How eye gaze, speech and gesture synchronize to construe multimodal microphenomena

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Research in a variety of fields, including conversation analysis, human-computer interaction research and cognitive psychology, has focused on the role of human eye gaze behavior, both as an index of cognitive processing and as a communicative instrument in face-to-face conversation (see Van Gompel et al. 2007, Rossano 2012, Risko et al. 2016 for overviews). With the development of *mobile eye-tracking systems* (in the form of eye-tracking glasses or table-top systems), researchers can now collect fine-grained information on people's eye movements while they engage in natural action and interaction. In a series of recent studies, mobile eye-tracking was used to investigate the distribution of visual attention of speakers and hearers in multiparty interactions (Vertegaal et al. 2001, Jokinen 2010, Holler & Kendrick 2015, authors 2016). These studies, at least in part, confirm some of the early findings based on video analysis, reported by Kendon (1967), Goodwin (1980) and Argyle & Cook (1976), while at the same time presenting more detailed temporal information on gaze patterns, based on aggregated data of multiple speakers and addressees engaged in face-to-face conversation.

The proposed talk will continue on this novel line of investigation and explores the potential of mobile eye-tracking for research on *multimodal microphenomena*, for which highly detailed temporal information is needed. Using a multimodal video corpus which consists of two- and three-party interactions, with head-mounted scene cameras and eye-trackers tracking all participants' visual behavior simultaneously (Brône & Oben 2015), we first singled out all participants' micro-gaze events, i.e. short gaze aversions or gaze shifts between interlocutors with a maximum duration of 500 ms. In a second step, we looked at which (micro)phenomena typically co-occur with these gaze events, both at the level of speech and gesture. This co-occurrence analysis yielded a range of recurrent multimodal pairings, of which the following are treated in more detail in this study:

Speaker		**Hearer**	
Gaze + speech	Gaze + gesture	Gaze + speech	Gaze + gesture
Fillers (uh, um)	*Gestural holds*	*Feedback* (uhum, yeah)	*Feedback* (*headnod, headshake*)

What this set of phenomena shows, is that gaze and other (non)verbal markers build strong **multimodal pairings** that are used in the realization of specific interactional functions, even within a minimal time-frame. This time-frame was explored in more detail in a third step, in which we measured the temporal synchronization between eye gaze and speech/gesture in the above-mentioned phenomena, using the technique of **cross-recurrence quantification analysis**. This analysis, based on a comparison of recurrent patterns in two time series, set off against a baseline, reveals a minimal time-lag between the onset of the gaze event and the co-occurring phenomena. This provides additional evidence for a tight coordination of multiple communicative resources in spontaneous social interaction.

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