ISAAC96
(aceite como poster)

Building AAC-Systems to Match People Needs

M. Gradim Gericota, INESC/ Polytechnical Institute of Porto

M. Lourdes Lourenço, Cerebral Palsy Rehabilitation Centre of Porto

J. M. Martins Ferreira, INESC/ University of Porto

One of the main issues when choosing an Augmentative and Alternative Communication System is its adaptability to the needs of the end user. A wide range of systems with different user interfaces can nowadays be found on the market. However, their cost is too high mainly because of the small quantities produced. This paper will present a prototype voice-output AAC aid whose modularity enables the connection of different user interfaces keeping the same AAC hardware core, minimising development and production costs.

Building AAC-Systems to Match People Needs

M. Gradim Gericota, INESC/ IPP
M. Lourdes Lourenço, CRPCP
J. M. Martins Ferreira, INESC/ UP

INESC
Pr. da República, 93
4050 Porto - Portugal

Introduction

The provision of voice-output in AAC aids significantly contributes to an improved interaction capability. We must take into account that the key to a successful intervention lies in a correct understanding of the functionality or ability of the user [1]. An axiom of current design thinking is that the tool needs to fit the person [2]. Providing straightforward procedures of tailoring a system to the specific needs of each user should therefore be a key concern in the research and development of AAC aids. Highly compact solutions are presently enabled by the current state of microelectronics technologies, while the use of one-chip microcomputers provides the additional benefit of flexibility. The system described in this paper was designed with the specific objective of exploring the extensive reuse of hardware and software modules, enabling the same AAC hardware core to be adapted to a wide range of user interface requirements.

A "Speech Stik"-based AAC device

A survey of voice record/playback systems available on the market led to the choice of one module manufactured by Dallas Semiconductor, the DS2271 "Speech Stik". This is a highly compact module which includes all the required circuitry in a double-side 4"x1" surface-mount board, from the analogue input and output sections to the dedicated blocks for processing the digitised speech signal. Up to 254 messages can be recorded and played back. Access to each message is fully random, regardless of in playback or recording mode. The extra circuitry required was therefore restricted to the addition of extra non-volatile memory (to maximise the recording time and enable the retention of the already recorded messages even during power loss) and of a dedicated microcontroller to support the required user interface alternatives.

User interface alternatives

The following three different interfaces were developed thus far:

1. Direct access through a matrix keyboard;
2. Scanning access through an LED matrix;
3. Scanning access through numerical selection.

A basic core of software modules providing general management of the system resources has been reused and coupled to a number of interface modules implemented in dedicated routines. Each combination corresponds to a particular interface method, which is accessible by simply plugging in the corresponding memory module and connecting the required user interface (the AAC hardware core remains unchanged).

KEYBOARD ACCESS

A matrix keyboard provides direct access to message selection, with 30 keys allocated to specific messages and 2 keys allocated to control functions. Since up to 8 pages (8x30=240 messages) are available, one of the control keys implements a "next-page" function. The other control key is used to signal the system that a number of messages/words is going to be selected, before the complete sequence should be output (message concatenation). In those cases where less experienced users require a smaller number of messages, neighbouring keys can be grouped together under the same message.

SCANNING ACCESS THROUGH AN LED MATRIX

A 32-cell LED matrix with a similar layout to the matrix keyboard can also be used, the main difference here being that one LED replaces each key. One of several scanning methods can then be selected (linear scanning, row/column scanning, etc.) and the user has only to signal the desired cell by pressing a single switch when the respective LED is on. The page control "key" (LED) is again made available to allow the user to select up to 8 pages of 30 messages and the "message concatenation" option is retained as well.

SCANNING WITH NUMERICAL SELECTION

In order to meet portability requirements, a two-digit scanning selection procedure was also made available. This same access method had already been implemented in a previous project [3] and proved to be a useful and simple interface to select up to 99 messages. Each two-digit code corresponds to one message and the user has one switch to indicate the desired code. The selection process starts with the left digit cycling from 0 to 9. Pressing the switch will stop the left digit in its present value and start the cycling procedure in the right digit. When the user presses the switch again a unique two-digit code has been selected and the corresponding message is then output. Message concatenation was also made available through the selection of a specific code.

Conclusion

The last two alternative interfaces described are fully controllable by a single switch. However, other selection strategies with more than one switch can be implemented. Different kinds of interfaces can be developed quickly upon request. Other features than those described above can also be implemented. The user evaluation sessions conducted so far have shown that the straightforward procedures made available to switch among the various interface methods were a key factor to promote a quick acquaintance to this AAC system.

[1] A. Spaepen. Can We Avoid Putting People with an Impairment at a Disadvantage with New Technology in Daily Life: A Preventative Control for Future Research. In *Proc. 6th ISAAC Conference*, pp. 26-27, Oct. 1994.

[2] Cheryl Goodenough-Trepagnier. Design Goals for Augmentative Communication. In *Assistive Technology*, Vol 6.1, pp. 3-9. RESNA, 1994.

[3] J. M. Ferreira, A. C. Teixeira, J. L. Ramalho, M. L. Lourenço, "A Portable Device to Improve the Communication Ability of People with Cerebral Palsy," *Proc. 6th ISAAC Conference*, pp. 446-448, Oct. 1994.