, we expect to have six more 20-min slots to be filled by speakers based on abstract selection.

Publicizing and Documentation

We aim to make use of our large network of collaborators and colleagues in order to personally publicize this workshop and solicit submissions from specific individuals and labs. Further, we will use social media like Facebook as well as mailing lists such as AMLaP, LINGUIST or ESAN for general advertisement. We have no plans for documentation of the workshop outcome at this point since we truly view this event as a kick-off event that should help to start discussions, form synergies, and initiate new collaborations.

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