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COMPUTER SUPPORT FOR CREATIVITY IN SMALL GROUPS USING CHATS

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Abstract. *The paper presents a new approach in the stimulation of creativity using computer support and the present facilities of communication offered by instant messengers ("chat").We start from the dialogic perspective of Mikhail Bakhtin and from the polyphonic theory of knowledge building in small groups, which was previously used for Computer-Supported Collaborative Learning. The PolyCAFe system, developed following the polyphonic ideas is used for the analysis of brainstorming chat sessions and for feedback generation.*

Keywords: Creativity, creativity stimulation, CSCL, Bakhtin, polyphony, inter-animation, chat

1. Introduction

There was a lot of research in Artificial Intelligence (AI) in the last decades for obtaining a computationally-based "artificial creativity", which was supposed to model the human creativity [7]. There were attempts to develop computer programs for poetry, humor and story writing, for generating metaphors, music, paintings, etc. However, creativity, together with consciousness, understanding natural language and intuition escape the attempts of automatization. Therefore, we are not positioning ourselves on the position of the "strong AI", which tries to develop programs that would replace humans. We rather prefer the "weak AI" position, which only tries to develop programs that support humans. We do not try to write programs that would "create" something, we envisage only to develop computer-based support tools for assisting and stimulating human creativity, a main guideline in our approach being to provide a central role for men as they are essentially creative.

In recent years, in the context of the intensive use of Internet communication tools like instant messengers ("chats", for example Yahoo Messenger http://messenger.yahoo.com/), many mundane activities involving natural language communication and collaboration are transferred from face-to-face toward virtual, online communication. This transition offers a great opportunity for people from any place to collaboratively construct knowledge. Well known creativity stimulating methods, like brainstorming [1] may be adapted and even

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extended in the context of the new communication technologies, as we will see. Moreover, the problem of creativity stimulation is extremely important today, when we are entering in the Knowledge-Based Society.

There are already several computer environments or systems that support the collaborative construction of knowledge, but they have been used until now mainly in Computer-Supported Collaborative Learning (CSCL) [11, 14]. On the other hand, there are already results in the research on the psychology of creativity [8] which may be used for designing supporting tools. Our approach starts from the results of CSCL and the psychology of creativity and aims at enhancing creativity in small virtual groups through using dialogue in chat conversations. One main idea is the usage of the *PolyCAFe* system, developed for the analysis of CSCL chats for the analysis of brainstorming sessions performed using chat.

2. What is creativity?

Creativity is defined in Encyclopaedia Britannica as "the ability to make or otherwise bring into existence something new, whether a new solution to a problem, a new method or device, or a new artistic object or form." [7].

It seems that this definition is a classification of creative activities: problem solving, technical creativity (for the design of devices) and, not at last, artistic creativity. Another possible definition of creativity is "the ability to see a challenge or a problem in a new light and to find solutions, which were not obvious" [19].

An important role in creativity is imagination, the imaging of "possible worlds", as said Peter Brian Medawar, Nobel laureate: "any research always start by inventing a possible world or a fragment of this world" [15]. Mihaly Czickszentmihalyi starts also from the image of creativity as a mental activity, an insight, intuition ("insight" in English) that appears in the minds of particular persons (”creativity is some sort of mental activity, an insight that occurs inside the heads of some special people.” [8], but he then reaches the conclusion that it is necessary to consider also the role of the community which validates the novelty [8]. But he finally defines creativity as any act, idea or product that changes an existing domain or transform an existing domain to a new one. In addition, a field cannot be changed without the explicit or implicit consent of a responsible [8].

Creativity is defined in the Encyclopaedia Britannica [7] and in other work [1, 8] in connection with the human person and the community (of practice) to which she belongs. Creative people are characterized by autonomy, independence and nonconformism, sometimes with trends to disorder and conflict (to which I would add imagination). They exhibit curiosity, search of problems, high intelligence, insight, motivation and divergent thinking. [7].

"Creative people are critical: they do not stop to what is given and (supposedly) obviously. They are creative and make a habit of thinking in a more open and flexible and anticipative way. ... Creativity can require a certain degree of playfulness ..."[19].

Subsequent to divergent thinking, seeker of new directions, consequences or even problems, required in a first phase of the creative process is the process of convergent thinking, guided by the goal, which integrates into a whole the identified consequences.

Brainstorming is one of the most used methods for stimulating creativity, which is used for small groups. "Production" of ideas is fostered by the advantages of this method [15] if it is properly prepared. The ideas of brainstorming are:

- Discussion sessions are organized within a small team having a common goal (e.g. to design something).
- Teams are reservoirs of ideas. Ideas of colleagues (even wrong) can generate similar or different ideas induced by the group. A critic attitude is forbidden.
- Teams are stimulants, among its members many times up to a solidaritae, a community with a common goal.
- Complementarity (age, education, specialty, personality) is desirable.

Brainstorming method can be used as auxiliary methods in other methods (Delphi, Electra, Aida, Pindar, etc.). Brainstorming can also have a version directed, "Socratic", "mental", derived from thought experiments (Gedanken Experiment ") made by physicists in Göttingen in the '20s, a method used in the Renaissance and ancient Greece [15].

Teresa Amabile believes that we should train thinking skills and creative work [1]. She considers that creative thinking should include [1]:

• Breaking the patterns, renouncing to models;

• Understanding, awareness of the complexity of the considered problem;

• Openness to new options;

• Suspension of the thinking, generating of as many ideas as possible without judging them immediately;

• Thinking that is open to relationships between ideas;

• Precise memory - knowing many things favorizes the retrieval of new ideas;

- Breaking scripts or habits;
- Novel perceptions, from a different angle than usual
- The usage of games, some "tricks" or clues

Mihaly Csikszentmihalyi wrote that creative processes have normally five steps [8]:

1. Preparation - immersion in interesting problematic features and arousing curiosity
2. Incubation - churn of ideas around the threshold of consciousness
3. Insight, the "Aha!" which is the beginning to glimpse the solution
4. Evaluation - the decision if the idea is correct and valuable.

Csikszentmihalyi observed, following extensive studies on creative people that they can easily enter into a special state, known by experts in cognitive ergonomics as a state of 'flow'. Such a state may be induced by polyphonic conversations on chat systems having referencing facilities, obtaining enhanced brainstorming sessions.

3. A dialogistic view of creativity

The idea of the collaborative construction of knowledge using chats has occurred due to the developments of the collaboration technologies on the web. Meanwhile, it is based on the socio-cultural [17] and the dialogism [3,4] paradigms, on the ideas of phenomenology and philosophical hermeneutics of Martin Heidegger, as discussed in [21], on the theory of collaborative knowledge building [11] and polyphonic inter-animation [12].

The dialogism-centered theories of the Russian philosopher, linguist and literary critic Mikhail Bakhtin are starting from the idea that the dialogue between the members of a community has a fundamental influence on any language-based communication act. He considers that everything is a dialogue, that the existence of the „second voice", of dialogic opposition is essential, that there are always many voices in ant text or utterance and that sometimes polyphony appears. [3-5].

Bakhtin raises the idea of dialogism to a fundamental philosophical category. For example, Voloshinov/Bakhtin said: "Any true understanding is dialogic in nature" [16]. This is in consonance with Lotman's conception of text as a „thinking device" [18,20], determining that: "The semantic structure of an internally persuasive discourse is not *finite*, it is *open*; in each of the new contexts that dialogize it, this discourse is able to reveal ever new ways to mean" [3].

Dialogue is in Bakhtin's oppinion directly linked to creativity: „Dialogically seen, information is not transferred, but, rather, produced. … dialogism could be seen as

a type of creativity" [10] „any literal, single-voiced word is naive and unsuitable for authentic creativity. Any truly creative voice can only be the second voice in the discourse" [5].

We consider that polyphonic music, counterpoint, are models for creativity, because they are naturally occurring ways in composing processes, validated by the listeners, to develop a theme in terms of a community of voices (persons) is a model of creativity. For those who listened to Bach's music it is clear that sometimes this is like an explosion of ideas.

In polyphonic music, Johann Sebastian Bach starts from a sequence of several notes and builds a remarkable series of fugues, canons, inventions and other pieces in which it seems that a number of persons (voices) are singing together in communion. They pass one to another the theme and, although amended in various ways and even if dissonances sometimes appear, the temporary "conflicts" are solved, and an immediately return to harmony occurs, the voices remaining in communion. To avoid monotony, however, to preserve the live musical performance, the voices must have the spontaneity, the freedom of even a carnival. Carnivalesque at Bakhtin is a way to eliminate limits on innovation, creation, as an extreme manifestation of multi-voiceness.

> "The Socratic dialogue is not a rhetorical genre. It grows out of a folk-carnivalistic base and is thoroughly saturated with a carnival sense of the world the Socratic notion of the dialogic nature of truth, and the dialogic nature of human thinking about truth. The dialogic means of seeking truth is counterposed to *official* monologism, which pretends to *possess a ready-made truth*, (...) Truth is not born nor is it to be found inside the head of an individual person, it is born *between people* collectively searching for truth, in the process of their dialogic interaction." [4]

As a consequence, it is natural to try to explore to what extent polyphony and counterpoint can stimulate creativity, and collaborative knowledge building in chat conversations. It is also very important to develop tools to support these cognitive processes.

4. Tools for the analysis and feedback providing for brainstorming chats

Inter-animation, polyphony and carnavalesque in chat discussions [12,13], which may be seen as catalysts of creativity are three basic ideas of Mikhail Bakhtin [2,4], with great potential for our approach. The objective of our research is the design and development of computer tools that integrate results from the paradigm of knowledge-based computational linguistics, with the new approaches of collaborative systems, based on Bakhtin's dialogism.

The starting point in our research was to use for supporting creativity the existing *PolyCAFe* system [14] which was developed for CSCL and a system for detecting collaborating regions in a chat [6]. Therefore, they are now used also for analysing brainstorming chats, in order to extract newly appeared ideas and to identify the polyphonic structure and inter-animation patterns [12] with the aim of providing feedback for future sessions.

The *PolyCAFe* system (**P**olyphonic **C**onversation **A**nalysis and **F**eedback generation) provides abstraction and feedback-giving services. *PolyCAFe* is implemented using natural language processing tools for discourse and content analysis and considers three categories of data: the concepts in the text, the degree of collaboration (including involvement, acceptance of others, leader/lurker role, interaction or inter-animation) and the existence of discourse and debate threads.

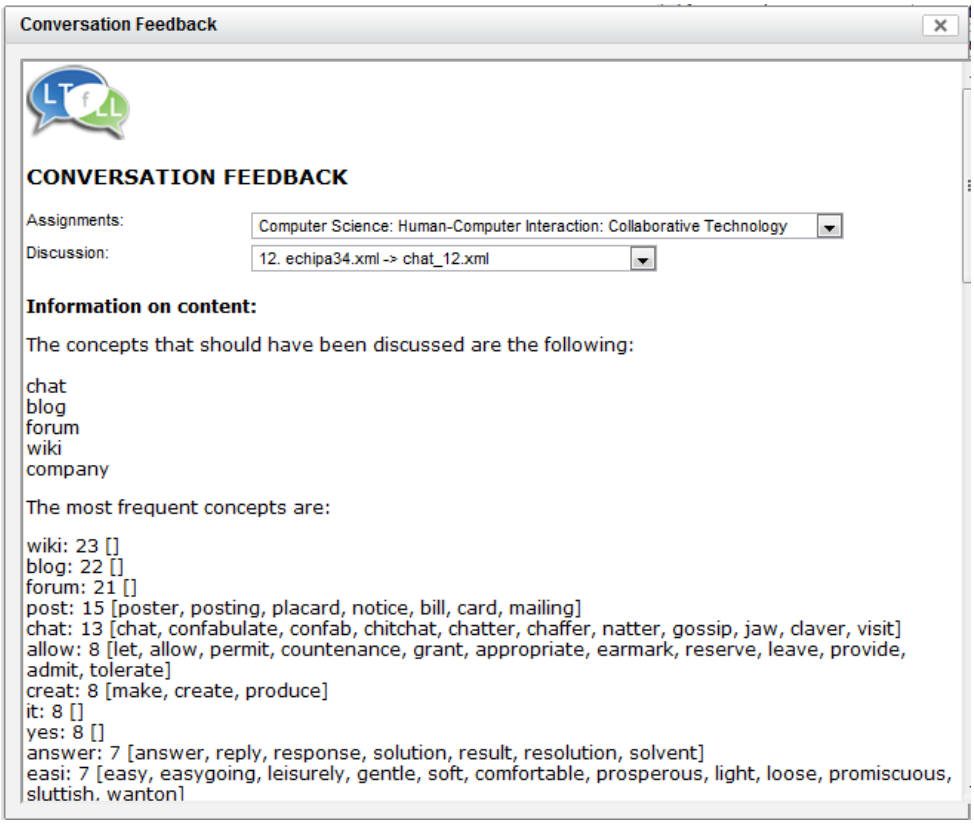

Fig. 1. Feedback about frequent concepts.

Chats has been used as assignments in the last seven 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 had lectures where they were taught the theory of interface

design and evaluation. They got this year a project assignment which has as first step a brainstorming session, in which they had to generate at least 15 ideas. The *PolyCAFe* system offers several services which can be used for analysing the brainstorming chats.

A first facility offered by *PolyCAFe* is the detection of new ideas that appeared during the discussion. The system can group synonym words in order to identify frequent ideas. For example, in the analysis of a chat, in addition to themes imposed for discussion (chat, blog, forum, wiki, company), the concept „post" (and his synonyms) was detected to have a high frequency (see Figure 1).

Starting from the detected frequent concepts, *PolyCAFe* may be used in order to identify the evolution of the usage of the ideas in the brainstorming chat (Figure 2).

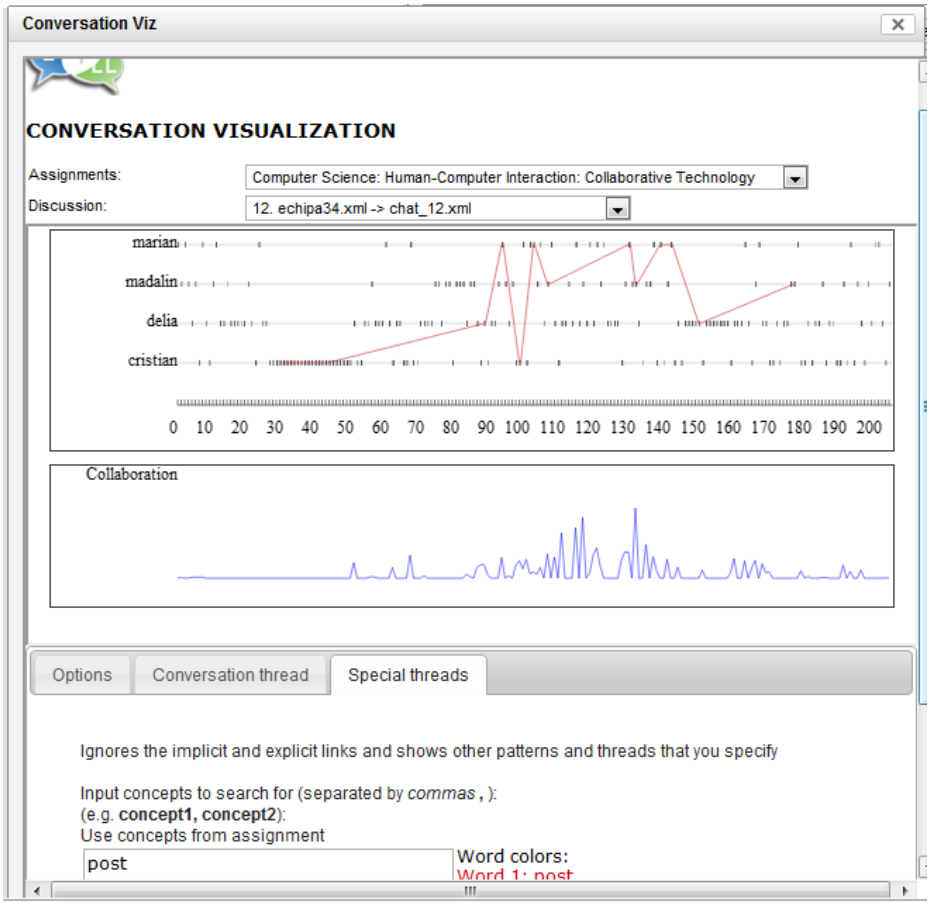

Fig. 2. The evolution of the usage of the "post" concept.

The figure illustrates also another important feature: *PolyCAFe* computes the variation of the degree of collaboration [9]. A related feature to the degree of collaboration are the zones of collaboration, detected by another system we have

developed [6]. In Figure 3 we may see in the bottom part the detected collaborative zones. Such a zone was selected, is emphasized in the chat excerpt and the graph o utterances and their relations is displayed.

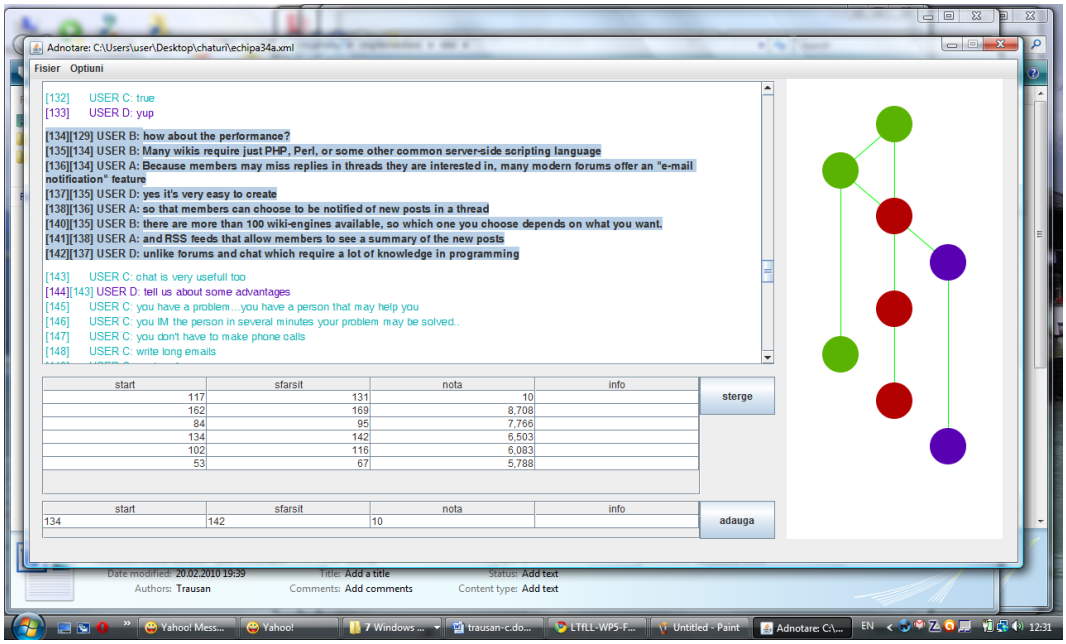

Fig. 3. The detection of collaborative zones.

5. Conclusions

Although there are many software tools that support creativity, they are generally not based on artificial intelligence, they are only providing very simple facilities. In our approach we provide Artificial Intelligence-based tools for analyzing chat sessions in order to support creativity. The theoretical perspective is socio-cultural and dialogistical. We consider the social aspects of creativity in small virtual (using chat) teams (up to about 7-8 people). We started by using existing tools that we have developed for CSCL chats. The next step will be to extend the facilities of these tools for our aim of creativity support. A future goal is to implement intelligent assistants that assist virtual groups of researchers that create knowledge together using, for example, the technique of brainstorming.

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