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# Evaluation of a text-based communication system for increasing conversational participation and control

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**Abstract:** A prototype communication system has been developed which allows a non-speaking user to incorporate relatively long text segments into a conversation. The prototype has been developed with continuous participation in the design development by a potential user. The first trials of the system were conducted using a single case-study design. The trials evaluated the ease of use of the system's interface, and its ability to help the user increase participation in conversations, and also increase their control of the dialogue. The system was found to augment significantly the user's current communication methods.

**Keywords:** AAC, augmentative and alternative communication, communication aid, conversation, non-speaking, participation.

## **BACKGROUND**

One important aspect of conversation which is very difficult for users of AAC systems to perform is the telling of extended narratives, or relating their views or experiences in the sort of detail which natural speakers find easy. Such conversational contributions increase the impact of the speaker's personality, and control of the conversation, rather than simply answering direct questions put by the other speaker, which is a conversational role that AAC users too frequently find themselves filling.

For an AAC user to make use of such conversational techniques, they would need to be able to store and retrieve easily a reasonably large amount of conversational material.

## **RESEARCH QUESTIONS**

### Use of hypertext

Keeping track of a large amount of stored data, and retrieving it easily and quickly is a general problem in information technology. In the case of conducting a conversation, part of the task is to make conversational contributions on the current topic, and to be able to move on to other topics without breaking the sense of continuity which both speakers attempt to create [1]. An interesting research question is whether particular ways of structuring stored conversational material will help in modelling the way a conversation might proceed.

### Involvement of user from beginning of design process

Another important research question lies in optimizing the interface between the user and a complex system. It is important that the cognitive load in controlling a conversation system should not be an additional burden on an already hard working non-speaking conversationalist. In this experiment we have explored the possibilities offered by software which allows the rapid building and altering of the interface, using an iterative design method, where a potential user becomes in fact a continual partner in the interface design, rather than just an experimental 'subject'.

### Effect of introducing extended text into aided conversations

The third, and most crucial, research question was what effect would the use of a conversation aid which allowed the introduction of large amounts of spoken text have on the nature and quality of the dialog.

Previous research has examined the usability of a text database to store conversational material [2]. One outcome of this research is the need for the system to take a more active part than a traditional database in helping the user to access stored material. A promising approach is to have the system contain information about what the user is trying to accomplish, so that it may anticipate their needs [3,4]. The experiment reported here is the beginning of a project to explore hypertext as a suitable structure to achieve the ends described above. Hypertext is a structure which allows multiple links between text items, and as such, should offer a good structure with which to model within-topic conversational moves and topic shifts.

## **METHOD**

A prototype system was developed using the Hypercard software on a Macintosh computer, with output through a text-to-speech synthesiser. Implementing the system in Hypercard allowed for rapid prototyping of the interface, in keeping with the iterative nature of the design process. The system has been given the working name 'Floorgrabber', one of its intentions being to increase the user's conversational

control. The interface design was a cooperative effort between one of the authors and a non-speaking person who had declared an interest in becoming part of an AAC research team. This person also was the user of the system in the trials. After experimenting with various interface types, a control panel metaphor was chosen. This allowed for a tightly packed display which was still clear in its layout, and meant that all the controls and displays could be put on one screen, with no need to go to other screens or menus. The interface consists of text boxes and 'buttons' which are activated by pointing and clicking with a mouse. Three types of buttons were used. These had the effect of (1) speaking the text in the box pointed to, (2) speaking a quick comment, (3) going to another topic.

Because the user of the system in these trials had been involved from the start in the system design, there was no need for a training period in using it. The user was a young man of 20, who has been non-speaking from birth through cerebral palsy. His usual method of communication is a 400-word Bliss chart, supplemented with a VOIS 135 communicator, plus gesture and some vocalisations. He has no receptive language problems, but significant spelling and syntax difficulties. He has a fair degree of controlled movement, and was just able to operate a mouse.

For this first experiment, the user produced textual material about one topic, a journey abroad he did for an international swimming competition. This topic was chosen because he is often asked about this interesting experience. Using his traditional communication modalities, he conveyed to a volunteer anecdotes and comments about the journey and competition. As he communicated, the volunteer stored this material into the system for him. The user's problems with literacy meant that this sort of mediation was necessary, but to ensure that the words were truly his, the material was all checked with him several times, and modified until he was completely satisfied with it as representing the way he would like to express himself.

The trials were conducted using a single-case experimental design. The user had 12 conversations with 12 different people on the chosen topic. The 12 sessions followed an ABAB pattern, with the baseline sessions (A) consisting of the user taking part in the dialog with his current communication methods, and the intervention sessions (B) differing by the inclusion of the prototype system as an additional mode of communication. Each conversation took 15 minutes. Half of the conversation partners were familiar with the user and had communicated with him using his current communication methods. The other half did not know him, and had no experience of communicating with an AAC user. The user's instructions were to use whatever communication mode was most comfortable and effective throughout the dialogs. The conversation partners were asked to have a 15-minute conversation with the user about the swimming expedition. All the dialogs were videotaped. Transcripts were made of the dialogs.

The information produced in this experiment is extensive: three hours of transcribed dialog. The first measure applied to the material was to assess the effectiveness of the prototype system, in terms of its ability to help the user take a fuller part in a dialog, and to have more control over the direction of the conversation. This was measured in two ways. Firstly, a count was made of all the words produced by each partner in the dialogs. Secondly, two conversational moves which were of relevance in conversational control [5] were defined:

**RESPONDER:** An answer to a question, or a feedback (backchannel) comment to the other speaker.

**INITIATOR:** A question, or a statement which is not a responder.

All occurrences of these conversational moves by both partners in the transcripts were counted.

## RESULTS

Referring to the three research questions which were addressed:

### Use of hypertext

The first stage of the prototype design has been to develop a usable interface and test the basic performance of the system. As the prototype grows in size, hypertext features will come into use in order to facilitate navigation through the material, and at that point the effectiveness of this structure will be assessed.

### Involvement of user from beginning of design process

This provided helpful insights for the researcher, and allowed design problems to be addressed by continually checking the effectiveness of potential solutions.

### Effect of introducing extended text into aided conversations

The results of an analysis of the transcripts are shown in the table below (Table 1), and the accompanying graphs (Figures 1,2,3). It is clear that, when the prototype was added to the user's communication modes, he was able to increase the total number of words he used in each conversation to a significant degree (t-test value of  $p < .01$ ) (Figure 1). The level of word output of the other speaker was unaffected, which indicates that the AAC user having the ability to introduce text did not inhibit the other speaker.

Conversational control by the AAC user was also increased, as measured by his increased use of initiators ( $p < .05$ ) (Figure 2). Again, the natural speakers retained their level of initiators even when the AAC user increased his, indicating a dialog which was in general more lively. There was no statistically significant difference in the AAC user's level of responders, but the increase in the case of the natural speakers was significant ( $p < .05$ ), which is not surprising, since the natural speakers had more opportunities to respond when Floorgrabber was in use (Figure 3).

	With or without Floorgrabber	
	Without	With
Mean number of words		
Natural speaker	917	999
AAC user	143	534
Mean number of initiators		
Natural speaker	48	50
AAC user	10	27
Mean number of responders		
Natural speaker	19	36
AAC user	87	71

Table 1: Summary of measures taken with and without Floorgrabber

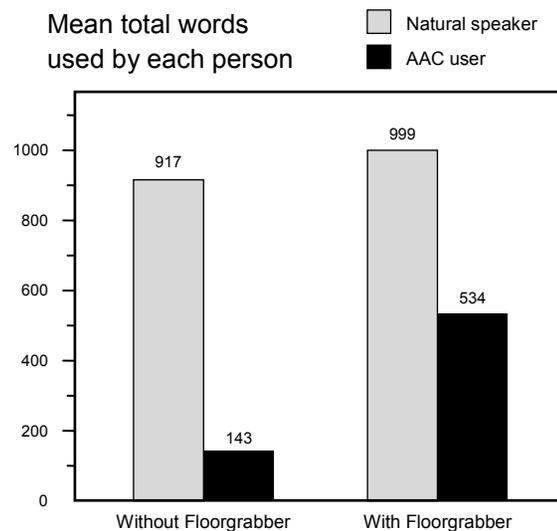


Figure 1

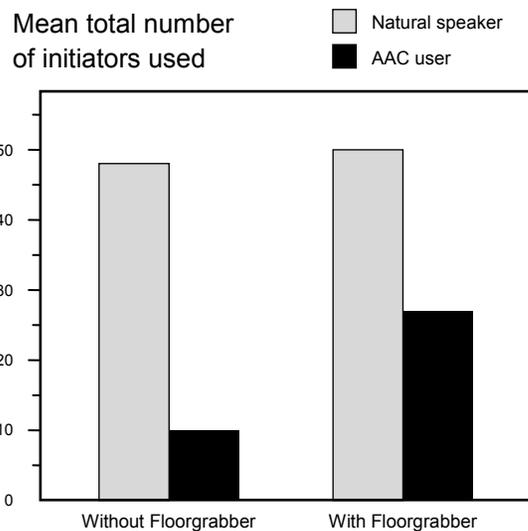


Figure 2

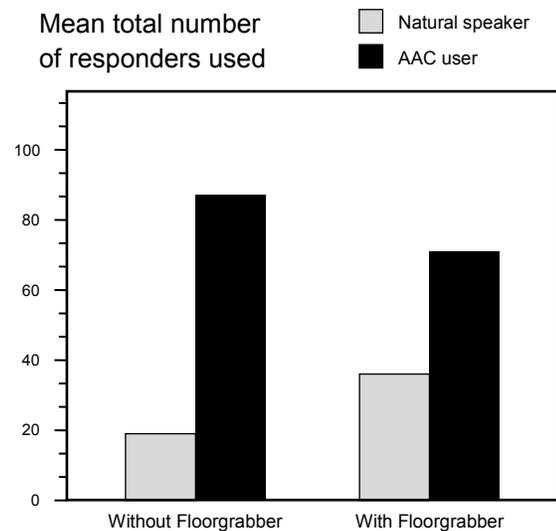


Figure 3

## DISCUSSION

This is the beginning of a series of analyses to be performed on the material produced by the experiment. Although at a very early stage, this data indicates that the system shows a promising direction for increasing the communicative repertoire of AAC users. In addition to further analysis of the data produced, work is proceeding on a further extension of the prototype, to cope with multiple topics.

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