

Establishing a communication system: Miscommunication drives abstraction

Gregory Mills

Institute for Language, Cognition and Computation
University of Edinburgh

gmills@staffmail.ed.ac.uk

One of the central findings in research on the emergence of communication systems is that interlocutors rapidly converge on a shared set of contracted referring expressions (Krauss and Weinheimer, 1966; Clark, 1996) which become progressively systematized and abstract. This occurs for a wide range of referents, e.g. when referring to spatial locations (Garrod and Doherty, 1994), music (Healey et al, 2002), concepts (Schwartz, 1995), confidence (Fusaroli et al., 2012), and temporal sequences (Mills, 2011). Systematization of referring expressions occurs across modalities – in spoken interaction (Pickering and Garrod, 2004), text-based interaction (Healey and Mills, 2006) and in graphical, mediated interaction (Healey et al., 2007). This pattern is observed both when interlocutors are faced with the task of describing unfamiliar referents (Galantucci, 2005), as well as when interlocutors already possess referring expressions suitable for individuating the referents (Pickering and Garrod, 2004). Even when referring expressions are given experimentally, interlocutors coordinate on the semantics of their referring schemas (Larsson, 2007). Further, the quality of the interaction directly affects the development of coordination. If interlocutors are prevented from providing each other with feedback, e.g. by being prevented from drawing on each other's drawings, this impedes the development of systematicity (Healey, 2007).

Cumulatively, these findings suggest that interaction in dialogue places important constraints on the semantics of referring expressions. However, there is currently no consensus about how best to account for how coordination develops, e.g. whether it occurs as a natural consequence of exposure to another's linguistic output (Kirby, Cornish, Smith, 2008), as a consequence of mutual priming (Pickering and Garrod, 2004), or via

interlocutors providing each other with positive evidence of understanding (Clark, 1996).

To investigate in closer detail the development of referential coordination, we report a variant of the “maze task” (Pickering and Garrod, 2004). Participants communicate with each other via an experimental chat tool (Mills and Healey, 2006), which interferes with the unfolding dialogue by inserting artificial probe clarification requests that appear, to participants as if they originate from each other. The clarification requests signal apparent miscommunication of participants' referring expressions.

Participants who received clarification requests performed better at the task, and also converged more rapidly on more abstract and more systematized referring expressions. We demonstrate how this beneficial effect is due to the artificial clarification requests amplifying naturally occurring miscommunication: When interlocutors establish a novel communication system, signals of miscommunication provide interlocutors with evidence of negative understanding of each other's referring expressions. Consequently, amplifying these signals yields enhanced problem detection and improves recovery from error. We argue that these results show that abstraction and systematicity of communication systems is driven by negative evidence: miscommunication drives convergence.

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