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A text database as a communication prosthesis

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Abstract: A text database is being used as the basis for a communication prosthesis. The database enables text items (words, phrases, paragraphs and extended narratives) to be stored and accessed. An interface module gives a handicapped user efficient access to stored text. Text items are designed to model conversational units and therefore allow the user to take part in extended conversational discussions. Text can be composed and modified using an integral editor.

Keywords: AAC, augmentative and alternative communication, communication aid, conversation aid, dialogue support, discourse, non-speaking, pragmatics, text database, topic in AAC.

COMMUNICATION AND CONVERSATION PROSTHESES

Communication systems (1) have been developed which attempt to facilitate and accelerate communication for handicapped persons, who may be restricted to effective word rates of less than 10 words/minute (wpm). Predictive strategies (2,3,4) and other devices (5) have been proposed; a typical predictive system on a current microcomputer might cut typing workload by half (4). Much greater improvements are needed, however, to increase word rates from under 10 wpm to the norm of 120-200 (spoken) wpm. The authors developed a conversation support system called CHAT (6), which assists a user to perform communication acts, and has:

- 1) a dialogue model, based on discourse analysis, to exploit the patterns in human dialogue;
- 2) a set of pre-composed stored phrases representing a wide range of conversational acts;
- 3) a simple and highly efficient user interface;
- 4) an editor to create, alter and delete phrases.

CHAT contains a large number of stored phrases appropriate for most sections of normal dialogue, but the dialogue phase which is least predictable, and therefore least amenable to the CHAT strategy, is the "Main Topic". It is difficult to equip a system with communication acts which will occur predictably in the Main Topic, but the user should have some strategy for dealing with it. The authors have therefore developed a system which enables a user to create and manage the large amounts of text which Main Topic discussion may require.

TEXT DATABASE

Computer databases are used conventionally for the storage and retrieval of large amounts of information, and some are designed specifically for use with textual material. We have investigated current microcomputer database systems, and selected one which has very flexible features, and is particularly suitable as a text database. The relevant valuable features are:

- 1) variable and unrestricted field and record sizes (for storing text items of different sizes);
- 2) variable record types (to allow modelling of different types of conversational units);
- 3) an index system flexible enough to model the inter-relationships of conversational units, but efficient enough for fast item retrieval.

The record format has been designed to model, as far as possible, the components of natural conversation. A piece of text can be retrieved by its topic(s), by the type(s) of speech act (e.g. Greeting, Farewell) it represents, or by words occurring in the text (content) itself.

HANDICAPPED USER'S INTERFACE TO DATABASE

An interface module has been developed to give the user efficient access to the text stored in the database. The interface and database operate concurrently on the computer. The computer display contains a command menu, a menu of text items (each truncated if necessary to fit on one display line), and an area

which will display, in full, any text item selected from the text menu. A text item may be any word, phrase or paragraph, and extended items may consist of linked paragraphs in the database.

The command menu offers speech act facilities like those in CHAT (6) (e.g. Greetings, Farewells, Requests, Responses and Fillers) but also facilities to allow Topic and Keyword to be specified. Text items in the database can be categorised by topic (each item can have several topic fields). The database can also search the content of every text item for any specified word. The user may thus select a particular topic for discussion, and the database will present a small number (e.g. 5) of items in the text menu. An item may be selected, or further items displayed, at the press of a single button. A selected item will be displayed in full; the user gives final assent by pressing one more button (whereupon the item will be transmitted to the dialogue partner(s)) or rejects the item by selecting another one.

Topic selection is performed by pressing one command button, then typing the topic name in full or mnemonic form. The mnemonic facility (similar to a technique proposed by Hunnicutt (7)) allows the user to abbreviate flexibly the topic name (e.g. "mc", "micro", and "mcr" could all select the topic "microcomputers").

A typical database access, starting with new topic specification, might require 7 or 8 key-pushes to retrieve and transmit a paragraph of up to several hundred characters. At the other extreme, a "filler" or "feedback" phrase of a few tens of characters may require only 1 or 2 key-pushes. The approximate key-saving ratio of 10:1 which this gives should improve significantly the word output rate of the user. Extended narratives (paragraphs linked together) will increase further this key-saving.

TEXT CONTENT OF DATABASE

The database must contain a substantial quantity of text representing the general conversational interests of the user before it will be of significant advantage. General purpose phrases like Fillers, Greetings and Farewells which were part of the original CHAT system will be present in the database from the outset, but user-specific text (topic material) will need to be added later. The user will use the integral editor in the interface, in his or her own time, to enter new text into the system and modify existing text, thus building up a corpus of useful and personally relevant dialogue material. The user may well prepare for meetings by scripting text in advance; text has already been composed for three diverse topic areas ("religion", "communication prostheses" and "a job interview") in order to exemplify the scripting process. The user's friends, family or facilitator may provide ideas or compose text for the system. The text content of the database will accumulate with time, gradually becoming more useful to the user.

FURTHER DEVELOPMENT OF THE TEXT DATABASE

The composition of new text remains the least efficient aspect of system operation, so continued development of efficient input techniques (e.g. prediction) will be valuable. An editor optimised for the modification of existing text would be very appropriate, to facilitate "re-cycling" of text. Existing predictive systems (2,3,4) can adapt to the vocabulary of the user; adaptive features could be incorporated so that the database system would optimise its performance to the user, for example by doing frequency-dependent prediction of text items.

CONCLUSIONS: TEXT DATABASE AND COMMUNICATION

A dialogue support system has been developed which incorporates a text database. This enables text to be stored and retrieved by topic or by content, and, in conjunction with an appropriate user's interface, enables a handicapped person to create and manage textual material efficiently, for use in dialogue situations.

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