Abduction, Belief and Context in Dialogue: Studies in Computational Pragmatics

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The problem of pragmatics arises as soon as we move beyond the linguistic analysis of an utterance and ask what the speaker meant by it. Now, speaker's meaning is a particular case of intention, and all intentions are complex mental attitudes that tie an agent's actions to its goals, its background beliefs, and its appraisal of the context in which it acts. Inferring the speaker's meaning, then, is a matter of recognizing how the speaker might have represented the utterance as linking up with the current discourse context and thereby furthering the goals of the conversation. This recognition of intention is reasoning to the best explanation, or abductive reasoning, as popularized in computational linguistics by Hobbs and colleagues (1993). So there they are: abduction, belief, and context—Harry Bunt and William Black's ABC of computational pragmatics—three concepts that rightly frame the diversity of current research in problems of pragmatic interpretation.

In this volume (*ABC* for short), Bunt and Black collect 15 chapters that grow, by and large, out of the ESPRIT project PLUS (Pragmatics-Based Language Understanding System). This coherence lends the volume strengths not often found in collections of research papers; *ABC* fits together to give a broad picture of computational pragmatics as an interdisciplinary enterprise in which a multitude of different investigations can be brought to bear constructively on a common project.

To start, *ABC* offers generally consistent terminology and perspective, laid out in a 150-page three-chapter overview of computational pragmatics in PLUS. As outlined by Bunt and Black in Chapter 1, dialogue system design in PLUS centered on the representations and inference required for recognizing the communicative intentions behind users' utterances. Jens Allwood's Communicative Activity Analysis (Chapter 2) provided the theoretical framework for this design, while Bunt's Dynamic Interpretation Theory (Chapter 3) bridged this dialogue theory and specialized models of meaning and context from computational linguistics and from computer science more generally.

Concretely, this approach is distinguished by a wide view of context, including social and physical dimensions as well as linguistic ones, and a wide view of agency, mandating considerations of ethics and trust in cooperation from the start. It is also guided by some more practical working assumptions:

- a focus on dialogues of information exchange in which domain reasoning (particularly reasoning about users' domain plans and domain-specific communication strategies) can be sharply circumscribed;

- an emphasis on the conventionality of moves in dialogue, against indirect speech acts and other particularized conversational implicatures;

- an eclectic use of mathematical tools for describing information states in dialogue—from computational logic, knowledge representation, and deductive databases as well as computational linguistics.

ABC also benefits from its coherence in achieving impressive coverage with minimal redundancy. In addition to the introductory material, chapters cover general problems in implementing interactive dialogue systems: context representation (Bunt), user modeling (Meyer), and architectures for system design (Sabah; Taylor and Waugh). Other chapters cover more specifically linguistic aspects of computational pragmatics: attention tracking (Carter), discourse structure (Redeker), and speech acts (Ramsay; Beun; Thijsse). Finally, connecting problems in computational linguistics and interaction are chapters on inference for dialogue understanding and generation, united by the theme of abduction (Neal): abductive generation (Oberlander and Lascarides), abductive context updating (Guessoum and Gallagher), and abductive interpretation (Hinkelman and Spackman). The chapters also illustrate a wide range of methodology, including not only the ubiquitous formal modeling but also corpus analysis (Redeker), Wizard-of-Oz studies (Beun), system building (Hinkelman and Spackman), and evaluation (Carter).

The coherence of *ABC* has the unfortunate side effect of offering little comparison with other ongoing work in computational pragmatics beyond the projects the book documents. *ABC*'s assumptions about dialogue are in fact rather controversial. Is information exchange simple? Research on cooperative response has made information exchange the classic test bed for modeling domain problem-solving and its ramifications for dialogue. Once a user makes clear his intention to *do something* with the information he gets, you may have a full task-oriented dialogue with all the structure and communicative action that entails. Can dialogue moves be purely conventional in a robust system? Or are disagreements, misconceptions, accommodation, even jokes, so common and so rich that a first-principles representation of communicative intention along Gricean lines cannot be avoided? And where are we to push for representations of context: database theory or models of uncertainty? With more and better comparison to alternative models, *ABC* would have done much better at conveying the difficulty, vitality, and diversity of research in computational pragmatics.

Even if *ABC* is hardly a source for all the latest ideas in dialogue,[1] ultimately, as always, it is the field itself that will make lasting comparisons. With its broad, consistent tutorial flavor, *ABC* deserves a place right behind Cohen, Morgan, and Pollack's *Intentions in Communication* (1990) as an accessible introduction to some classic ideas in the computational analysis of conversation.

References

Cohen, Philip R., Jerry Morgan, and Martha E. Pollack, editors. 1990. *Intentions in Communication*. MIT Press, Cambridge, MA.

Hobbs, Jerry, Mark Stickel, Douglas Appelt, and Paul Martin. 1993. Interpretation as abduction. *Artificial Intelligence*, 63:69–142.

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1 Indeed, *ABC* seems to have had the usual protracted publication. The PLUS project ran from 1990 to 1994. Within *ABC*, its other chapters are cited from 1998 through 2000; on the Web, chapter drafts show up as early as 1995.

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