Workshop on Tools and Technologies for Emotion Awareness in Computer-Mediated Collaboration and Learning.

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Proposed paper title: "Paying attention to the learner's emotions in virtual collaborative learning"

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Goals for the workshop

- **Focus 1: Emotion awareness in CSCL**. This focus will be on understanding how learners' emotions and emotion awareness influence collaborative learning processes and outcomes. In the CSCL context, we will address the questions of how to display learners' emotions during interaction and how such a display affects the processing of emotional information and also the appraisal of the collaborative situation and its consequence on the quality of collaboration and the group outcomes.
- **Focus 2: Affective computing and CSCL**. This focus will be on emotion awareness in CSCL from an affective computing perspective. What can CSCL and affective computing bring to each other? What can CSCL gain from research on automatic emotion recognition? And how can the affective computing field include CSCL issues to its research agenda? We will also address the question of how to develop adaptive systems able to automatically display emotional awareness information depending on the moment-to-moment characteristics of the interaction.

Relationship between the position paper and the workshop research goals:

The latest investigations that took place in virtual environments for teaching-learning processes showed, on one hand, the importance of taking into account not only the cognitive abilities and capabilities that the students possessed or needed to acquire through those processes, but also their affective abilities and capabilities, which we cannot separate from the former, trying to maintain a holistic perspective of the student during those processes. On the other hand, there is a growing tendency to study the new forms of interaction that stimulate and promote the necessary skills for human communication and critical thinking in more depth, with the objective to improve the learning experience. This tendency is seen in the development of graphic environments directed by virtual agents that operate as virtual tutors or teachers who are able to interact with the student following the face-to-face model of human interaction to achieve communication.

With regard to the first focus point of the workshop, our research aims, on the one hand, at showing the emotions that students experience during their collaborative virtual learning processes and how these emotions influence the learning experience. In that way we can obtain an integral and better understanding of the learning process, and also evaluate the recorded emotions to classify them, observing them within the period of time that the formative action lasts. When trying to detect the emotions in CSCL contexts we need to pay attention, not only to their manifestation but also to their expression. For this reason we need methods to analyze the discourse and the conversation used for educational purposes such as *sentiment analysis* or *opinion mining*. Through these methods, we can incorporate non-intrusive automatic detection and extraction of emotions from student-created texts and then provide them with dynamic recommendations and affective feedback for the activities depending on those emotions at every moment. In this sense we also take into account the idea of emotion based on content adaptation (Rodríguez, P. et al, 2012). Along these lines, our approach is using elements from the sentiment analysis (Pang and Lee, 2008) (Liu 2012) to detect emotions both in the works resulting from the students' individual tasks and from the product of teamwork (for example, during wikis creation).

On the other hand, we need to analyze what kind of approaches, tools or methods we can use to influence, model and manage these affective situations in the best possible way. Current research (Hascher 2010; Pekrun et al, 2011) shows that the quality of the relationships, when they happen in pairs (student-student) or between several users (students-teacher), is the key for effective learning. To model affective interaction, it is important to analyze the emotional structure of discourse in virtual and blended learning settings, in any spaces emotions arise (debates, chat-rooms, teamwork - e.g., a wiki creation, an evaluation task, etc). We achieve this by applying an extension of the RST (Rhetorical Structure Theory), which was originally applied in Natural Language Processing area and was based on the use of *coherent relations* between two adjacent text units to analyze discourse (text and dialogue) (Mann and Thompson 1988). The extension of this theory focuses on finding the *emotional relations* between two text or dialogue units, thus providing a rich and graphical representation of the discourse emotions.

With regard to our second focus point, on the one hand our study aims at discovering in which learning situations affective virtual tutors may be effective and appropriate. This is done by examining the role the affective virtual tutor plays in the design of student-centered CSCL contexts, in which the teacher follows constructivist methods such as, *activity theory*. In this sense, our approach includes the use of questionnaires at the beginning of the learning activity in order to build an initial learner model and determine both the cognitive and emotional characteristics, as well as the skills, attitudes and initial expectations of each student, as the start point of the learning process. This serves as a reference for the teacher to establish the content format, to develop the activities and to choose the settings where to use methods such as Project-based Learning, Problem-based Learning or Case-based Learning. Moreover, we are using constructivist strategies such as *cognitive dissonance* to arouse and detect emotions in interactions between different users (student-teacher or student-student) during the knowledge exchange phases. The application of our integrated approach will help the system (and thus the teacher) to induce, in a controlled manner, the dissonant elements and their emotional relationship, both in collaborative tasks that students are asked to complete and in conversation settings between students and teacher. In this way we are able to know when particular emotions arise and why, i.e., what caused them, and thus to provide the appropriate feedback.

On the other hand, we can determine which capabilities or skills the teachers need to have to optimize the students' learning processes. Here we can emphasize the affective role the users play when they come to learn new concepts and procedures and to develop skills and attitudes within a dual cognitive and emotional process. The most recent studies, trends and advances in the area of artificial intelligence, robotics and human-computer interaction, are characterized by the development of graphical environments managed by virtual agents that act as virtual tutors or teachers, and are able to interact with the student following the face-to-face human model to manage communication (Beale and Creed, 2009; Frasson and Chalfoun, 2010). This reflects the role an affective virtual tutor can play when resolving problems, providing advice and explanations, affectively supporting the student interaction and exhibiting coherence, continuity and temporality within the learning context. Virtual tutors can have human appearance or be "cartoonish", but they need to offer the following skills": cognitive and emotional intelligence, affective bidirectional abilities, and neutral language communication capability. Our ultimate aim is to design and construct a prototype based on the results obtained by the aforementioned objectives, which can provide affective-effective feedback to the students, guide, orientate and help them, always with regard to their needs and detected emotions. This will be done by studying the learning settings in which virtual avatars and worlds are effective and appropriate, as well as the characteristics that such environments and tools need to have in order to optimize the teaching-learning process.

Our proposal pretends, on the one hand, to add an important value to CSCL from the affective computing perspective, trying to offer solutions to the problem of students' emotions management, which has not been widely treated so far and which has an enormous influence in students' participation and performance. On the other hand, we want to help teachers understand better the effect and the influence of the emotions in the learning processes and guide them to provide a better and more effective planning of such processes. Our interest focuses on detecting which emotions arise, the degree they are perceived by students and when they occur. In particular, it is important to analyze the reasons that caused the emotions to arise and how we can transform them to achieve effective learning, considering that this transformation may depend on individual factors, such as a resistance to change, social and cultural factors, peer support to alter cognition, or the need to acquire new skills to overcome dissonance.

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