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Proceedings of the Annual Meeting of the Cognitive Science Society

Title

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Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 19(0)

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Publication Date

1997

Peer reviewed

Acknowledgments in Tutorial Dialogue

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We discuss an important aspect of human tutorial dialogue—the use of acknowledgments—and present a critique of earlier work on the use of acknowledgments in synthesizing tutorial dialogues for Intelligent Tutoring Systems (Evens et al, 1993). Our goal is to establish a more solid theoretical base for studying and synthesizing tutorial dialogues than what was used in the earlier work. A proposed foundation for this study is the idea of language use as a joint activity composed of joint actions, as presented by Clark (1996). It appears to provide a more powerful conceptual linguistic framework within which to describe the behavior of human tutors and shows promise as a guide for synthesizing tutorial dialogues in Intelligent Tutoring Systems. In particular, we are investigate the role of acknowledgments as a mechanism that makes joint action possible. We propose that an acknowledgment is anything which signals closure or lack of closure of a joint action

Clark explains how the participants in linguistic activity perform mutual coordination of their individual actions. He says: "There is coordination of both *content*, what the participants intend to do, and *processes*, the physical and mental systems they recruit in carrying out those intentions" (p. 59).

Joint actions can be divided into entry, body, and exit phases. The phase entries and exits are coordinated by syntactic, morphological, and intonational markers. A joint action is complete when there is a mutual recognition of closure on that action. "It is a fundamental principle of intentional action that people look for evidence that they have done what they intended to do." (p. 222) Clark restates Norman's *Principle of closure*: "Agents performing an action require evidence, sufficient for current purposes, that they have succeeded in performing it." (p. 222) and then introduces the *Principle of joint closure*: "The participants in a joint action try to establish the mutual belief that they have succeeded well enough for current purposes" (p. 226).

It turns out that the idea of language use as a joint activity composed of joint actions maps very nicely onto the sort of planning and linguistic activity that must be carried out by a natural language based ITS (Intelligent Tutoring System). In particular, this provides a very nice framework for deciding when to issue acknowledgments

and guidance on what the text generation processor should issue. In the case of our ITS, CIRCSIM-Tutor, this turns into the system presenting a joint project and looking for the student's uptake of the project—or refusal to do so. The system analyzes the response, and if it is sufficient to declare the goal reached, the system can issue a positive acknowledgment and continue. If the answer was wrong or insufficient, the system can issue a negative acknowledgment, or a partial positive acknowledgment. If what the student produced does not appear to be an uptake of the project, then the input can be treated as metacommunication or as a student initiative, and handled accordingly. We are currently working on mapping these acknowledgment rules into tutoring and discourse generation rules in the CIRCSIM-Tutor planner and plan to report on and demonstrate the resulting system in the future.

We believe that approaching acknowledgments in communication from a joint actions framework is a productive one that is an advance over previous efforts relating to acknowledgments. We are using this to perform a qualitative and quantitative study of acknowledgments in our transcripts, expect results in the near future, and are comfortable that those results will support the proposed framework.

Acknowledgments

This work was supported by the Cognitive Science Program, Office of Naval Research under Grant No. N00014-94-1-0338, to Illinois Institute of Technology. The content does not reflect the position or policy of the government and no official endorsement should be inferred.

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