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Linking to Several Messages for Convergence: a Case Study in the AulaNet Forum

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Abstract. In this article, a piece of research on the development and use of a discussion forum is presented. In an online course, it was identified that one of the problems of the educational use of discussion forums is the high number of messages that go unanswered. To attenuate this problem a convergence mechanism was elaborated: links to messages beyond the replied one. In the case study conducted in two course editions, it was verified that the use of links decreased the number of unanswered messages.

Keywords: LMS, Discussion forum, convergence, links

1 Introduction

This article presents a case study on the use and development of the discussion forum tools that are available in some learning management systems: Moodle [1], BlackBoard [2], AulaNet[3] etc. Research on the development and use of forum tools in the educational context has been on the increase [4].

As presented in Section 2 of this article, forum tools have typically structured the discussion in a tree format, implying in a diverging development of the discussion as the breadth of the tree tends to increase. Diagram tools, on the other hand, have structured the discussion in a graph format that favors the convergence of the discussion but is more difficult to use and not as widely adopted.

As addressed in Section 3, according to a certain discussion dynamics conducted through the forum in a given online course, a discussion is considered good when learners discuss more among themselves than directly reply to the questions posted. In

that course, it is considered that a deeper tree level and a low percentage of leaves are indicators of a good discussion. A lower leaf percentage indicates that fewer messages were left unanswered, i.e., more messages were used in the conversation chain.

As discussed in Section 4, one strategy to prevent a high number of unanswered messages proposes the use of Diagram tools, which makes possible having a graph structured discussion. However, learners have difficulties in using such tools. The solution proposed in this paper is the use of an enriched hierarchical structure: beyond the father, links to previous messages in the forum can also be established.

According to the case study analyzed in Section 5 links were effectively established decreasing the number of unanswered messages, as it was desirable in the discussion dynamics of that course. The conclusion and future works of this research are presented in Section 6.

2 Conversation Structuring

In a communication tool messages are generally organized in one of the following structures: in a list (linear), tree (hierarchical) or graph (map) [5] – Fig. 1. Although the list is a particular case of a tree, and a tree is a particular case of a graph, none of the structures is always better than the others.

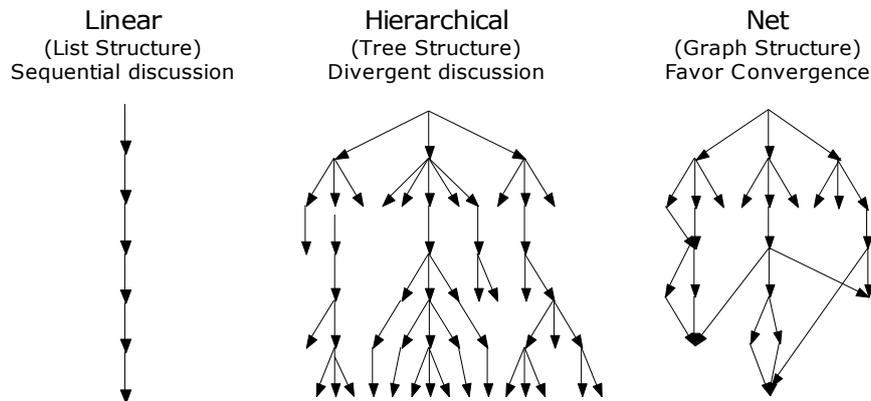


Fig. 1. Models of Discussion Structuring

In the list structure, typically used in e-mail and list discussion tools, explicit relationships among messages are not established. A message can relate to the text of other previous messages, but if there are too many relationships the reader will have difficulty in identifying them and getting a general vision of the discussion. The messages are listed according to the date they were received and can be rearranged according to other parameters such as the sender's name or the message's heading. The linear organization is propitious for communication where the chronological

order is more important than the eventual relationships among the contents of messages, as it is the case of memos, bulletins and news.

In the tree structure, typically used in forum tools, participants choose which messages they wish to reply to, thus creating ramifications of the discussion. This discourse structure promotes the topical organization of the discussion: it favors the chaining of messages about a given subject in a single branch and the separation of messages into different branches about different subjects. In a tree the only explicit relationship is between the father message and the children messages. If a message makes a reference to a sister or grandmother message or to a message located in another branch of the tree, this reference will not be explicit in the structure of the discourse. The hierarchical organization is propitious for the visualization of the width and depth of the discussion. A problem with this structure is the difficulty to converge a discussion [6] since the conversation proceeds into divergent lines and the breadth of the tree tends to increase.

The graph structure is used when it is necessary to express relationships that are more complex than message hierarchy. It is useful when seeking convergence of a discussion or negotiation, taking decisions, seeking consensus, or when a high degree of structure in the dialog records is desired, as in the joint construction of semantic webs or in the study of concepts and their relationships. One of the first tools to deal with a discussion using the graph structure was gIBIS [7, 8, 9]. The discussion is structured on the basis of the IBIS - Issue Based Information System [10] - which proposes the categorization of messages into Question, Position and Argumentation. The QuestMap tool [11] is an evolution of gIBIS based on argumentative processes for project decision-taking that presents a larger set of categories. With the potential to express more complex relationships comes also the potential to generate a relationship mess that can hinder the understanding of the discussion. There are frequent reports on the difficulties encountered in using these tools that indicate the need for better training on their adequate use [12]. To try to decrease this problem some tools make use of rules that restrict the number or type of links among messages.

3. Problem: a High Number of Unanswered Messages

The research presented in this article was prompted by the identification of a problem in the use of the forum in an online course: the high number of unanswered messages. The course in question, ITAE (Information Technologies Applied to Education), is a course offered by the Department of Informatics at PUC-Rio that has been conducted totally at a distance through the AulaNet environment since the second semester of 1998 [13, 14]. Amongst the activities carried out in this course learners participate in seminars to discuss issues regarding the course's topics. The seminar is conducted in the Conference service, the AulaNet environment's discussion forum tool. The discussion is initiated through the Conference service with the "Seminar" message after which 3 messages using the "Question" category are chained. After that, learners start the discussion sending messages using the

“Argument”, “Counter-argument” or “Clarification” categories and establishing chaining with previous messages.

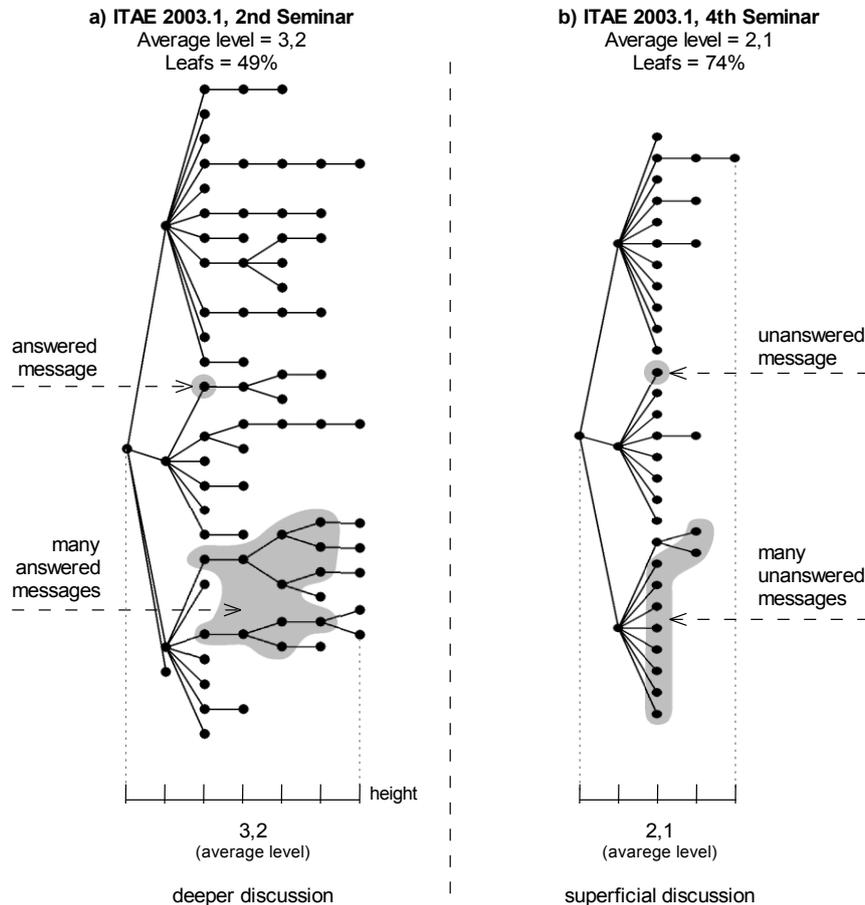


Fig. 2. Analysis of the discussion tree: leaves and level

The form of the resulting discussion tree supplies indications on the quality of the discussion [4, 15, 16]. For example, in the tree presented in Fig. 2.b the average level was very low: 2,1. A barren discussion took place in which practically all learners answered the questions presented in the seminar directly, without discussing each other’s ideas. The objective of the educational activity is to promote discussion among the learners themselves so that the forum will not become merely a questionnaire to be answered by all learners in the class. It can be observed that in the tree in Fig. 2.b, 75% of the messages were not answered (high percentage of leaves). When sending a new message, practically no learner took into consideration what the other participants had already said about the questions under discussion.

Comparatively, the tree in Fig. 2.a presents a much fruitful discussion resulting in a smaller leaf percentile and a higher average depth level.

Throughout several editions of the ITAE course it can be observed that the percentage of leaves is generally between 52% and 62%. In this course, a discussion that results in a tree with a percentage of unanswered messages above 62% is considered inadequate. The average depth level of the tree is inversely moderately correlated with the percentage of leaves: the more unanswered messages, the lower the depth of the discussion, which is also considered inadequate for the educational activity conducted within the course's forums.

4. Solution Proposed: Enriched Hierarchical Structure

To decrease the number of unanswered messages, the solution proposed was the use of an enriched hierarchical structure. Using this structure, as illustrated in Fig. 3, the linking with any other previous message can also be established besides the hierarchical association reply mechanism. This structure does not reproduce the structure used in the Graph Structured tools since the spanning tree [17] is kept as the main structure. The goal is to provide a mechanism that keeps the typical message hierarchy of a discussion forum but also makes it possible to establish the multiple associations typical of the graph structured tools.

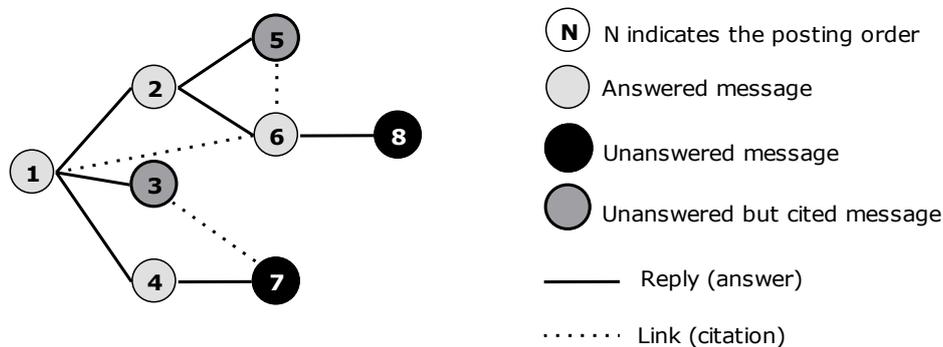


Fig. 3. Enriched Hierarchical Structure

Using the enriched hierarchical structure there is an increase in associations that promotes the reduction in the number of unanswered and not-cited messages. This structure was implemented in the Conference service of the AulaNet [18]. When replying a message the sender may also establish links to other messages resulting in the enriched hierarchical structure.

To investigate the use of this solution the new tool was used in two editions of ITAE course, as described and analyzed in the next section.

5. Analysis of the Results from a Case Study

The hypothesis put forward is that linking mechanism will be used by the forum's participants and thus few messages will remain unanswered and not-cited. The tool implemented was used in the ITAE 2006.1 and 2006.2 editions (first and second semesters of 2006).

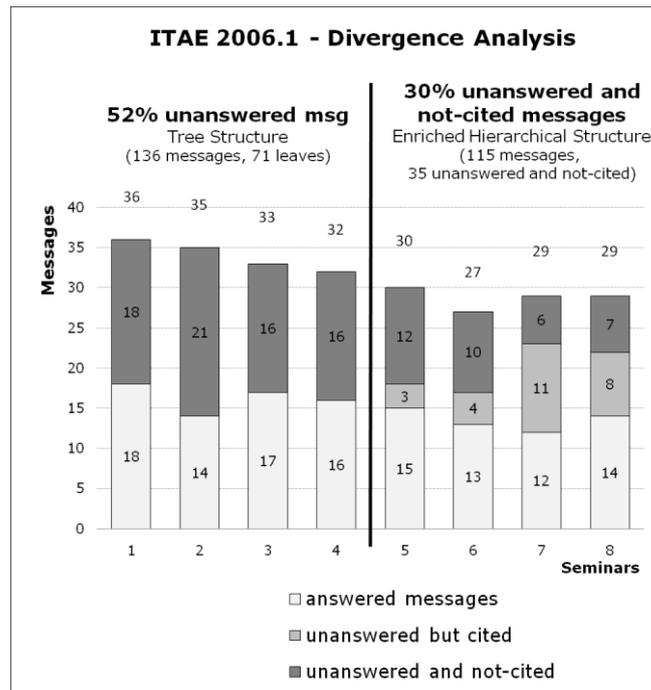


Fig. 4. Reduction of unanswered and not-cited messages percentage

As shown in Fig.4, In the ITAE 2006.1 edition, 9 learners participated and sent a total of 251 messages during the 8 seminars of the course. In the 4 first seminars the tool with hierarchical structure was used and 52% of the messages were left unanswered. In the 4 last seminars, the enriched hierarchical structure was introduced and the learners used it in 58% of the messages, resulting in only 30% of unanswered and not-cited messages. Without the linking mechanism 53% of leaf-messages would have occurred in the 4 last seminars. In effect, its use reduced the number of unanswered and not-cited messages.

Similar results occurred in the ITAE 2006.2 edition; the use of the enriched hierarchical structure also decreased the percentage of unanswered and not-cited messages: from 56% it dropped to 34%.

It should be pointed out that perhaps in those seminars the links were established only because that was requested by the mediators (teachers-tutors). There is the intention to investigate in future works if these mechanisms would be used

spontaneously, as a means of expression or as a way to converge the discussion, as opposed to being only a demand imposed by the mediators.

It should also be pointed out that in this research one assumes that the participants established the links coherently. However, there may have been a random use of the links without the adequate understanding of this mechanism, aiming only at satisfying the mediators' requests. Further research must be carried out to overcome the limitations here identified.

6. Conclusion

In this article a research on the development of the enriched hierarchical structure forums was presented. It had been identified that in the forum sessions in an online course many messages had been left unanswered – on the average, more than half of the messages had not been chained into the discussion. This problem was ameliorated with the use of the linking mechanism implemented in the Conference service of the AulaNet environment, as described in this article.

The use of this mechanism was studied during the seminars of two editions of the ITAE course. It was verified that the participants succeeded in using the mechanism implemented and this resulted in a significant reduction in the number of unanswered and not-cited messages.

The new tool, developed in the context of this research, opens possibilities for the elaboration of new educational dynamics. For example, in future studies the forum could be initiated with the use of the hierarchical structure, propitiating divergence, and in the final phase ended with the use of the enriched hierarchical structure. In the final phase it might be appropriate to add new categories of messages such as “Synthesis” and “Conclusion”.

One future implementation to be investigated should make it possible to add comments to the links so the reader could understand the reason for establishing such link. Another modification to be investigated should make it possible to specify which excerpt of the body of the linked message is being quoted.

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