

The cognitive science of interactive language

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Everyone agrees that dialogue is the primary arena for language use (e.g., Clark, 1996). Every language user, including young children and illiterate adults, can successfully hold conversations, yet reading, writing, giving speeches and even listening to speeches are far from universal skills. It is therefore particularly surprising that it has been hugely underexplored within psychology, computational and theoretical linguistics, and cognitive neuroscience. No-one denies the importance of understanding the mechanisms and processes underlying dialogue, but most researchers have assumed that naturalistic data is too uncontrolled to study scientifically and that appropriate experimental techniques are not available. It is now becoming apparent that these problems can be overcome, and that the time is right to understand dialogue and to apply that knowledge to practical problems.

Fundamentally, dialogue is successful when interlocutors align relevant aspects of their mental representations. In the same way that the goal of research into monologue is to understand how people convert sound into meaning (in comprehension) and meaning into sound (in production), the goal of research into dialogue is to understand how interlocutors achieve compatible representations. Pickering and Garrod (in press) propose that this occurs via a largely automatic priming mechanism – interlocutors have a strong tendency to employ the same linguistic representations that their partners have just used. On top of this, interlocutors use more sophisticated strategies when necessary (e.g., modelling the interlocutor, intentionally aligning). We propose employing the full range of psychological, linguistic, neuroscientific, computational, and social scientific methodologies to understand how this alignment comes about and what its theoretical and practical implications are.

We therefore propose, for example, conducting experimental research in dialogue using eye-tracking and scanning techniques, within the context of dialogue tasks. This will feed into computational modelling of dialogue (e.g., modelling alignment processes). At the same time, we shall develop dialogue systems (which are of immense practical importance but are still in their infancy) and use the developing systems in turn to produce controlled experimental environments that will inform theories of human-computer and human-human interaction. Similarly, we shall draw on large-scale dialogue corpora to study interactive language outside an experimental context and integrate the results with experimental studies. We need to replace the study of isolated utterances with the study of dialogue in a full multi-modal context (including gesture and physical surroundings), and to study the data using hybrid techniques that integrate the analysis of speech and eye movements with neuroscientific methodologies.

Such a research programme should lead to a developed theory of the mechanisms that underlie language use in the full range of naturalistic settings, from narrative to argument, from “free” conversation to semi-ritualised interchanges (e.g., shopkeeper-customer). It treats monologue as an interesting special case, rather than giving it the dominant position it has within modern psycholinguistics, for example. If we address this grand challenge, we should truly be tackling an issue of central importance to any theory of the mind that takes us beyond the traditional laboratory, and which would help resolve crucial applied questions such as assisting language

learning and use in young children and special populations, and the development of dialogue-based pedagogic tools (e.g., tutoring systems) and commercial tools (e.g., in e-commerce or interactive technologies).

References

- Clark, H.H. (1996). *Using language*. Cambridge: Cambridge University Press.
- Pickering, M.J., & Garrod, S. (in press). Toward a mechanistic psychology of dialogue. *Behavioral and Brain Sciences*.