

„NewsReader“ - A Comfortable Digital Newspaper and Bookreading System

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The project “NewsReader” is aimed at the development of state-of-the art digital newspaper and bookreading systems for blind people. The key concepts in “NewsReader” are digital transmission from the source (the publisher) to the reader, a user interface that is based on extensive reader surveys and an object-oriented approach to software development. Currently, the “NewsReader” reading system already enables blind people of all ages to read a variety of document types like newspapers, magazines and books. Available output devices include speech synthesis, braille and screen enlargers. Field trials showed that the user interface can be mastered within about 10 minutes for simple tasks like the reading of a newspaper article. While a menu-driven approach, together with a minimum number of only four keys, allows also computer-illiterate and computer-sceptical persons to use the system with minimum effort, a set of powerful functions is available to the advanced user.

1. Background

The aim of project „NewsReader“ is to make all kinds of printed media, particularly newspapers, available to the handicapped, and especially the blind people. While most blind people still very much depend on special braille editions, audio cassettes, or relatives and friends who read for them, recent developments in the publishing industry as well as the rapid spread of personal computers allow more sophisticated means of access. Nearly all printed media are prepared on computers, and in principle, the direct transfer from the publishing house to the personal computer at home is technically feasible. Once stored in the memory of the personal computer, the documents - newspapers, magazines, books, etc. - can be easily accessed with artificial speakers (voice synthesis), electronic braille displays, or large-character displays for the visually handicapped. Since the delivery done via existing telecommunication networks (in its simplest form, the telephone), it is fast and cost-effective, and therefore allows the daily, up-to-date access to newspapers. As an additional benefit, the navigation (identification of interesting articles) can be supported with powerful search functions not available to the reader of the paper copy.

Widespread acceptance is truly the main goal of „NewsReader“ - to be the reading system that can be used and is used by everybody, from the five-year old to the over-70 year old (the majority of blind and visually-impaired people is over 50 years old!). Many technical problems, especially in the area of the user interface, have been solved to reach this goal and hide the technical complexity from the reader. The field trial with

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the prototype version of the system showed that this goal has been achieved, that the system is very quickly mastered by the young as well as the elderly, and that it is very well accepted.

2. Project Goals

The main goals for the system have been defined as follows:

The reading program must be

- comfortably to operate (reading newspapers and books should be a pleasure!)
- very simple to learn, yet also support advanced features
- *must not rely on any computer-knowledge or knowledge of the keyboard*
- must be able to support all kinds of newspapers, magazines and books
- must run on standard computer hardware (PC)

The declared aim is to get the largest possible readership, and to support not only the computer-specialists but also the computer-illiterate and even the computer-sceptics. This, and the definition of the user interface, is a main difference to earlier trials in this direction.

3. System description

The function of the whole system is shown in figure 1. The raw data from the newspaper are transferred from the computer in the publishing house via telephone modem into a computer which is part of our network. In this computer, called „server“, the raw data (full text of the articles) is processed, indexed and converted into the format which is understood by the reading software at home. From the server, the data is fetched via a distribution network, which can be anything from a simple telephone modem to a satellite link. Initially, distribution is done via the telephone network. The data transfer is *done fully automatically* (at the press of a button), so that the reader does not need to know anything about the technical process which is involved.

As soon as the newspaper is stored in the computer at home, the blind reader can comfortably and easily select the various parts (politics, sports etc.), read the headlines of the articles, and select the interesting ones for reading. Possible output options include braille on a braille display, artificial voice (speech synthesizer) and enlarged screen display.

4. Reading software („NewsReader“)

Over the past years, several versions of a reading program have been developed and tested successfully, which culminated in the first commercial release in April 1994. A major feature of the program is its carefully designed user interface, which has been used by a variety of people in a very short time. It has an object-oriented design and has been implemented in C++ from the very beginning, resulting in a very flexible structure of the whole system which allows rapid extensions for new features and applications.

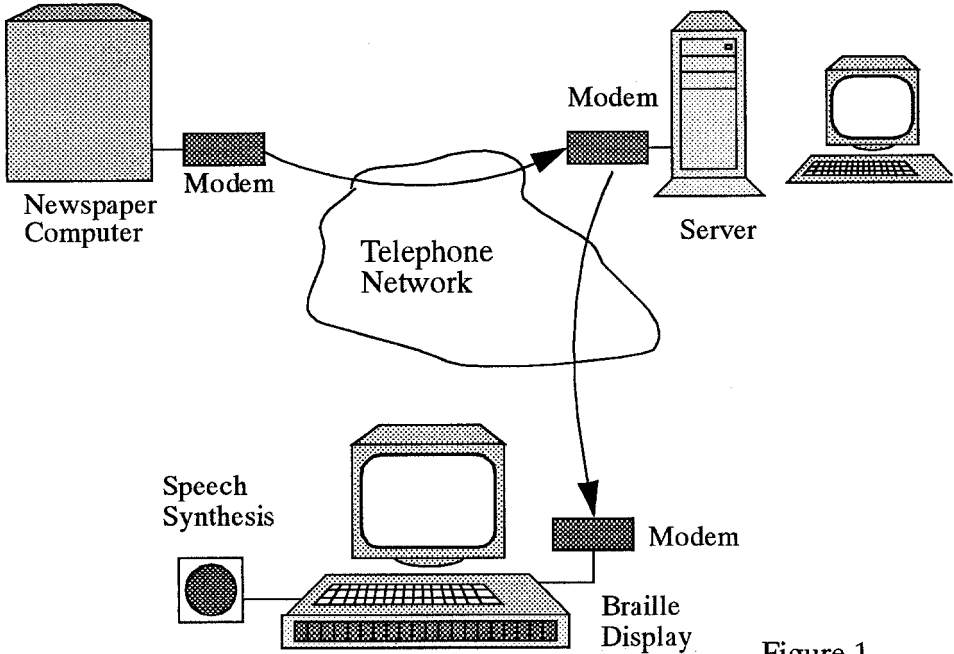


Figure 1

4.1 User Interface

Input

The first, simple user interface is operated with a very small set of keys (4-10 keys). *Only four keys are sufficient to operate all standard functions of the NewsReader program.* They can be mapped to any key on the keyboard (see figure 2 for the standard mapping, which takes into account easy grasping of the keys). Most users, who have never used a computer keyboard before, are able to master them in very short time. The keys are defined for very generic functions (next page, previous page, next article, previous article) and do not depend on any typical computer function keys. It must be possible to execute all major reading functions, like selection of a newspaper, selection of subjects and articles, adjustment of the systems parameters like the speed of the artifi-

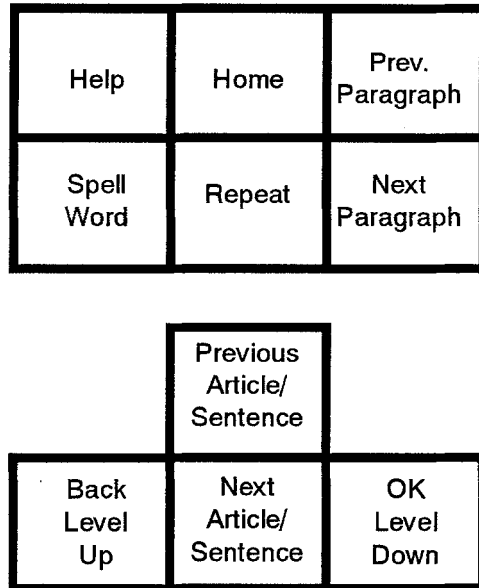


Figure 2 : Standard - Keyboard

cial speech and so on. Also the navigation within the selected document is made as comfortably as possible.

As an alternative for computer-sceptics and elderly people who are usually deterred by a full computer keyboard (even if they only need a small number of keys), an off-the-shelf “console” of a video game has been adapted as an input device (figure 3). Since it is very small and light-weight, it is also useful for more demanding users when reading on the couch or bed.

For more advanced users, several additional functions are available with the full alphanumeric keyboard. Indexed access (the user types an index keyword and the system looks up all relevant articles) as well as full-text search, where the user can search for one or more phrases in the system, are possible. Other more sophisticated input methods like speech recognition should be easily possible using commercial speech recognition software.

However, the main goal of the input interface is to make simple tasks like browsing a paper or a book as comfortably as possible, while still offering more sophisticated functions - which are also more difficult to master - for advanced users.

Output

For output, three types of interfaces are supported:

1. Braille displays (all displays that support automatic cursor routing)
2. Speech synthesis (currently four different speech synthesis systems are supported)
3. Enlarged letters on the screen (any commercial screen enlarger can be used)

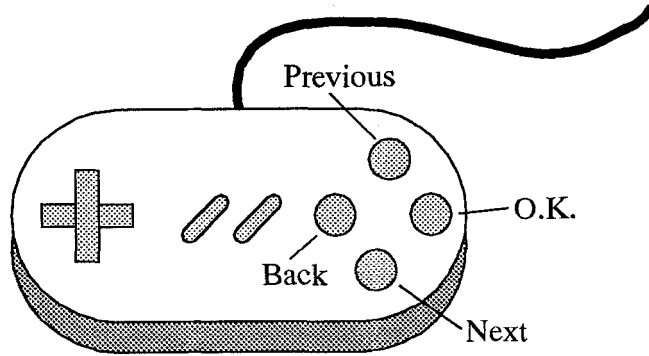


Figure 3: Easy input pad

In the development of the database interface, use of existing developments in the market will be made as much as possible.

4.2 Automatic Reception of Data

The fully automatic transmission of newspaper and other data from the distribution centre to the reader is one of the most important features of any system that wants to be used in true daily operation. For telephone transmission, a number of commercial software packages exist which allow the exchange of data using a so-called telephone modem and a suitable mailbox-program. However, these software packages can only be operated by non-handicapped users or the "experts" among the blind. Therefore, the development of a special module, which automates the process of connection establishment, transmission/reception and handling of errors, has been developed and used with much success. As an additional feature, it is also able to display the progress of the data transfer in a form which can be read by the users, i.e. voice or braille.

5. Distribution Network

The network, mostly built with off-the-shelf components, allows the automatic dissemination of data, access control from the outside, verification of the callers, accounting and generation of charging information as well as remote network management. Initially, a network with three nodes in Austria is being set up. The so-called servers store a variety of newspapers, books and other up-to-date information. Also old newspaper issues are available, again something not easily available to sighted readers. Special consideration will be given to methods which can protect the rights of the information providers, i.e. the publishers and prevent users from unauthorized copying.

The access network is the part of the network which transfers the information from the publisher to the processing server. This part of the network will necessarily be operated by ourselves and will consist of dial-up telephone connections between PCs at the

printing houses and our own premises. Since only one transmission is made every day, the cost of a phone call does not matter so much.

On the other hand, the distribution network must bring the information to all subscribers, which may be several thousand in the real operation. Currently, the distribution is also done via modem and in future possibly ISDN. For a low to medium number of users, this has been identified as the most cost-effective means of transmission, with the additional advantage of cheap off-the-shelf hardware that can also be used for other purposes. This may be extended to other distribution methods in future, as soon as the they become commercially feasible.

6. Transformation of data

The internal data formats used by the publishing houses for typesetting are very different and all unsuitable for the reading system. Therefore, before the dissemination of data to the end users, a lot of data processing is necessary. Currently, such automatic "converters" have been developed for two Austrian newspapers. In the development of the necessary processing software, a cooperation with the „Modellversuch Informatik für Blinde“ in Linz, Austria has recently been established.

7. The Electronic Library becomes reality

With the version 1.8 of NewsReader, powerful functions have been integrated that allow the comfortable reading of all types of electronic books, e.g. fiction and lecture notes. Several types of "table-of-contents" are available and bookmarks can be set and cleared by the reader, as well as shared with others. It was important for us to realise that books are not just another type of newspaper, but something very different in the way they are used. This is taken into account by the user interface. Currently, a small but quickly growing number of very different titles is available like lecture notes, large fiction books, cookbooks and others.

7.1 Bookmaker

An important tool that is given to every user is "Bookmaker", a software package that allows to prepare/convert electronic book titles into the NewsReader format. Together with any RTF (Rich Text Format) compatible word processor (like Microsoft Word), fully structured NewsReader books can be easily prepared and distributed. This is very useful especially to education and university environments, where a large number of important teaching material is prepared internally and is typically already available in RTF format. As soon as they are available in NewsReader format, they can be read by everybody who has the reading software installed, in all possible output formats, comfortably, and within very short (learning) time.

8. Conclusion

One of the most important goals for NewsReader is its general availability to an as large as possible community of readers and information providers¹. From the very beginning, it was not designed as an "academic exercise" but as something that is really useful to a large number of people, who up to now do not have any means for

reading newspapers, books and magazines on their own. This aspect (free choice of information without involving others) turned out to be most important for the readers. From November 1993 to April 1994, NewsReader has been tested in a highly successful field trial in several regions in Austria, during which a newspaper was made available on a daily, up-to-date basis. A general service is currently being started. The system proved to be highly stable and reliable already during the first year of operation, which we regard as a proof for the object-oriented concept. The experience of the first readers (from seven-year to seventy-year old) was enthusiastic, and it encourages us to continue on this path into new areas.

9. Acknowledgements

The authors would like to gratefully acknowledge the help from Dipl.-Ing. Bernhard Stoeger and Mag. Klaus Miesenberger ("Modellversuch Informatik fuer Blinde" in Linz), Klaus Martini from the Austrian Society for the Blind, and various people at the Odilieninstitut in Graz. All gave us very important comments on the initial versions of our system and taught us - patiently - to see with the eyes of the blind.

1. The NewsReader system is being made available to interested parties under special licensing conditions.