Collaboration in Learning with Mobile Devices: Tools for Forum Coordination

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Research and New Developments in the general field of interest to the conference
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Abstract: The forum (or conference) is an asynchronous communications tool, which is used to delve deeper into a course subject. To ensure the conference reaches its objective, the coordination of learners' activities must be supported. One difficulty that mediators and learners face to coordinate themselves is that the moment for the sending of messages is unpredictable and varies considerably. This requires frequent action of mediators to check up on how the discussion is going and intervene when necessary. Learners also need to follow up the conference frequently to self regulate their activities. In a scenario in which mobile devices and wireless networks are bringing a new range of possibilities for teaching and learning, this study aims at investigating coordination tools for educational forums that explores resources of these new technologies. Case studies are being carried out with participants of the Information Technology Applied to Education Course. This course, regularly offered by the Computer Science Department of the Catholic University at Rio de Janeiro, is given totally at distance through the AulaNet, a web-based teaching and learning environment developed since 1997 at this university. This study presents the extension of the AulaNet Conference service to PDAs (Personal Digital Assistant) and the use of coordination tools in PDAs and cell phones. The first results show that visual information about the conference tree structure coupled with wider connectivity of PDAs is a valuable coordination tool. The offering of alerts and statistical information through cell phone text messages (SMS) and PDAs are under investigation now.

Keywords: coordination, forum mediation, collaboration, CSCL, m-learning

1.   Introduction

The forum or conference is a textual asynchronous communication tool that is used for the development of a course topic. In order for the conference to reach its purpose, support for the coordination of learner activities is necessary. Mediators must perform the tasks of preparation, accompaniment and evaluation of the discussion. They must also maintain continuous monitoring over the entire running of the conference, ensuring that learners participate with consistent and quality arguments, and intervening quickly when problems are identified.

Because it is impossible to predict when a message will arrive, there can happen both a lingering period of inactivity and the arrival of several messages in a short period of time. This demands frequent action on the part of mediators to connect to the environment to verify the course of the discussion. Another difficulty is that the collection and analysis of the information needed to mediate the group's discussion is usually left to the mediators.

The coordination of a conference is not achieved only through the action of the mediators; learners also must organize themselves to carry out their tasks. In educational conferences, participation is not totally spontaneous and learners are subject to the evaluation of their messages and participation, and must comply with certain obligations [1] such as, for example, sending a minimum number of messages, interacting with a minimum number of participants, presenting a position on a given topic and meeting deadlines. For this to happen, learners also need to constantly check the content of the topics that are in debate, receive feedback from the mediators, analyze the messages of their colleagues and choose which of them to answer.

In light of this, the objective of this study is to investigate mechanisms to enhance conference coordination. This article specifically investigates the use of mobile devices for coordination. The development of this study was based on the AulaNet [2] and the case studies are taken from the Information Technology Applied to Education classes regularly offered by the university.

The AulaNet environment and the Information Technology Applied to Education (ITAE) course are presented in Section 2. Section 3 discusses conference tools that are under investigation. Section 4 presents a description of the extension of the AulaNet Conference service to mobile devices as well as the results of the use of this service in support of the mediators of an ITAE course. Section 6 concludes the article.

2.   The AulaNet Environment and the ITAE Course

The AulaNet is a web-based LMS that has been developed since June 1997 by the Software Engineering Laboratory of the Catholic University of Rio de Janeiro (PUC-Rio). The AulaNet's architecture is based on the 3C Collaboration Model, which identifies the communication, coordination and cooperation dimensions as the basis for collaboration [3]. As of 2004, the AulaNetM, which is an extension of the desktop AulaNet for users of mobile equipment, has been under development.

The AulaNet development team also runs the ITAE (Information Technology Applied to Education) course [4], which has been regularly offered by the PUC-Rio Computer Science Department since the second semester of 1998. It is taught entirely at a distance through the AulaNet environment. In the

first phase of this course, eight topics are discussed, one each week. During each week, the learners must study a proposed topic, participate in a conference through the Conference service and a text chat through the Debate service (Figure 1).

Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday
1. Readings (Lesson Plan and Internet search)						
			2. Seminar (Conference) 12hs		14hs	3. Debate (chat) 13 - 14hs

Fig. 1. Weekly timetable for the first stage of the ITAE course

The Conference service is used to run the "Seminar" learning activity, which takes place over 50 hours. One of the learners is chosen to initiate the discussion, sending a message about an aspect of the week's subject (the seminar) and three questions to be discussed. A snapshot of the ITAE seminar is presented in Figure 2.

Fig. 2. Example of an ITAE Seminar

The activity "Seminar", which takes place through the Conference Service, is used in the case studies in this research because it is the central activity in the course's first phase. In each new course, new functionalities are evaluated by learners and mediators during their participation. The introduction of these new functionalities is made only in half of the conferences, allowing a comparison with the use of AulaNet without these new resources. A record of the learners' and mediators' navigation and when the alerts were sent is kept, and, at the end of the course, qualitative research is carried out to evaluate the hypotheses adopted and orient future studies.

3. Tools for conference coordination

Upon entering a conference, the participant is capable of evaluating how a discussion is evolving through the observation of several factors. For example, the quantity of messages sent over a given period of time, the quantity of answers and the quantity of active and inactive participants all offer indications about the conference's level of activity. Other factors indicate the quality of the discussion, such as the content, form and appropriateness of the messages that have been sent, the quantity of messages that have been given

high marks and the type of intervention on the part of the mediators. This information provides a context for the learner to decide about the best way of participating and to reach his objective within the subject. For their part, the mediators have different objectives and need tools that make it possible for them to make more in-depth evaluations of the overall evolution of the discussion and of the learners, in particular.

Activity reports and a history of the participation of individual learners already are tools that exist in some groupware [2][5][6][7][8]. Statistical data about the conference frequently is presented together with those from other services, while in some cases specific reports are made available for each conference. The use of analysis of interaction in learningware is still a recent field [9] and helps in the identification of, for example, subgroups of learners who only debate among themselves. Another coordination tool consists of sending e-mails notifying the occurrence of given events [10]. This paper investigates the coordination features presented in sections 2.1 and 2.2.

3.1.   Preliminary findings

The investigation of resources that can offer continuing support to conference participants is being conducted concomitantly with the development of AulaNetM, which at moment is consisted of the extension of the AulaNet Conference Service for PDA in the online mode. The first stage of the development of AulaNetM consisted of a version with the minimum functionalities of the Conference service, where the service's viability in the online mode through a browser was verified along with the main demands and difficulties reported by users [11]. To evaluate the service, five mediators and learners experienced in the AulaNet environment but not familiarized with the use of PDAs were interviewed. They were asked to enter the system, navigate freely, look for and read a specified message, reply to this message and read their reply. These procedures were repeated with the 2 PDAs models used in the study. Then, open question interviews were conducted, and, departing from the interviewee's answers, topics of higher interest to this investigation were further explored.

The conferences accessed by the interviewees were part of the 2004.2 edition of the ITAE course. The sizes and titles of the messages in this course were relatively large for PDAs screens, thus serving the purposes of these tests. Typical values in this course are more than 4 words for the title and 3 to 5 paragraphs for the message. The size of the page in bytes rarely surpasses 10Kbytes. Besides, the messages posted in the ITAE course generally have dense argumentative content, demanding close attention from the reader.

All the interviewees reported positive impressions of the use of the Conference Service in PDAs, some above their expectations. The service is seen as a complement to the desktop version to be used in opportunistic situations or when no other form of connection is possible. The extreme case of using exclusively PDAs to access conferences was disapproved by all interviewees. Just one of them observed that it would be possible to follow a course entirely from a PDA, as long as there was a new course design in which texts would be proportionally adequate to the size of the PDA screen.

The interviewees didn't have difficulties reading relatively long and dense messages with small type but entering data to write messages was considered difficult. The results of initial tests also demonstrated that they all

identified the need for the conference message list presented in a tree structure fashion to be replicated on the PDA, even knowing that only a small part of it could be displayed at a time.

Starting from these results, a case study was conducted to verify the use of this structure as a tool for supporting coordination of ITAE mediators. Besides, other tools identified by mediators as necessary for their mediation work were also investigated.

In this case study, AulaNetM was used by both mediators of class ITAE 2005.1 in the course's four last conferences, while the first 4 held with no PDAs. Mediators were asked to read through the PDA at least 5 still unread messages. Wi-Fi access was available in 2 buildings and in and around a restaurant in the PUC-Rio campus. To verify in which situations mediators accessed the service, they were requested to answer three questions before entering AulaNetM: which network they were connected to, if access had been planned or opportunistic and whether another connection possibility (a desktop) was available to them at the moment. The functionalities available to the mediators were basically limited to the reading of messages of the tree-structured message list and of a list of the last 10 messages sorted by date. Such information is sufficient to follow up the conference's progress and identify problems.

The results of qualitative interviews carried out with the mediators and their activity logs demonstrate that they identified opportunities and actually used the PDAs in typical situations that call for their use, such as standing in a restaurant line and when all lab computers were busy. Both mediators considered being able to use the service in a restaurant line very useful, while the use of the AulaNet in opportunistic or emergency situations was identified as advantageous for the mediation work.

One of the mediators observed that the service "would have been more useful if I could use it in more places", while another one stated that the absence of connectivity "interfered a lot", as he encountered several situations when he wished he "could access the course through the PDA… but couldn't". Other problems reported were related to connection difficulties and discharged PDA batteries.

The opportunity to use the information of the conference tree structure for coordination purposes was not identified by one of them, a newbie in the activity. The other mediator, who had participated in the activity for six semesters, did identify such opportunity. This mediator produced a spontaneous and enthusiastic written account of the situation that occurred right during the first week. The two mediators, physically close to each other, had to define urgently the division of messages to be evaluated, but at that moment and place there were no computers available. The PDA was used to access the conference and the decision taken on the basis of information obtained directly from the conference tree: from the message titles in the category "Question" and from the visual observation that one of the questions had a very small number of replies.

In the interview this mediator confirmed and summarized the relevance of the support to coordination offered by AulaNetM when he stated that "I found seeing the tree through the PDA to be very useful. It is a synthesis of the conference. This makes the PDA very useful when, for instance, I want to know

whether I should rush to a desktop to evaluate messages or I can wait a little longer".

Besides the tree structure, one of the mediators requested that reports be made available so that he could check levels of learner participation and the number of messages sent per hour. As such information can be extracted from the conference tree structure, this commentary suggests the need to offer these data more specifically so that they can be perceived faster.

The development of assessment mechanisms was requested by both, although one of them stated that the assessment required concentration and peace of mind, conditions typically found in situations where a desktop is available. Reading messages without being able to assess them was not helpful to the mediators, since they only read a message when they are about to assess it. If such functionalities are to be implemented, a mechanism should be provided to replicate in the PDA a list of the most frequent errors, which in the desktop functions as a template and starting point for the mediators, thus facilitating the beginning of the assessment process.

The results of this case study show that, although the service had only the conference's basic functionalities and it was not possible to evaluate messages through it, mediators realized its usefulness to the point of complaining about the lack of broader connectivity or difficulties to establish a wireless connection. These results also show that the conference tree structure is an important coordination feature. The mediator's account of the enhancement of the coordination through the use of the conference tree structure associated to the PDA shows a typical case of the service's relevance in this type of device. The information about learner participation requested by the mediator could have been obtained from the message list, however, its presentation through a report would be perceived more immediately by mediators. This suggests that the offering of concise information such as reports on the reduced PDA screen is useful within this context. The suitability of this support service for mediators is also made clear by the statement that the use of the PDA for coordination activities is very appropriate in opportunistic or emergency situations.

This case study confirms the statements of Gerosa [12] concerning the importance of visual and statistical information. This motivated further investigation regarding offering the mediators the presentation of the tree structure in a fully visual manner and charts with statistical data about the conference. The mediators of the ITAE 2006.1 class are currently testing the relevance of these features to support coordination.

3.2.   Prompting mediator reactions

In a conference several discussion lines are created where the relationship between a given message and the message it is replying to is visually characterized. As the messages are published and remain in the environment, one can have a visual indicator of the direction a discussion is taking. Depending upon the characteristics of the tree structure formed by the chaining of messages (Figure 3), mediators can evaluate at a glance whether or not the discussion is going well and intervene in the course of the discussion. In the case of the tree being wide but not very deep, the discussion is not taking place because learners are limiting themselves to directly answering just a few messages without dialoguing with the other participants that reply to the same

message. If one of the branches of the tree is too deep, it indicates that learners are concentrating too heavily on just one aspect of the discussion.
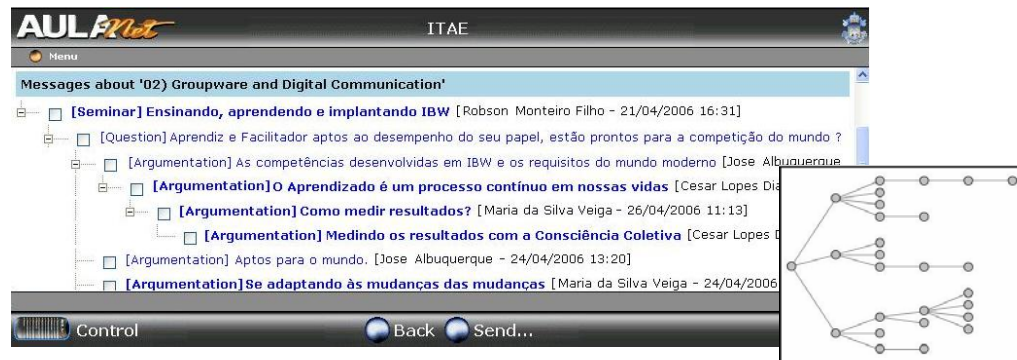

Fig. 3. Example of conference tree structure

Gerosa [12] proposes as a coordination tool for mediators the offering of the presentation of the tree structure in a fully visual manner and charts presenting statistical data about the conference. The use of mobile devices to present data in this form increases the number of situations in which mediators can access the environment to verify the course of the conference.
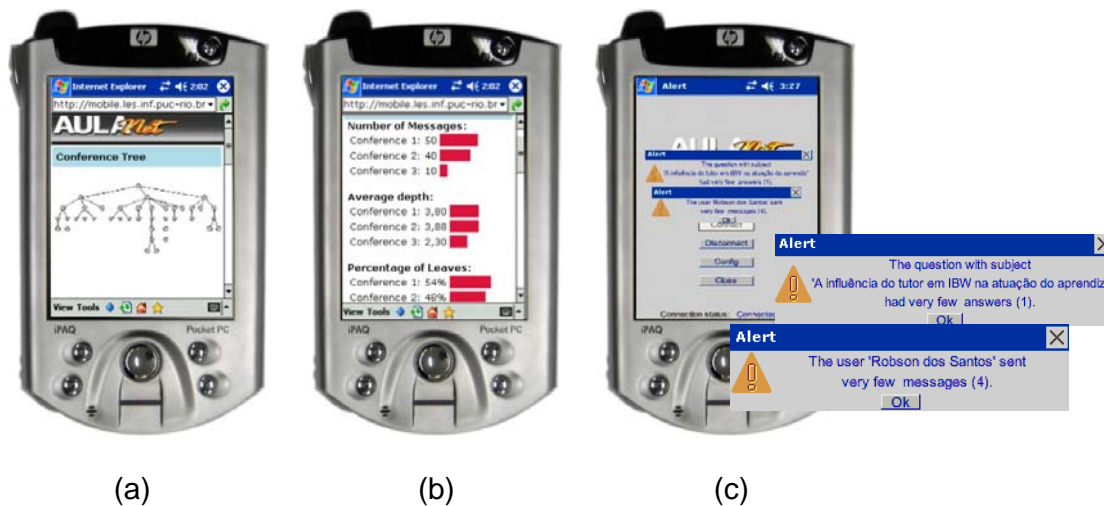

(a)   (b)   (c)

Fig. 4. (a) Visual form of the tree structure on a conference (b) Statistics from the three conferences of an ITAE class (c) Alerts regarding the conference

In this paper, we investigate if and how the use of this equipment effectively allows the mediators to react faster when intervention is necessary. The coordination features are offered in two modes. In the pull mode, the mediator uses the extension of the AulaNet Conferences Service for the PDA. Through the equipment's browser, the mediator can follow the evolution of the conference, checking the tree structure and quantitative data and charts, as well as the messages that have been sent. In the push mode, the sending of alerts regarding situations that are outside of the norm is offered, such as lack of conference activity, very low participation by a given learner or a message that has received very few answers (Figure 4). The alerts are received through the

PDAs and as SMS messages on cell phones. All these features are under investigation in ITAE in the first semester of 2006.

3.3.   Learner participation

In an asynchronous environment where the learner is promoted mainly through interaction with other learners, it is important to constantly check when and how the other colleagues are carrying out their tasks. The action of one learner influences the others: for example, if a low quality message is sent, the other participants can choose to wait for a better one that is easier to answer. This perception of the work of others also leads a learner to make a self-evaluation of his efforts.

This paper investigates the use of alerts regarding the evolution of a conference as a way of fostering the self-organization of the learners and their participation in the conference. The alerts are SMS messages that participants can receive in any location.

This research took into account alerts that favored the group and not a particular individual. The alerts that are under investigation report that a given number of messages were sent (Figure 5) and that a given number of messages were evaluated. Without more detailed information about these messages, it is supposed that the learners access the conference to check if any new messages and evaluations interest them. The intention of the alerts is to invite the learners to participate in the discussion. Alerts such as "your message has been answered" and "your message was evaluated" have a strong appeal for the learner because they offer precise information about personal aspects. However, the learner who only occasionally checks the conference in search of a grade or answers to his message would no longer need to do so if there was a certainty that he would be advised when this occurred. The sending of text messages about the evolution of the conference is also being verified for the same ITAE class, both for learner and mediators.

Fig. 5. Example of a SMS message

The availability of the tools in cell phones and PDAs for mediators, and just cell phones for learners, satisfied the different affordances and constraints. The PDAs satisfy the greater demand of the mediators for more elaborate features, such as those that display charts and the tree structure, which would not be possible on cell phones; while the latter satisfy the demand for just-in-time information. Although some of alerts and statistics are more appropriate for

mediators, the coordination tools proposed are useful to participants independent of the roles they play in the course. Because the use of PDAs is not so widely disseminated, as is the cell phone, this study did not investigate offering the same tools to the learners.

The results of this case study will be obtained through the analysis of the activity log by the participants and supplemented by qualitative surveys involving the mediators.

4. Conclusion

AulaNetM began with the proposal of offering a version with all the functionalities of the desktop AulaNet Conference Service, but the first versions of the new service demonstrated that it is more relevant to explore functionalities that are appropriate to mobile devices and the situations in which they are used. In this context, the support to conference coordination was identified as an important resource. The results observed provide evidence that offering summarized, relevant and focused information presented in visual form that can be consumed in short periods of time, anytime, aggregates value to the coordination work of conference mediators. Even without reading conference messages, the information presented warn of problematic situations and give a general notion of the direction of the conference. Thus, the use of mobile devices associated with functionalities such as those presented in this work provides support capable of increasing the opportunities for mediators to follow up conferences, intervene in their course and coordinate themselves.

For learners, the tools investigated in this paper aim at assessing if they are participating more actively in the conference. The ongoing studies will also indicate if services with such characteristics will help them self-organize their participation in the conference.

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