Moving from dialogue modelling to ITS design

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1 Introduction

The workshop (to which this poster contributes) is concerned with the issue of 'capturing human teaching tactics and strategies as well as attempts to model and evaluate those tactics and strategies in systems'. In this poster we briefly present our own position on aspects of this issue. Below we have reformulated the issue as three sub-questions and have also provided a brief discussion of each sub-question.

2 Starting points for the design of ITS

Question: Should naturally occurring human-human interactions be taken as the starting point for the design of Intelligent Tutoring Systems (ITS)? The issue of taking descriptive basis for system design can be restated as the question: What is the nature of the argumentative link between the analysis-description of what a human teacher did and the design of a system?

The relation can not be one of direct transfer of expertise, for a number of reasons. On the purely dialogue side, you have open-ended spoken dialogue versus constrained human-computer dialogue. And then, artificial agents are not meant to be copies of human ones. The interaction analysis framework and the study described in Cook [1] are part of a pedagogical agent design approach, described in [2], that aims to make practical use of empirical research in pedagogical agent development. We have argued, therefore, that because very few studies have examined how to develop an artificial agent for music teaching, the best starting point is to look at what human teachers do, and to then implement descriptive models of that.

3 Techniques for capture and modelling

Question: If there are circumstances when the answer to the above question (given in section 2) is yes, then what techniques are available to analyse interactions and hence capture and model expert and 'ordinary' tactics and strategies?

One method is the 'normal' modelling of processes and human expertise in executable models (simulations and knowledge-based systems). The other method for producing models — Dialogue Analysis and Modelling — is an approach that draws on

such diverse fields of study as speech and communicative act theory, goal-based interactions when problem-solving, dialogue games, argumentation, rhetorical structure theory and the analyses of causal reasoning to develop models of behaviour. The author has proposed a methodology [1, 2] that explores the systematic relationships involved when moving from theory, to an analysis and modelling of corpus data, to the instantiation of computational model, and then on to computational implementation (a system called MetaMuse [4]). This method draws upon speech and communicative act theory, plus goal-based views of agents when problem-solving, to capture interactions between expert composer-teacher and learners.

4 Effect of models on ITS design and on our understanding of the teaching-learning process

Question: What is the effect of this modelling activity on system design or indeed on our understanding of the teaching-learning process under investigation?

The author's methodology mentioned above [1, 2] was used to generate descriptive models of interactions that are usable in ITS design. For example, state transition networks were generated and then used as the basis for an interaction planner in MetaMuse.

We have addressed the second part of the above sub-question (i.e. the effect on our understanding of the teaching-learning process) as follows. One earlier empirical result [1] was a taxonomy of pauses in interaction. Pauses were shown to be indicators, in context, of learner reflection. Furthermore, Cook [3] describes results from a recent detailed analysis of a transcribed corpus of the face-to-face interactions that took place between cooperating pairs of students when engaged with the pedagogical agent MetaMuse [4]. One empirical result [3] showed that MetaMuse encouraged cooperative musical problem-solving and that the learning mechanism for this involved a dialogue model of 'find-predict-explain-refine'.

References

1. Cook, J.: Mentoring, Metacognition and Music: Interaction Analyses and Implications for Intelligent Learning Environments. International Journal of Artificial Intelligence in Education, 9 (1998) 45-87
2. Cook, J.: Knowledge Mentoring as a Framework for Designing Computer-Based Agents for Supporting Musical Composition Learning, Unpublished Ph.D. thesis. Computing Department, The Open University, UK (1998)
3. Cook, J.: Cooperative problem-seeking dialogues in learning. ITS 2000 - Fifth International Conference on Intelligent Tutoring Systems. June 19 - 23, 2000, Montréal, Canada (2000)
4. Cook, J.: Evaluation of a support tool for musical problem-seeking. ED-Media 2000 - World Conference on Educational Multimedia, Hypermedia & Telecommunications. June 26-July 1, 2000, Montréal, Canada (2000)