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Alternative routes to communication

Developing communication aids in close collaboration with users

Stefan Langer (University of Munich) & Alan Newell (University of Dundee)

Communication aids — devices that help people with different kinds of disabilities to communicate — play an important role in the lives of many people. There are no exact figures about the number of disabled people in Europe, but one source estimates the number of severely speech impaired people (including all different kinds of disabilities that lead to it) and aphasic people in the EU at 5 million.¹ More conservative estimates put the figure at around 1% of the population. An additional 2.7% of the population suffer from some kind of hearing impairment, and 2% are visually impaired. Although there are slight variations in the official figures for different European countries, we can assume that the percentages for European countries, including the new member states, are about equal.

All these disabilities can affect one or several communication channels, or the cognitive ability to communicate by natural language. The target population for communication aids is thus quite large; and it is growing, especially in industrialised countries, where people live longer: elderly people are more likely to acquire disabilities.

Partial or complete loss of the ability to communicate with others can lead to complete isolation. This means that, contrary to many other products that involve language technology, communication aids do more than just help users to complete particular tasks at work or elsewhere: they are essential tools to allow them to be participants in communication processes (either spoken or written) at all. For their users they constitute a prerequisite for other activities that involve interaction with co-workers, relatives or friends. Without communication aids, integration and rehabilitation of many people with communication disorders into society would be much more difficult, if not impossible, and their quality of life would be considerably lower.

Speech communication aids are one well-known type of communication aid. They are used by speech-impaired people to convey utterances by means of a phrase-building or message selection application, which is connected to a text-to-speech converter or a graphic display.

¹ 1993 figures, which do not include the member states that joined in 1996.

Communication is a buzz word these days. We are aware of how essential it is to most human activities. We want it to be efficient, fast and smooth, and distance should be no object. A lot of research is devoted to the development of technology that makes these things possible; and people meeting in virtual space, or live lectures on the Internet, are no longer a thing of the future.

In such a Wonderland, it is easy to forget that the type of communication which is most central to human life takes place on a day-to-day basis between friends, colleagues, people meeting; at home or at the office, over drinks, in shops. For most of us the ability to communicate through speech, when we want to, is a given. But it can't be taken for granted by the estimated 5 million people in the European Union who are either severely speech-impaired or aphasic. For these people,

research that leads to development — the development of communication aids — can make the difference between human contact and isolation.

Stefan Langer and Alan Newell open this issue of ELSNews with an account of Augmentative and Alternative Communication, an area devoted exclusively to the development of communication aids. Other authors look back on memorable Summer events (such as this year's ELSNET Summer School) and report on new landmark actions (such as DISC).

Reactions, corrections and comments are, as always, very welcome!

Mimo Caenepeel

For the Editorial Team

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In a wider sense, communication aids cover all devices that support in some way the process of production or the understanding of spoken or written utterances in different semiotic systems. They thus include applications such as text simplification devices for aphasic people, TV subtitle generators, sign language interpretation and translation for deaf people, and reading aids for vision-impaired people. Systems can be based on purpose-built hardware or standard personal computers running special software.

Research

The area of research into the development of communication aids is known as AAC (Augmentative and Alternative Communication). AAC is an interdisciplinary field which, apart from NLP, involves medical research, psychology, research on human-computer interaction, and semiotics. The applications resulting from research and development in AAC are natural language devices as well as systems using symbol and icon languages (e.g. BLISS).

Quite a few past and present research projects on communication aids have been initiated for very practical reasons: one researcher knew a person who needed a communication aid, and started investigating the possibilities of supporting communication for that particular user. In such projects there is a natural incentive to move quickly from basic research to a (preliminary) application: a person in need of a device will be ready to start using a less than perfect product rather than not communicating at all. At the same time, in spite of the wide range of disabilities and differences in the gravity of individual handicaps, generic solutions can and should be found. Research projects that start off as geared towards one single user need to widen their scope as the project develops, and lead to an application that can be used by people with different abilities.

Most communication aids are thus developed in very close collaboration with users, who generally have a vital interest in contributing to the success of the research. In good projects close links with users are kept throughout the project, from beginning to end, and panels of consumers, and often also carers, frequently assess the products.

One of the consequences of this continuing evaluation is that the resulting research prototypes tend to be very close already to commercial products. Many communication aids that are currently on the market are the direct result of close collaboration between researchers at Universities and companies: examples are **Talk:About** (University of Dundee & Don Johnston), **Scriptalker** (result of a TIDE project with several industrial and academic partners), **CAMELEON** (outcome of the TIDE VAESS project), **Profet/Prophet** (developed by KTH Stockholm), and **PAL** (developed by Applied Computing, Dundee).

AAC and NLP

Until recently, research on communication aids was not very concerned with what was going on in mainstream NLP research, and NLP researchers were largely unaware of this application area. The reason for this was that many techniques offered by NLP up to the beginning of the nineties were either not very reliable or only applicable to very limited subject domains, which made them unsuitable for transfer to AAC.

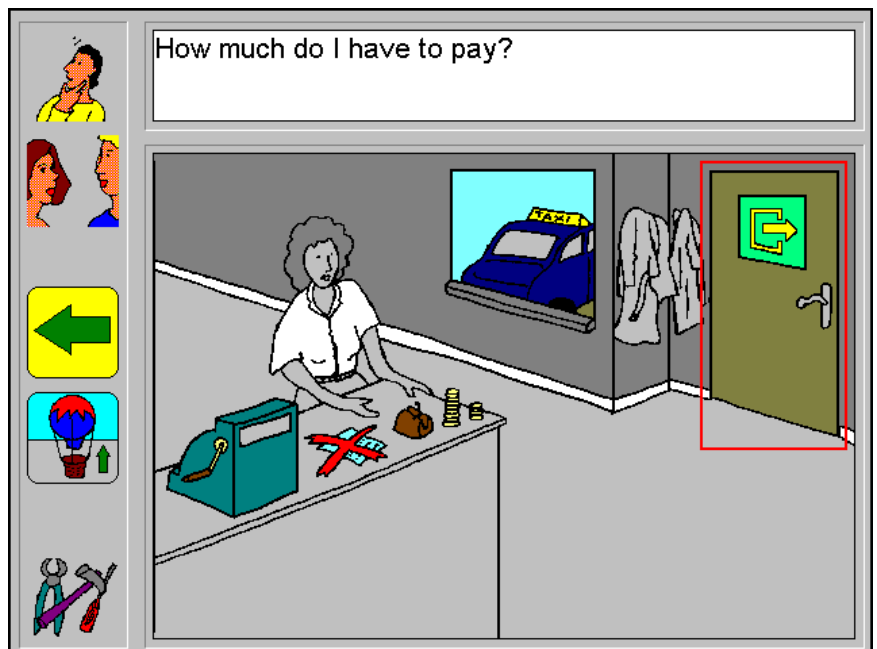
During recent years, however, NLP has become more relevant and applicable to AAC and the development of communication aids. This is due to the increasing interest in statistical techniques within NLP, the arrival of broad coverage lexicons, and the current activity in the area of spoken language for dialogue systems. The growing relevance of NLP is reflected in current research, which focuses on topics such as

- the enhancement of word prediction techniques with input from research on speech modelling,
- the building of more efficient message retrieval systems, employing techniques from full text retrieval; and
- text summarization/simplification for aphasic reader and for hearing impaired people using close-caption TV.

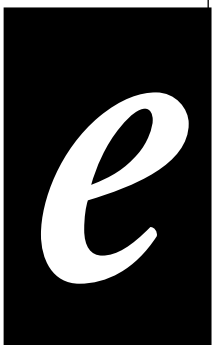
The impact of NLP on the area is also reflected in the fact that two recent workshops have been devoted to the subject of NLP for communication aids (one at the University of Dundee in September 1996, and one at the ACL/EACL meeting in July 1997). In addition to this, a special issue of the *Journal of Natural Language Engineering* on the subject will appear in spring 1998.

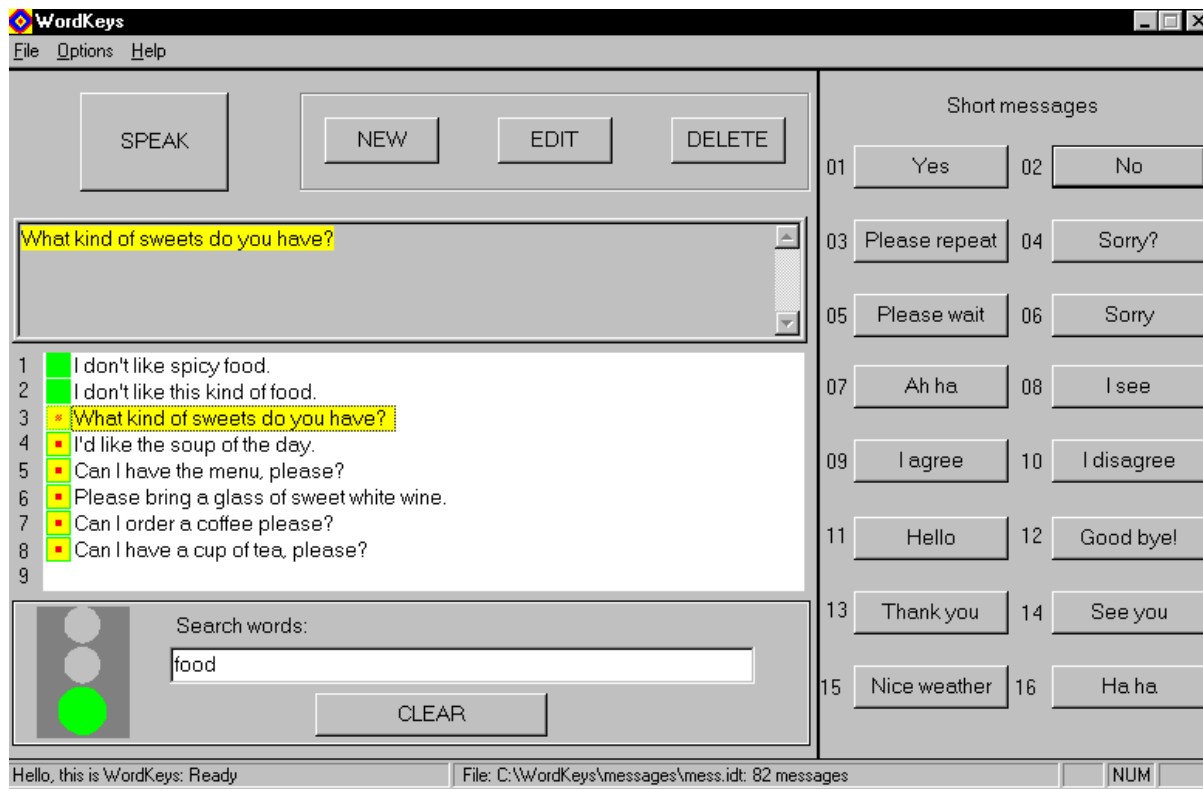
Research projects presented at the workshops once again showed a substantial involvement of users: many of the resulting prototypes are already being used on a day-to-day basis by users involved in the projects. The integration of new techniques into communication aids also relies on continuing user support.

²There were a few exceptions to this lack of collaboration — notably research at the University of Delaware (USA) within the **Compansion** project, based on ideas from language generation, and, in Europe, research at the University of Dundee, at KTH in Stockholm, and some projects in the TIDE framework.



The Scriptalker interface, developed in the European ALADIN project





The WordKeys communication aid with full text message retrieval, including semantic expansion, developed at Applied Computing, University of Dundee

Most efforts to enhance the quality of life for users with speech and language disorder so far have focused on English, probably because of the huge English speaking market in North America and Britain. There is still much to be done to transfer research and applications to other languages. A notable exception to this, however, are the Scandinavian countries, and especially Sweden, where, relative to the comparatively small size of the user population, there has been a high degree of R & D activity in the area of aids for the disabled. There are also several products on the Scandinavian market. In the EU, research and development for disabled and elderly people over the last six years has been supported by the Telematics/TIDE programme; and there has been considerable R & D activity in the area in France, German-speaking countries and Spain. But there are still relatively few products around that use advanced techniques. On the whole, an imbalance between northern Europe and the rest of the continent remains. One challenge is thus to produce devices that are easily adaptable to different languages, and to achieve the transfer from applications and techniques from English to other languages.

Conclusion

Prospects for a new generation of communication aids that employ NLP techniques seem to be very good. And although communication aids target a very specific user group, many concepts from application development for communication aids can be transferred to other NLP applications, especially those aimed at a mass market.

Key requirements for communication aids are low cognitive load on the user, simple and easy-to-use interfaces and customizability for different users. All of these are also important requirements for language technology products that should be suitable for a wider public. They can only be met if applications are developed in close collaboration with users. And for research

with continuing user involvement, the development of communication aids can provide a valuable model.

FOR INFORMATION

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Prof. **Alan Newell** is head of the Applied Computing Department in Dundee, a major international research institute in the area of communication aids, with close links to industry. He is one of the pioneers in R&D of electronic communication aids: his interest into computer systems to assist people with disabilities began in 1968 at Standard Telecommunications Laboratories. In 1995 he was awarded the Lloyd of Kilgerran Prize (The Foundation of Science and Technology) for his work in this area.

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