Proceedings of the ESCA Conference: "Speech and Language Technology for Disabled Persons", Stokholm, Sweden, May 31-June 2, 1993, Edit. B.Granstrom, S.Hunnicutt & K. Spens

THE BLISPHON ALTERNATIVE COMMUNICATION SYSTEM FOR THE SPEECHLESS INDIVIDUAL

Georgios Kouroupetroglou, Antonis Anagnostopoulos,
Georgios Papakostas, Costas Viglas and Aris Charoupias
University of Athens, Department of Informatics,
Panepistimioupolis, TYPA, GR-15771 ATHENS, Greece
Fax: + 30 1 7228981, E-mail: KOUPE@ATLAS.UOA.ARIADNE-T.GR

ABSTRACT

BLISPHON is a multilingual integrated system, with synthetic speech output, for the augmentative or alternative communication of the speechless or with communication problems individual. It is based on Blissymbolics: a well established international, pictographic and ideographic symbol system. BLISPHON has been designed and developed using advanced human-computer interaction techniques in order to provide flexibility and adaptability to the specific requirements of the disabled individual. The user can choose from different possible methods and devices for pointing or selecting symbols and for constructing a dialog. A language dependent parser is used for Bliss-to-text conversion. The output of the system can drive a variety of text-to-speech converters. Furthermore, BLISPHON incorporates a powerful educational environment to learn Blissymbolics.

INTRODUCTION

Although the most common and preferable form of interpersonal communication is the speech, not everyone has this ability. For people who can not speak or as a supplement to speech for those whose speech is difficult to understand, alternative or augmentative ways of communication will have to be used. A large number of speech disabled people are dependent on communication aids with non-orthographic writing systems because they have also difficulties in reading and writing.

Blissymbolics is a well-established and internationally accepted non-orthographic, meaning based, augmentative or alternative communication system capable to provide comprehensive communication among speechless or with communication problem individuals and his/her social environment (Bliss 1978). The system includes grammar, syntax and strategies providing a successful communication way for concrete things, events and abstract meanings (ideas, emotions, intentions, desires, etc.) (McDonald 1980). Users who need to expand the system can do so by applying logical strategies and simple syntacting rules. An international organization Blisssymbolics Communication Institute (BCI) has the responsiblity for the standardization and dissemination of the

system (McNauton 1985). BLISCII has been proposed as a standardized code for Blissymbols (Tronconi 1990).

General specifications either for hardware or for software for an alternative/ augmentative system include: a) modularity, b) open system and c) integration of the needs of the disabled, resulting in a more flexible approach that can be adapted to the evolving demands of the users, accommodating the human diversities concerning physical and intellectual abilities. Portability, simplicity, reliability and adoption of the principle of internationalization are key features. Training modules are also important.

BLISPHON has been designed and developed according to the above specifications as an integrated, portable voice output communication aid that combines Blissymbolics with advanced information technology techniques in order to serve the speechless or with communication problems individuals for their alternative and/or augmentative communication. BLISPHON is also an educational environment for Blissymbols and a graphics environment to design and edit new Blissymbols.

BLISPHON STRUCTURE

To achieve maximum flexibility and adaptability, BLISPHON structure contains a number of modules briefly described in the next paragraphs. The core module in our design strategy is a database of symbols which can be accessed by the three operation modes. A formal method for the description of the Blissymbols in the database has been also developed (Kouroupetroglou et al. 1992).

During the design phase of the system, a number of models of user-to-terminal interaction have been analyzed to tailor user interface characteristics of BLISPHON alternative/ augmentatice communication system to the requirements and abilities of people with special needs (user profiles ranged from novices to frequent users in a wide range of disabilities). The user interface part of BLISPHON contains a set of modules. Consistency, that is common action sequences, terms, layout, color, size was a key factor for the design.

A direct manipulation user interface has been developed i.e. a visual, icon based, interface in which the user operates on a representation of the objects and actions of interest with appropriate or metaphorical representations. Keyboard entry or menu choices is replaced by cursor-motion devices to select from a visible set of objects and actions. Direct manipulation user interfaces are easy to learn, allow errors to be avoided and encourage exploration. Such user interface designs are appealing to novices, are easy to remember for intermediate users and can be rapidly accessed by frequent users.

Display organization and screen-layout has been designed according to the principles of: consistency of data display, minimal memory load of the user and flexibility for user control of data display. A high-resolution color VDU has been selected to provide display quality.

There are two input modes used in BLISPHON relative to the user's physical control difficulties: direct selection and scanning. With a direct selection aid, the user can point to his/her choice from a selection or can use a keyboard or similar device. The scanning mode is usually employed along with specialized individual switches. Since lack of speech is usually accompanied by general physical impairments, nonspeakers often require special switches to act as input devices to control a communication system. The input devices interface module developed for the direct manipulation in BLISPHON depends on the user profile, task analysis and interaction style and includes, except from the normal cursor-movement keys, two types of pointing devices: direct (touchscreen) and indirect (mouse, trackball, joystick and touchpad).

Rate enhancement modules: even when the switch and input mode has been optimized for a particular user, communication is still extremely slow. Two modules for rate enhancement have been developed in BLISPHON to accelerate the input process based on the principles of: a) achieving more output for a minimal input and b) applying linguistic knowledge in order to predict what the user might want to say/write next. Minimal input/maximum output is based on storing entire phrases of Blissymbols which the user could access with a small number of activations. Blissymbol prediction depends on logging the user's output and offering likely candidates for the next symbol or symbols.

The output message from BLISPHON can drive a speech synthesizer or printed out on paper. The following modules have been designed for message processing before the message feeds the output. Bliss-to-text module: in order to achieve proper transformation of symbols in a well-formed sentence we apply syntax rules for the word order and the indicators (verb tenses, plural of nouns, interrogative and negative statements, possessive formed adjectives/nouns discrimination). Text-to-IPA (International Phonetic Alphabet): this rule based module is essential in order drive specific speech synthesizers.

BLISPHON has been developed for a PC compatible environment with a VGA adapter and a color VDU.

APPLICATION OF THE SYSTEM

BLISPHON serves mainly as a voice output communication aid. Blissymbols are presented on the screen in groups of colored categories: place, time, persons, actions, nouns, adjectives/adverbs, special symbols (strategies), together with the corresponding meaning in the native language of the user. The user selects the symbol and influences it using the strategies. The symbol is copied in a special line in order to formulate the sentence. The system provides full editing capabilities for the Bliss-sentence enabling the user to add, delete, insert symbols or change the strategy of any symbol. BLISPHON transforms any Bliss-sentence in ordinary text form, grammatically and syntactically correct, for driving a speech synthesizer or for printing. The user can configure the communication screen to include from 4 up to 77 symbols in multiple pages with his own graphic vocabulary.

BLISPHON is also a powerful and supporting environment for Blissymbolics to improve learning and communication capabilities. The symbols can be presented in small, medium and large size. The large size covers the full screen. The small size corresponds to the communication operation and the medium serves for transition purposes. Moreover, the teacher has the ability to use the symbol colored overlays to gradually transform from more realistic graphics to Blissymbols. At this stage he can select to display the name of the symbol as well as the basic lines of Blissymbolics. The procedure of teaching a person to communicate is so complex, especially in the first learning stages, so that we have developed a step by step approach that follows a multiprofessional evaluation which is discussed elsewhere in detail (Charoupias et al. 1990).

The designer subsystem of BLISPHON is a simple but powerful environment for creating and editing Blissymbols. After an extensive analysis we have found that any Blissymbol can be designed using simple straight lines, circles, and arcs. The user can combine previously designed shapes and segments. A special grid can be selected to appear on the screen during the design procedure. The trainer can also create a set of colored overlays on each Blissymbol. Overlays play a very important role for teaching Blissymbolics.

An English and a Greek versions of BLISPHON are currently available and the system is under evaluation in a special education school in Greece.

In conclusion, BLISPHON is a portable, powerful, flexible, integrated voice uotput communication aid for speechless or with unintelligible speech individuals supporting their interpersonal communication.

ACKNOWLEDGEMENT

This work was supported in part by the General Secretariat of Research and Technology, Greece, under Grant 90PS35 and in part by grant from TECHNOLOGIKI Ltd.

REFERENCES

Bliss, C.K. (1978): "Semantography-Blissymbolics", Semantography Publications, Sydney-Australia.

Charoupias, A., Kouroupetroglou, G. and Anagnostopoulos, A. (1990): "Information Technology and Blissymbolics: An Educational Environment for the Non-Vocal Communication", Proc. of the EURIT Conference, April 24-27, 1990, Herning, Denmark.

Kouroupetroglou, G., Anagnostopoulos, A., Papakostas, G. and Charoupias, A. (1992): "The structure of the BLISPHON system", University of Athens Research Report 90PS35.

McDonald, E.T. (1980): "Teaching and using Blissymbolics", Blissymbolics Communication Institute, Toronto-Canada.

McNauton, S. (1985): "Communication with Blissymbolics", Blissymbolics Communication Institute, Torondo, Canada.

Tronconi, A. (1990): "Blissymbolics-based telecommunications", Communications Outluk, vol.11, pp.8-11.