Resources for Coordination in Collaborative Telelearning

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ABSTRACT

We have analyzed data from a field study in collaborative telelearning (Wasson, 1999). The goal of the study was to investigate how the students used a set of groupware tools to coordinate learning activities. We have used concepts from collaborative telelearning and coordination mechanisms (Schmidt & Simone, 1996) as analytic framework. Our findings indicate that students coordinate many activities by implicit, locally adopted resources instead of fully developed mechanisms. Three implicit resources were identified and named (no initial discussion, asymmetry of knowledge, and different expectations). These resources were not associated with any specific groupware features, but referred to the students' background knowledge and subjective interpretation. We end the paper by suggesting how implicit resources in distributed learning environments can play a role similar to how non-verbal cues – such as gesture and facial expression – play a role in face-to-face interaction, but without imitating human body language.

Keywords
Collaborative telelearning, distributed collaboration, coordination, explicit resources, implicit resources

DISTRIBUTED LEARNING AND COORDINATION

We have studied a distributed collaborative scenario over a period of four weeks. The participants were students enrolled at three educational institutions in Norway. They were assigned three activities requiring collaboration. A groupware system was used to mediate the interaction. The central research question we have asked is how the students coordinated their activities with the groupware facilities they had available.

Coordination can broadly be defined as how to support, manage, and justify collaborative interaction. Coordination has also been defined as "articulation work" (Strauss, 1985): the organization of work that accompanies work (contacting people, scheduling meetings, division of labor, etc.) to ensure the latter's successful completion. We have identified three main strands of research of relevance to collaboration systems: 1) Executable coordination mechanisms (e.g. Dourish & Bellotti, 1992), 2) Articulated coordination mechanism (e.g. Schmidt & Simone, 1996), 3) Coordination theories (e.g. Malone & Crowston, 1992, Wasson, 1999). The notion of coordination mechanism we use in this paper is adapted from articulated coordination mechanism (Schmidt & Simone, 1996), with some added modifications. Our focus has been to identify the shared artifacts and articulation work the students have used to coordinate their activities. We take a socio-cultural perspective in our analysis and have studied the scenario from different views (Wertsch, del Río & Alvarez, 1995). The most important technique was observation of the students as they worked. This was augmented with more traditional HCI-oriented usability studies, such as data logging and user satisfaction questionnaires.

FINDINGS

Our findings pertain to coordination at the tool use level and are summarized as follows. There were no prior agreement or discussion among the students for how to use the different tools before they started on the assignment. This would often lead to unanticipated situations. Most notably the students would use different tools to accomplish the same task. When there were no procedures for how to use the tools and none had been developed by the students nor suggested by us, the use of tools depended upon students' prior skills and new ideas for how the tools could be used. When interaction between students required several rounds of turn taking the expectation for what constituted a complete action sequence would often be interpreted differently.

Our findings are different from past work on coordination mechanisms by revealing personal choice and style as key factor in coordination rather than procedures and mechanisms. The styles were easily amenable to local interpretation and mutual adaptation. They were not built into the groupware, but dynamically "built" by the students during interaction with each other. That is why we call them *implicit resources* to stress their informal and subjective characteristic.

DISCUSSION

We argue in the full paper that implicit resources should be seen as the "virtual equivalent" of body language since body language (facial expression, body position, gesturing, etc.) and our implicit resources are associated with informal, situation-specific cues people indirectly use and take for granted in collaborative interaction (i.e., a kind of tacit knowing). These resources provide an important awareness of other people's activities and their level of participation.

IMPLICATIONS FOR DESIGN

We propose an approach to system design - inspired by Polanyi (1958) and his concept of *peripheral awareness*, which is different from past work on coordination and awareness (e.g. Dourish & Bellotti, 1992). Instead of imitating body language in support of computational awareness (e.g. multiple cursors, different views, interaction histories, etc.), we use it through analogy. Our findings indicate that collaborative telelearning can be more efficient if more attention is paid to informing the participants about affordances and constraints of coordination and collaboration. This can be achieved by a technique we have dubbed "conceptual awareness on demand". A conceptual level adds a new dimension to collaborative telelearning and exploits the distributed nature of this form of interaction. By bringing generally useful information about coordination and collaboration to the users' attention in ways that are different from face-to-face situations we go "beyond being there" (Hollan & Stornetta, 1992).

The current activity in the DoCTA project (DoCTA NSS) includes designing, developing, and field-testing a "pedagogical agent" system that will instantiate these principles and provide for this kind of peripheral awareness. In this phase we reuse ideas developed by others in the areas of software agents for collaborative applications, including the work on knowledge-based critics (Fischer et al. 1991) and coaches (Suthers & Weiner, 1995).

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