

Experiencing, Conducting, Designing and Evaluating Polyphony in CSCL Chats

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Abstract: The paper presents an approach that induces a polyphonic structure to a CSCL chat by assigning conflicting concepts (key-words) to each student. The aim of immersing students in a polyphonic (counterpointal, or word-counter-word) experience is to increase inter-animation and, therefore, collaboration. Another major consequence is that such a design facilitates the analysis of the collaboration and personal contributions of students, starting from the degree in which they consider others’ words.

Introduction

Starting from the idea that dialogic opposition is present in any human activity (Bakhtin, 1984), learning may be “seen as the process of multiple voices coming into contact, both within and across speaker-produced utterances” (Koschmann, 1999). In Bakhtin’s vision, words have a more complex role than in a semiotic or a classical Natural Language Processing perspective. They have a major role because they carry echoes of their usage in previous utterances, they become multi-voiced (Bakhtin, 1984). Moreover, words may be seen also as voices, an important role having the presence of “others’ words” in somebody’s utterances.

Repetition of words is also very important. It may take different forms and it may have different roles, for example an indicator of the involvement of participants in conversations (Tannen, 2007). Considering the special case of CSCL chats, repetition of words has a major role in polyphonic structuring and in inter-animation patterns (Trausan-Matu, Stahl and Sarmiento, 2007).

Based on the above ideas, this paper presents an approach directed towards enforcing a polyphonic structure to a CSCL chat starting from assigning (key-)words (topics) for each participant and encouraging debates with the aim of increasing inter-animation, collaboration and knowledge construction. The goal is to provide a polyphonic (counterpointal, see Trausan-Matu & all, 2007) experience to the learners. Such a design facilitates the analysis of the collaboration and personal contributions of students, starting from the distribution of their own and the “others’ words” (Bakhtin, 1984) in the conversation.

The Polyphonic Model of CSCL and Its Experience

Polyphony, a concept introduced in music, is an example of a joint achievement of several independent participants acting sequentially (singing or emitting utterances), starting from a common *theme* and meanwhile keeping coherence among them. Polyphony may occur in musical pieces with more than one melodic line (or *voice*) at a time, in contrast with monophony, where a single voice (part) is present. Polyphony differs also from homophony because, even if in both cases multiple voices are present, in the former they have a degree of independence. Moreover, even if they are independent, in order to achieve polyphony, voices obey some implicit constraints, some so-called counterpoint rules, for example, in order to achieve a joint harmonic, pleasant musical piece. Polyphony may be seen as a model of group interaction and creativity (as in jazz), in which independent individuals (voices, in a metaphorical sense) achieve a joint activity during a period of time.

The polyphonic model of CSCL group interaction considers, similarly with the musical case, that the students are *experiencing* the presence of a number of concurrent voices (in an extended sense), each of them having independence but contributing to a joint discourse. The *theme* is the discussion subject or the problem to be solved assigned by the teacher or tutor. There is an implicit unity tendency imposed by the need of achieving joint learning goals collaboratively. Each of the participants emits a coherent sequence of utterances and, interacting in a group, inherently has to solve the transversal dissonances appearing between them, participating to *inter-animation* phenomena along the two *sequential/transversal* dimensions, and two tendencies, *unity/difference* (Trausan-Matu & all, 2007). The experience of debating on others’ words, the conflicts that appear and their desired resolution are extremely important, in our opinion, because they foster understanding and creativity.

Designing and Detecting Polyphonic Dialogism in Chatting Virtual Groups

A polyphonic scenario in which inter-animation is induced was used for several years at the “Politehnica” University of Bucharest in a course on Human-Computer Interaction (HCI) for the Computer Science and Engineering students in their last year of undergraduate studies. Students were divided in groups of four and each of them was assigned the task of sustaining one of four technologies presented at the course (chat, forum, blog and wiki) in a 1-2 hours chat. In the first part of the chat conversation, each student had to champion the technology he represented by presenting its features and advantages and criticize the others by invoking their

flaws and drawbacks. In the second part of the chat, they had to discuss on how they could integrate all these technologies in a single online collaboration platform. The result was that students identified themselves with the four words denoting the technologies, and they entered beyond expectations in a word-counter-word debate.

The polyphonic analysis tries to identify inter-animation patterns along the sequential-transversal dimensions and corresponding to two types of forces, centrifugal-centripetal (Trausan-Matu & Rebedea, 2010). The longitudinal dimension may be found in the chains of repetitions of words, which may be seen as parallel voices. The transversal dimension may be detected as dissonances or differential positions among the uses of words (seen as voices). Therefore, the analysis of the longitudinal and transversal dimensions of the polyphonic texture may start from the detection of the repetition of words among participants. The visualization of repetitions and an automatic analysis providing several metrics were implemented in the PolyCAFe system using Natural Language Processing and Social Network Analysis techniques (Trausan-Matu & Rebedea, 2010). For example, in Figure 1, the left diagram, having longer and a higher degree of variation of the word threads (that correspond to the assigned topics “chat”, “blog”, “forum” and “wiki”) among participants (for each student there is a horizontal line containing hers utterances ordered in time from left to right) corresponds to a team with a better collaboration than the right one (the classification of teams’ chats as having a good or bad collaboration was done manually by four tutors for each conversation).



Figure 1. The Threads of the Assigned Topics in a Collaborative Team (Left) and a Less-collaborative (Right) Team.

For the analysis of the degrees of inter-animation and involvement of each student, in addition to PolyCAFe facilities, a new method was used, which considers the relations among students and (their or others’) words, with an emphasis on the utterances considering “others’ words” (Bakhtin, 1984). A good participation is, in this sense, that of a person which emitted utterances containing or referring to others’ words. In this aim are considered the number of utterances in which a student speaks about other topics than her own, refers about utterances containing topics that are not her own and speaks about different topics that the one discussed in utterance she explicitly referred. The analysis of the number of occurrences of the above situations and of some of their ratios gave results similar to those given by the human tutors regarding the contribution of the participants to collaboration and inter-animation.

Conclusions and Further Developments

A polyphonic structuring of a CSCL chat (and implicitly, a polyphonic experience for students) can be conducted by a careful design, in which each learner is assigned a topic to support, which is conflicting with those of the other participants. The result is that the learners experience a kind of polyphonic experience, in which each of them “sings” her voice but, meanwhile, they interfere in a counterpointal way to the others’ voices. This design simplifies the evaluation of the collaboration degree and of the participation of the learners. The first validation showed that the results of the polyphonic analysis are close to those of tutors which only read the chat for the evaluation.

References

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