USING COMPUTER-BASED INTERACTION ANALYSIS TOOLS FOR EVALUATING BLOG PARTICIPATION IN TERTIARY EDUCATION: AN EXPLORATORY PROPOSAL

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Abstract

Computer-based Interaction Analysis (IA) is an emerging research field aiming at analysing the complex interactions that take place in a computer-mediated, collaborative learning activity. To date it has been utilized in various collaborative environments, under the scope of CSCL, for the support of all or some of the involved actors. The current paper explores the possibility of applying IA techniques in blogging systems based on the expertise obtained in order to implement supporting tools for the human actors. The paper focuses only on the teacher's perspective by providing examples from a conducted case study.

Introduction

Web 2.0 tools are nowadays widely used in tertiary education. Mainly blogs and wikis, even social networking services are utilized in the context of collaborative learning activities. In all cases of Computer Supported Collaborative Learning (CSCL), under the scope of contemporary learning theories such as constructivism and socio-cultural theory or even modern approaches, such as Learning Communities, interaction among participants and the need to support and enhance it is highlighted. Towards this direction, supporting mechanisms in the form of adaptive tools addressed directly to the users should be researched (Bratitsis, 2007). Computer-Based Interaction Analysis is an emerging research field within the academic community focusing in analyzing in an automated way interactions among users in various collaborative situations (Dimitracopoulou, 2009). The core aim is to implement tools for providing support to all the involved actors (students, teachers, moderators, and researchers).

The paper is structured as follows: initially the IA research field is briefly presented, followed by an overview of the state of the art, focusing in the analysis of Technology Enhanced Learning activities, based on communicative means. Then blogs as teaching tools are discussed in an attempt to investigate possible informational needs, mainly related to the teacher's point of view. The DIAS system, an asynchronous discussion platform with integrated IA tools, is described and a brief overview of the findings of the corresponding, conducted research is presented. Finally, by highlighting the structural

similarities of blog queues and asynchronous discussion threads, the suitability of some of DIASs' IA indicators is examined through a pilot study that took place during the winter semester of 2009 followed by a concluding discussion.

Interaction Analysis

Computer-based Interaction Analysis (IA) can be defined as the set of automatic or semi-automatic processes that aim at understanding the computer mediated activity, drawing on data obtained from the participants' activities. This understanding can serve in order to support the human or artificial actors to take part in the control of the activity, contributing to awareness, self-assessment or even regulation and self regulation. The IA research field focuses mainly in collaborative activities occurring within a learning context. The IA process consists in recording, filtering and processing data regarding system usage and user activity variables, in order to produce the analysis indicators. These indicators (presented usually in a visualized form) may concern: a) the process or the 'quality' of the considered 'cognitive system' learning activity; b) the features or the quality of the interaction product; or c) the mode, the process or the quality of the collaboration, when acting in the frame of a social context forming via the technology based learning environment (Dimitracopoulou, 2009).

The IA results are presented to the participants, as well as the observers of the (learning) activities in an appropriate format (graphical, numerical or literal), interpretable by them. The core aim is to offer the means directly to the human actors, so as to be aware of and regulate their behaviour, either as individuals or as cognitive groups. In fact, the corresponding IA tools support the users in three major levels: awareness, metacognition and evaluation. The objective is the optimization of the learning activity through: a) refined participation by the students through reflection, self-assessment and self-regulation, b) better activity design, regulation, coordination and evaluation by the teachers.

Several categorizations of the IA indicators can be made, depending on: their interpretative value, the point of view of the analysis or the complexity of the visualizations (Bratitsis & Dimitracopoulou, 2010).

State of the Art

Reviewing the literature, several collaborative systems integrating IA tools exist. For example, Jermann (2004) by providing tools to dyads of students and observing them directly in laboratory settings showed that IA tools facilitated students' self regulation, during synchronous, game-like simple tasks. Supporting tools have been proposed in order to facilitate the teachers' moderating tasks. For example, Gerosa, Pimentel, Fuks, and Lucena (2005) produce various diagrams for the AulaNet discussion module for that matter, whereas the MailGroup system (Reyes, 2005) uses Social Network Analysis tools

addressed to researchers. The Knowledge Forum system (http://www.knowledgeforum.com/) provides metacognitive tools, assisting students to reflect upon their performance and improve their learning strategies in problem solving situations. The Knowledge Forum has been used by many researchers who have implemented add-on analysis tools, some of which can be used during the learning activity, but they are mainly addressed to the teacher or the researcher. For example, Teplovs, Donoahue, Scardamalia, and Philip (2007) provide a set of indicators for the teachers. The Argunaut system (de Groot et al., 2007) offers to the teachers means of understanding when to intervene in order to assist students. Other systems provide interesting visualizations, facilitating students' participation, such as the i-Bee (Mochozuki et al., 2005) and the i-Tree (Nakahara et al., 2005) systems. A more focused approach, the DIAS system (Bratitsis, 2007) provides an extensive set of IA indicators, addressed to all the involved actors of asynchronous discussion learning activities. Finally, IA tools have been implemented in order to support the collaborating members of a Community of Practice, such as the Kaleidoscope Network of Excellence (Bratitsis, Dimitracopoulou, Martínez-Monés. Marcos, & Dimitriadis, 2008), in matters of enhancing social queues and supporting decision making processes.

Most of the implemented IA approaches are related to collaborative, communication-based activities, usually within a learning context. An additional subcategory of such implementations is that of systems, providing indicators based on analysis of the discussions' content, like the CALICO system (Giguet, Lucas, Blondel, & Bruillard, 2009). Blogs are communicative means used widely nowadays to support teaching in tertiary education. To date, evaluative or supporting tools based on IA methods have not yet been implemented. This paper attempts to address this issue by studying the possibility of utilizing IA tools for analyzing Blog queues, although initially built for other, similar communicative means, thus producing evaluative tools for the teacher-moderator.

Blogs in Education

Blogs are easily updatable personal web spaces for recording information in multiple ways and formats (text, pictorial, audio, etc.), following a chronological ranking. Each post can be categorized using key words, called tags, which facilitate search and access, while the visitors of a blog may post comments, related to any one of the blog posts. Moreover, each post is assigned with a unique URL, thus being easily addressable and available world wide. In their newer versions, blogs allow linking with other blogs, so as to automatically display updated information (pingback – trackback). Additionally, content management has become very easy, even for novice users.

Blogs are mainly used as an expression medium (e.g. online diaries), as well as communication medium, for exchanging information, opinions and knowledge. Especially in education, blogs have been used as a communication medium among teachers and students or between collaborating student groups. The later are required to post data (ideas, opinions, assignments, etc) in order to receive feedback from their

teachers or co-students, keep a diary of actions within a learning activity context, so as to self-assess and thus learn through self-reflection (Sigala & Christou, 2008). Finally, blogs are being used as a substitute for more complex Learning Management Systems, as they provide facilities of assessment and evaluation, categorization and accessing of stored data, offering, in some cases, better adaptation in students' needs (Farmer & Bartlett-Bragg, 2005).

All the available blogging software provides a set of statistical information. They are usually narrowed down to data useful mostly for an administrator, such as: number of post authors, number of posts and comments, most recent and popular posts or comments, most popular tags. These constitute minimal information, which is more suitable for an administrator rather than for a teacher or a student.

In the next section, DIAS, an asynchronous discussion platform with integrated IA indicators, will be presented providing with ideas that might be applicable in blog systems. The main reason is the structural similarity of blogs and discussion threads, as described in a later section of the paper.

The DIAS System

The DIAS System (Discussion Interaction Analysis System) is a fully functional asynchronous discussion platform. It incorporates IA indicators, which directly support the collaborative activity participants. About 80 visualized IA indicators are produced (including all possible variations of the indicators), varying from simple statistical awareness information to complex cognitive and metacognitive indicators. The indicators produced by the DIAS system may reveal different information to different types of users or roles. Ethical considerations have been taken into account, ensuring participants' anonymity in the produced diagrams.

All the indicators are produced by measuring quantitative activity data, such as number and size of messages written and read, by whom, etc. Their plethora results in having charts varying from low (presenting very simple and understandable information) to high interpretative value (providing several aspects of information, which can be different, depending on the type of user who is reading the indicator). Some of them are addressed to individual users (e.g. individual activity reports), some others to groups. Teachers–moderators or researchers–observers have increased information needs, due to more complex responsibilities within a discussion forum (they want to monitor, assess and evaluate). Thus, several indicators are addressed only to them. Moreover, the notion of an Interpretative Schema has been deployed, providing added value to the actual IA indicators. An Interpretation Schema is a set of instructions, explaining the manner and order of combining information from different indicators, in order to extract additional, qualitative information. More detailed information regarding the DIAS IA indicators can be found in (Bratitsis, 2007).

Research findings reveal that IA indicators addressed to the students affect them significantly. Not only they enhance their motivation to increase participation and activity (reading and writing messages), but they assisted them in qualitatively improving their participation and overall behavior. The visualized indicators were easy to understand and decode, facilitating reflection, self-assessment and eventually self-regulation of the students, as individuals, as well as collaborating groups (Bratitsis & Dimitracopoulou, 2009).

Several, more complex, indicators were addressed to the teacher or the researcher only. This is the case of diagrams which depict condensed information, related to various aspects of the students' participation, facilitating evaluation made by the teachers. Complex diagrams, such as Social Networks, reveal interesting information about the behavior of the students. During the evolvement of the discussions, problematic situations and the ones that require the teacher's regulative intervention are very easily revealed, utilizing the Interpretative Schema. A representative example is described in Bratitsis and Dimitracopoulou (2008). Furthermore, in some cases, evaluation of the discussion's quality, based on the content of the messages was possible (Bratitsis & Dimitracopoulou, 2006).

In the next section, the structure of a Blog's postings is correlated with that of an asynchronous discussion thread, in an attempt to distinguish the similarities, in an attempt to examine whether the IA indicators (and which ones) of the DIAS system are appropriate for analyzing blog activity.

Blogs and Asynchronous Discussion Forae: Structural Similarities

Blogs and Asynchronous Discussion Forae are both Computer Mediated Communication (CMC) tools, initially designed for rather contradictious purposes. The main scope of Forae systems is the development of dialogic discussions, whereas the main scope of Blog systems is the recording of personal data (ideas, information, etc). In the first case, interaction in communication is mandatory for the discussion to take place. In the second case, commenting is not a prerequisite for the blog to exist. A blogger posts and does not necessarily expect to be commented upon.

Nevertheless, in educational contexts, both Forae and Blogs are being used in rather similar manners. Apart from the cases where a blog is used as an individual reflection and evaluation tool, for example as a personal diary of actions, almost all the other uses of both system types are based on bidirectional communication. Therefore, both are utilized in such a way that interaction among the involved actors takes place. Thus IA tools could be applicable for analysis.

Examining the structure of asynchronous discussions, the distinct features are:

- One message that initiates a discussion thread (root message).
- Messages that as posted as answers to the initial or a subsequent message, having a logical connection to it.
- Every message can be posted as an answer to only one other message.

Correlating these features to a blog, a blog post corresponds to the initiating message of a discussion thread. Likewise, the adjunct comments correspond to the answering messages, which constitute the actual discussion. Moreover, each comment can be logically connected to only one post or another comment. Thus, the logical structure of the user interaction in a blog is the same as the one in an asynchronous discussion forum. The determinant between a blog and a forum is the mandatory feature of the interaction in the latter, as opposed to the former. In the case of educational approaches, it depends mainly of the design of the overall activity to ensure that minimal interaction will occur for the goals to be met.

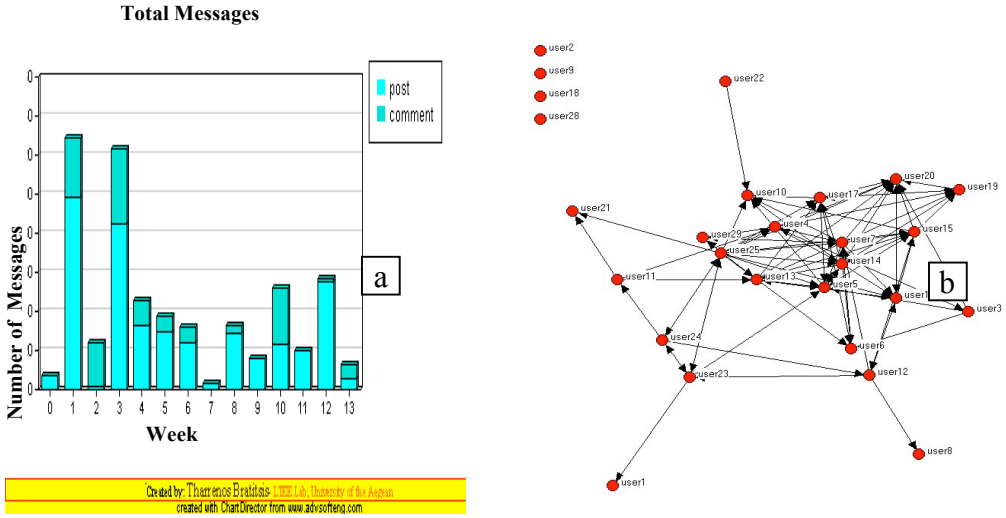
Research Methodology

The current paper focuses on IA tools suitable for a blog communication queue which could facilitate a moderator's tasks. The study was conducted during the winter semester of 2009–2010, with the participation of 29 undergraduate students in the course entitled "ICTs and artistic creation", at the Early Childhood Education Department of the University of Western Macedonia, located in Florina, Greece. The aim of the course was to provide all the necessary knowledge to the future kindergarden teachers, so as to be able to produce digital content for their educational activities. During the course they were introduced to digital photography basics, photo editing, audio editing and video creation.

The students were asked to complete mini assignments, on a weekly basis, relevant to each week's new material. They were obliged to upload their creations on a blog explaining all the intermediate steps towards the final product. They could also comment upon their co-students' creations, ask questions and exchange ideas. Commenting was requested, but not mandatory for the students. The duration of the course was 13 weeks, in which 658 posts and 162 comments were written: a total of 820 messages. Wordpress, one of the most commonly used blog platforms, was selected for this activity. At the end of the semester, the main question on the teacher's side was: "is there a way to evaluate student participation, without reviewing all the blog posts?"

The information provided by the Wordpress platform is rather minimal for the teacher. For example, there is no way to find out how many posts and/or comments each individual authors has written or how many posts were written during a specific time period, without addressing a direct SQL query to the corresponding database. Taking into account the structural similarities between blogs and discussion forae, the decision to test the results produced by the IA of the DIAS system was made.

Figure 1: Total messages indicator & SNA answers indicator



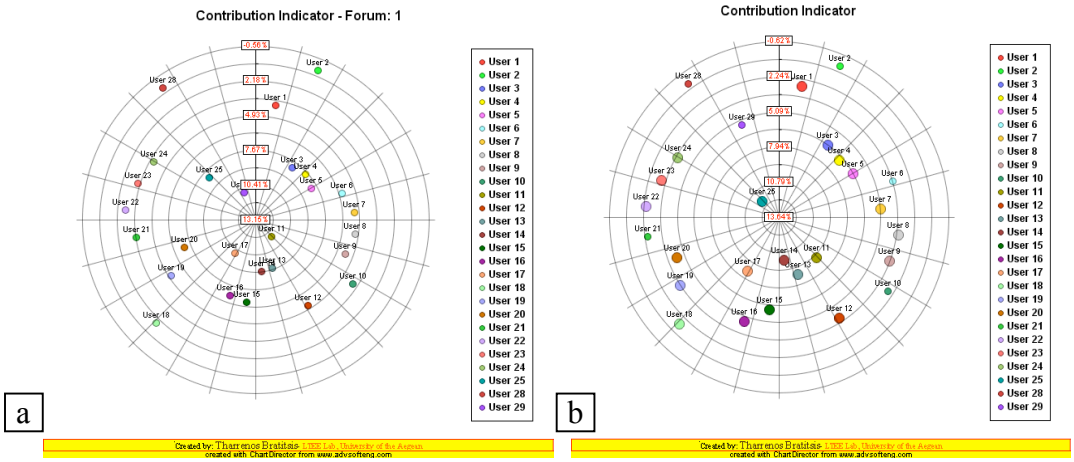
The bar chart in Figure 1a presents the total numbers of messages written in the blog. The posts and the comments are distinguished using a color variation. The DIAS system can produce similar charts for various time periods and various time slots (months, weeks, days). This simple bar chart provides a quick overview of the total activity for the teacher. Apart from obtaining simple statistical information from these bar charts by applying a different interpretation approach other useful conclusions can be drawn. For example, there is increased activity during weeks 1 and 3, but minimal activity during week 7. Both were expected and can be explained; the former as part of the initiation of this teaching approach, the later is due to the Christmas vacation period. Another observation regarding the post/comment ratio can be made. In week 2, almost all the messages are comments. This was also expected as the students were asked to provide their estimation of the camera settings explaining the digital photographs that their co-students uploaded to the blog. Near the end of the activity, the chart shows that mostly posts were written. During that period, students were uploading their video creations, trying to fulfill all their obligations with this last task. As a consequence, they paid almost no attention to what their co-students were uploading and thus wrote very few comments. This example shows that a simple bar chart can provide more than simple statistical information, as it can be utilized in order to examine if the activity evolvement is as planned. In any other case this could be an indication for the need of a regulative intervention by the teacher.

The Social Network Diagram in Figure 1b depicts the communicative interaction among the blog participants. The social matrix is created by counting the comments of each student to the posts of his/her co-students and the answers to others' comments. In the SNA diagram, this is represented by arrows, pointing towards the vortex corresponding to the author of the post or the initial comment. Moreover, the placements of the vortices depend on the number of connections among them, with the most active ones being towards the middle of the diagram. Thus such an SNA diagram shows if the interaction

level is close to the desired level and which are the participants that need more attention from the teacher, due to low communicative interaction with the others.

Another complex indicator from the DIAS system is the Contribution Indicator (Figure 2a). It is a polar diagram, showing the contribution of each participant in the communication evolvement, as a percentage of the overall activity. Each participant corresponds to a colored vortex which is distinguished by the color code appearing on the right side of the chart. All the vortexes are placed within a 360^{o} radius in order to avoid overlapping, starting form the top of the diagram.

Figure 2: Contribution Indicator in forum and blog system

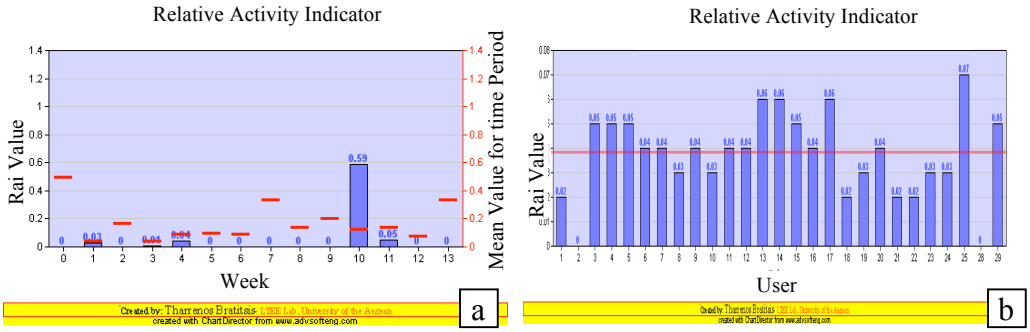


The size of each vortex is proportional to the number of message types (e.g. question, answer, information, argument, etc.) the participant has used and the distance from the circumference of the polar chart is proportional to the contribution percentage for each participant. In the case of a discussion forum, the initiation of discussion threads, as well as the use of several types of messages was subsidized, as the common participation behavior is to write answers to existing messages. In the case of a blog, the common participation behavior is exactly opposite (users initiate discussions with every post). Therefore, the use of comments is subsidized, instead of the initiation of communication queues and the vortices have two possible sizes only. The difference between the two calculation approaches is obvious in Figure 2, although the images are resized and skewed, due to space limitations. A quick inspection of the diagram in Figure 2b, reveals the normalized contribution level of every participant in comparison to all the other participants and if he/she has used comments.

A final example of IA indicator is the Relative Activity Indicator (RAI), with two of its variations appearing in Figure 3. The diagram on the left is produced separately, for every individual user. For every week a blue bar shows the activity of this user, in comparison with the mean activity value for that time period (represented by the corresponding red line segment). In this case, commenting is also subsidized. Proper interpretation of the red line segment's position may reveal additional information. It corresponds to the mean

value of activity per time period — that is number of messages divided by the number of individual users. Consequently, the higher its value is fewer individuals are participating and vice versa. If the value is 1 (corresponding to 100%), then only one person has written all the messages for that time period. If the value is 0, then there is no activity at all. Thus this indicator presents to the teacher the activity of an individual participant in comparison to the overall activity. The research conducted with the DIAS system showed that this indicator is utilized by the students as well, facilitating self regulation of their actions (Bratitsis, 2007).

Figure 3: Relative Activity Indicator – Individual and group variation



Finally, the RAI variation in Figure 3b shows the activity of all the participants, providing at a glance comparison among them, as well as with the mean value of the overall activity for a specified time period. Utilizing this diagram, the teacher can distinguish the underactive and the overactive participants, so as to initiate a deeper investigation in order to intervene, if necessary.

Discussion

It is a fact that blogs are nowadays widely used in educational settings. Under this scope, the need for supporting tools for all the participants in such learning activities is necessary. Drawing on research conducted with other CMC tools, such as the DIAS system, it is clear that supporting tools for all the participants facilitate the tasks deriving from the design of the learning activity. Up to now, many studies can be found in the literature presenting innovative ways of utilizing blogs in educational settings. Most of these studies investigate how blogs can be used by all the actors involved in learning activities, in order to enhance the learning outcome. Indeed, positive conclusions have been drawn.

In this paper, the step beyond the current status is attempted by applying the IA tools integrated in the DIAS system on blog activity data. An XSL filter was implemented in order to parse through the Wordpress database, feeding the data into the DIAS system database and the integrated IA indicators were tested. Focusing on the teacher's tasks, the

indicators presented in this paper provide information which may significantly facilitate his/her moderating tasks. Moreover, quantitative evaluation of students' participation is possible. Up to now, learning oriented statistical tools for blogging systems do not exist.

In the case study presented in this paper, the teacher further examined the content of all the blog posts and the comments. The result was compliant with the conclusion drawn from the IA indicators. The students appearing less active and less interactive in the diagrams were the ones who did not actually address all the requested issues, during the activity. Moreover, almost all of these students produced the poorest multimedia creations. Thus, the indications distinguished by the diagrams are in the correct direction.

Further research is needed in order to examine which are the most appropriate IA indicators for a blog system. Additionally, the effect of IA indicators to students participating in a blog based learning activity should be researched. The results from other, similar research studies, such as the ones conducted with the DIAS system can be a guide for better designing the necessary research approaches.

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