SOCRATES: Barrier Free Communities of Aphasics on the Internet

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Abstract. The barrier free internet is one of the greatest challenges for computer science in the future. While in the last years the growth of the internet was exponential, still many potential user communities can not use internet technology for their communication needs because of inappropriate tools and narrowly designed communication processes. These problems become obvious when transferring applications to communities of people with special needs. Many people suffering from aphasia are not able to interact with current chat tools while need for money for therapists could be eased by such virtual self-help groups in a geographically distributed setting. This is because massive word finding problems can sum up typing a simple sentence up to several minutes. We have designed, implemented and preliminary evaluated a new chat tool for such groups. By using the tool aphasics can constantly monitor their communication behavior and in case of difficulties switch to a synchronous talk mode where up to four people can monitor typing letter by letter. Proposal for phrases can be generated by the community to help their member. Therapists and linguistic researchers can also monitor online and offline conversations from automatically generated transcripts.

1 Introduction

Universal access to information society technologies is an important topic in the new research framework of the HCI community and the European Community [6]. Recent work focuses on new design of input assistance as well as automatic prediction of the user input or adaptive content presentation. Input assistance has made good progress due to the utilization of touch pads for handicapped or elderly people as in [4], but is still bound to costly and sensitive equipment. Other attempts try to increase usability by voice assistance, but are still to be improved since the rate of misrecognition is still very high and depends heavily on the pronunciation [8]. An alternative is research that aims at transforming the

content to fit the user's needs by increasing the readability [2], but usability of those approaches is limited in interactive systems, since input is not supported. That is what predictive and abbreviation systems try to cover, but as well as auditory user interfaces, those systems now lack up detection reliability as well [5, 14].

Nevertheless, this work focuses on individuals only. It neglects the observation that many communication barriers are best overcome in cooperative learning communities with people facing similar problems. Our research in the collaborative research center on "Media and cultural communication" aims at analyzing and evaluating the impact of difficulties in new media applications [10, 11] (http://www.uni-koeln.de/inter-fak/fk-427/). In this paper we present a cooperative web-learning environment called SOCRATES (Simulation of Oral Communication Research Analysis and Transcription Engineering System) to overcome difficulties in new media usage. SOCRATES supports a learning community comprising patients suffering from aphasia (aphasics) [3], therapists, researchers on linguistics, and system developers.

2 Difficulties in Virtual Community Media Usage

Digital media has improved lifestyle and abilities to communicate for most of us. Nevertheless, communities of people with special needs sometimes face unexpected problems when using new media. These problems are not only restricted to misdesigned user interfaces, but commonly arise in the medium of conversation. Obviously, troubles appear and we have to make them productive. So, we are trying to find media mixes that allow us to overcome these problems, by combining media to increase their benefits by simultaneously reducing their deficits. When designing community software, it is necessary to analyze the nature of difficulties and to distinguish whether they are caused by media specific or user specific influences. In addition, we have to adjust the repair strategies with respect to the difficulty.

The design of community systems depends on a tight interplay between the organization of knowledge and communicative processes within the communities of practice [13]. To increase usability it is necessary to analyze the kind of difficulty taking part in a conversation. Basically, we distinguish the following influences on difficulties:

- *Media specific:* influences that depend on the medium itself.
- *User specific:* effects, caused by the user's deficits.

Usually, a mixture of both kinds of difficulties can be recognized. In case of an aphasics community it is obvious that problems emerge due to word finding, comprehension and spelling problems of users. Those problems are common in other communities, too. However, in combination with media specific difficulties, the situation becomes worse. Since aphasics face spelling and word finding problems, communication via an asynchronous chat-board is of danger in breaking down. Due to the delays in between of letters of words to be spelled, other participants in a chat system might believe that a user has left the community

system. Indeed, this effect might happen in conventional chat boards, too, but in communities of people with special needs, visibility is interesting to indicate problems in digital media. Difficulties of aphasics in digital media depend on the communication structures simulating synchronousity of conversation. Because of word finding and spelling problems conversation gets asynchronous, since delays and line based inputs may sum up to minutes in comparison to reference conversations of non-handicapped people, which take seconds.

3   SOCRATES

SOCRATES is a community system combining digital media to make difficulties in single media usage accessible to repairs by the community members. To support this community initiated communication process, SOCRATES has been developed as a community system enabling aphasic communities to make use of distant communication in specially designed chat boards. On the one hand we are creating a meeting point for aphasics and on the other hand therapists and researchers can also use the system for a further analysis on conversation structures. Research on oral aphasic communities is still in its infancy and this is even more true for simulated orality as in chat boards. For linguistic research and therapy development, one of the most interesting features is the automatic recording of time delays between pressed keys because this might indicate the grade of disability.

SOCRATES is similar to Internet Relay Chat (IRC) [7], which offers a good possibility for a real-time text-based communication in communities. An IRC Server relays all incoming messages to the other participants taking part in the same conversation. Our relay servers are used to coordinate conversations and to enrich them with additional metadata, which is necessary for further computation. In the case of SOCRATES, especially time delays between letters to be spelled are captured. The digital community media are being captured in XML trace files to be placed in the SOCRATES conversation repository.

Access to SOCRATES is granted by a login procedure. By making the system exclusive to those persons suffering from aphasia, their therapists and researchers, members are being protected from people that might molest or make fun of the aphasic's stories. Only those who share a common value are allowed to participate. Passwords are only provided to those that are known to persons active in the self-help groups.

3.1   Community Centered Repairs in (Re-)Combined Digital Media

Obviously, spelling of words takes some time, and aphasics might be disadvantaged in a single media system based on a chat board. Hence, we are implementing community initiated repair strategies in digital media. Regarding conventional chat board communication, repair strategies are limited to line based messages. Nevertheless, little can be done, since users are restricted to the information given by the line-based inputs of the aphasic. Therefore, we are analyzing the impact of (re-)combined digital media in aphasics' community software.
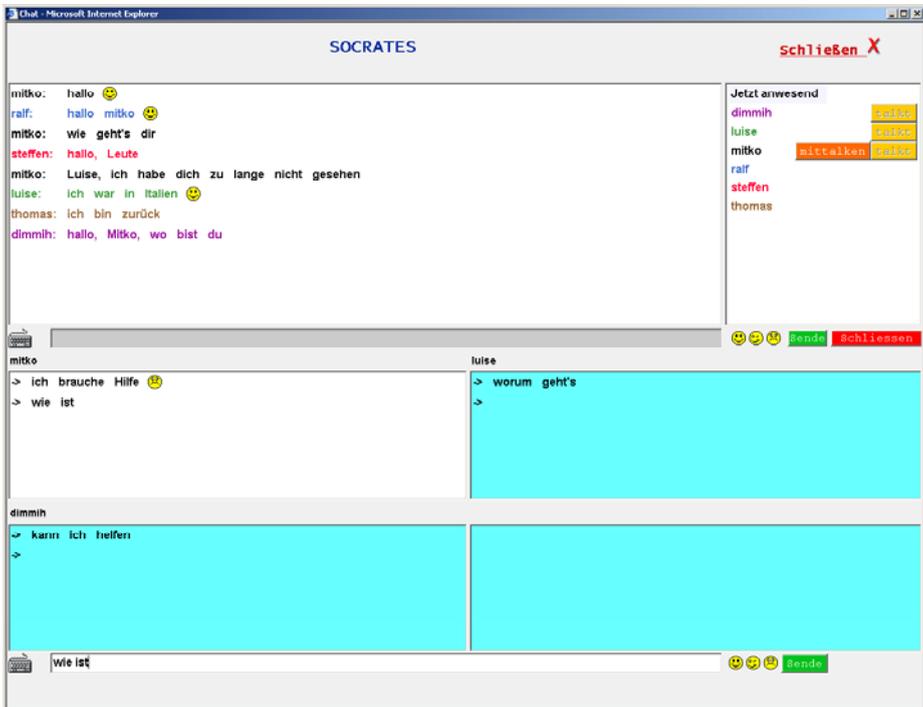
Fig. 1. SOCRATES: Combining chat and multi-user talk (in German)

Figure 1 shows a user initiated repair process in a SOCRATES Java applet. The design is similar to conventional chat boards, but has been adapted to the community's needs, which have been assessed in workshops together with the aphasic community. To keep transparency, each user has its own color to distinguish his inputs from those of others. The new approach to overcome the word finding and spelling problems of aphasics is a button on the right hand side of the applet that starts a self-initiated transcription process. By pushing the button "Talkrunde" (eng. multi-user talk), an aphasic might indicate the need for a decoupled conversation with only a restricted number of participants. Then, a multi-user talk is being activated, and on the bottom of the client Java applet a screen becomes visible which allows a synchronous talk conversation between up to four persons. For keeping focus on the user's own window, the chat windows of participants are colored bluish. The command line is automatically set to the lower section on the screen, allowing input for the multi-user talk. All other participants in the chat get the information that somebody has initiated a multi-user talk by highlighting an orange colored sign behind the aphasic's name. Those persons, who are willing to help, click on the sign to activate their help modus which automatically displays a yellow button behind their name, indicating their participation in a multi-user talk. Due to the synchronization of multi-user talk conversations, community members can now directly see the

```
Id:      1644
Typ:     TALKRUNDE
Server:  RS1
Start:   2004-03-16 11:00:32.0
Ende:    2004-03-16 11:06:22.0
Dauer:   00:05:50


Teilnehmer:
1. mitko
2. luise
3. dimmih


TRANSCRIPT

                00:00:00                                                          00:00:37
<mitko  #1>  ¤              i(18.51)ch·brauche·hilfe<<<<<Hilfe·§:-(§(1.53)
<luise  #1>  ¤(7.0)                                                 w(27.18)p<p<oru
<dimmih #1>       ¤(12.0)

                00:00:37                                                          00:01:06
<mitko  #1>
<luise  #1>  m·g(1.05)eh⁴<t's¶(24.66)
<dimmih #1>

                00:01:11                                                          00:01:41
<mitko  #1>
<luise  #2>
<dimmih #1>  k(59.51)ann·ich·H(20.33)el<<<helfen¶(5.79)

                00:01:54                                                          00:01:54
<mitko  #1>  ¶(86.56)
<luise  #2>
<dimmih #2>

                00:01:56                                                          00:05:50
<mitko  #2>  w(1.55)ie·isr<t         ¤(230.01)
<luise  #2>                                   ¤(283.05)
<dimmih #2>               ¤(195.01)
```

Fig. 2. pdf transcript of a SOCRATES multi-user talk (in German)

problems in the aphasic's spelling process. They are able to guess the word that causes the trouble for the aphasic by proposing different words. The aphasic is now able to take over the word or even sentence by clicking on it, so that the words can be posted on the chat board.

3.2   Therapy and Research Assistance Offered by SOCRATES

Data in SOCRATES is based on XML. The data captures all necessary information needed to cover the context of a conversation, which are participants, global time, delays and the conversation itself. By keeping compatibility to XML, SOCRATES data can be easily interpreted by applications compliant to the standard. Automatic processing of the files is backed by their hierarchical structure. Hence, queries can be used to access selected elements of a document via XPath/XQuery [1].

SOCRATES offers the transcription of conversations into various output media. This allows therapists to adapt a therapy individually to the user's needs. To personalize the information as good as possible, the generated transcripts offer lavish information on the conversation process. The generated transcripts
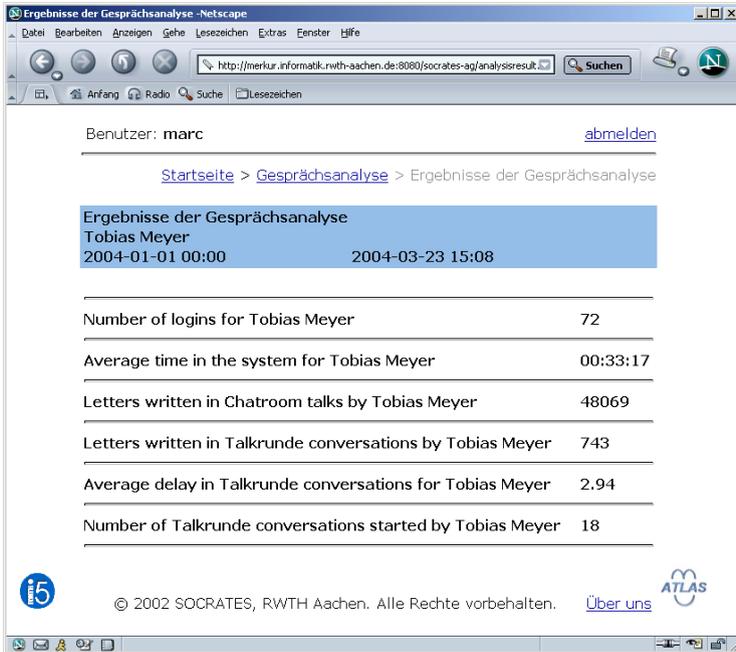
Fig. 3. Statistical information about SOCRATES usage (name changed)

are - apart from the replay function - based on the discourse analysis standard in linguistics GAT [9] and modified for written text pool [12]. The transcript covers writing delays of more than one second, time of conversation, corrections and the nicknames of the participants in addition to the spelled words (cf. figure 2). Deletions, corrections, delays, and other typing operations are marked for every line of conversation type in our chat system. To (re-)experience the discourse situation even an offline therapist can replay the whole transcript in SOCRATES based on the XML transcript. Researchers can manually or semi-automatically extract discourse features like recurring patterns of spelling problems. In addition, via the webinterface therapists and researchers are able to access the statistical information about the overall system or an individual community member. In figure 3 the evaluation of Tobias Meyer's activities (name changed) within a period of about the last three months is being displayed. By comparing these information with those spanning other time intervals therapists can gain worthful evidence whether results of the therapy indicate improvements of the disease pattern.

4   Conclusions and Outlook

We are working together with logopedics from the clinical center of the University of Aachen (RWTH Aachen) and psychologists from the German Unterfranken aphasia self-help center (http://www.aphasie-unterfranken.de). Apha-

sics are coming mostly from Unterfranken, Cologne, and Aachen, all located in Germany. SOCRATES usage and feedback of aphasics' communities is very promising. Since we have created an access authorized community system, localization of the software has been adopted on conventional chat board systems to fit the requirements of an aphasics community. Therefore, the user interface has been designed in cooperation with aphasics and their therapists. Reducing the user interface functionalities to a minimum is one of the results of the cooperative design process. This shall avoid that aphasics get lost in SOCRATES due to information overload. Size and colors of the letters on the chat board have been adapted to the aphasics needs. Also, the naming of buttons has been adapted to the community's interests. For instance the button "Talkrunde" (eng. multi-user talk) was initially named "Hilfsgespräch" (eng. help conversation), which led to unsatisfying usage by members, since most participants were embarrassed to push it. Another improvement of the system was derived from the workshops we arranged together with the aphasics community by integrating smiley buttons in the system. The reason therefore was twofold. On the one hand side, aphasics with a minor degree of disability liked to use smiley symbols they frequently use in mails for fun. On the other hand, aphasics still suffering of a higher degree of aphasia wished to have the buttons integrated into the system for a more serious reason since they wanted to express their emotions quickly without writing long sentences and probably getting lost in a too fast conversation.

An important aspect of introducing a new system to aphasics communities is personal support. In the beginning, support was needed to promote the system and for troubleshooting of technical aspects in particular (like the installation of a browser) since aphasics have a tendency to give up quickly in case of any malfunction. Now, SOCRATES is self-promoted by the members of the community as their system and giving support in case others encouter problems using it. In the meantime, SOCRATES has become very popular in the aphasics community enabling them to communicate freely with others without being afraid that they might get lost in rapid conversation. Since they have the option to indicate their need for a conversation in a smaller circle, other community members get aware of their media dependent difficulties. Participants are now able to meet others over spatial distances while protecting their privacy in an insular virtual community. By integrating other self-help groups of aphasics nationwide into SOCRATES, we hope to support even more aphasics in the near future.

The usage of XML has been applied successfully, since it is able to cover versatile information for further computation. The automatically generated transcripts of SOCRATES conversations are of great importance for therapists. Therapists are now able to adapt therapies due to the SOCRATES transcripts. Our colleagues from logopedia and linguistics are currently carrying out a controlled study with a group of about 50 aphasics frequently using SOCRATES. Analysis of human computer interaction that had been done manually before can now be computed automatically saving time and money in a steadily reduced budget of therapists and researchers.

Acknowledgements

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