

# AudioKrant, the daily spoken newspaper

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## Abstract

Being subscribed to a newspaper, readers expect some basic things: receiving their paper in their mailbox early in the morning, being able to read it privately when and where they want, reading first what they find most interesting, etc. For people with a reading disability all this is not that obvious as only few accessible alternatives are around; accessible news on a daily basis does virtually not exist. Knowing that the number of visual disabled persons follows the rise in the ageing population, an increasing number of citizens however is getting debarred from a daily news reading experience. At present Belgium is one of the rare countries publishing a daily newspaper accessible to readers with a visual impairment, both in a Braille print and an electronic version. Notwithstanding major accessibility improvements over a printed newspaper, these newspapers still have some important barriers for many visually impaired readers. Reading requires specific skills and/or equipment, such as the ability to interpret Braille or the availability of a personal computer, a screen reader, a speech synthesizer or an internet connection. The goal of the AudioKrant project was to develop a new, universally accessible news publication with a minimal learning curve, aiming at a wide range of potential readers: the “talking newspaper”. Thanks to significant progress in text-to-speech technology it is today possible to produce a newspaper read by a computer voice that is understandable, has an acceptable speech quality and is even pleasant to listen to. This paper explains how the talking newspaper is produced, what formats and technology are used, what the current status and challenges are and what future improvements can be anticipated.

**Keywords:** newspaper; accessibility; Daisy; DTB (digital talking books)

## 1. Introduction

According to the European Blind Union 1 in 30 people are blind or partially sighted. Blindness and partial sight are closely associated with old age, so as people live longer the number of visually impaired persons is increasing. Nearly 90% of all blind and partially sighted people in Europe are over the age of 60, and two thirds are over the age of 65[2] [3].

In several countries initiatives exist for publishing news to readers with a visual impairment. Mostly this takes the form of an audio book containing a daily or weekly selection of news articles, read by a human voice, or a Braille book, also with a selection of articles. Of course this is a major improvement for disabled readers but it is still far from the reading experience offered by a traditional print paper: accessible news should also be complete, recent and allow a private reading experience.

At present Belgium is one of the rare countries publishing a daily newspaper accessible to readers with a visual impairment. Both a Braille print and an electronic version are published on a day to day basis. Subscribers can read these papers either by “feeling” the dots on Braille printed papers or by listening to a text-to-speech synthesizer on their computer [1].

Notwithstanding major accessibility improvements to a printed newspaper, the Braille and electronic newspapers still have some important barriers for many visually impaired readers. Reading requires specific

skills and/or equipment, such as the ability to interpret Braille or the availability of a personal computer, a screen reader, a speech synthesizer or an internet connection. Knowing that a growing number of elderly readers have difficulties reading a printed paper and at the same time are unable to learn Braille or to operate a computer, an increasing number of people are excluded from getting information from a newspaper.

Given the rise in age related visual disabilities there is a clear need for a **new, universally accessible newspaper** publication with a minimum learning curve. The AudioKrant project has developed such a “talking newspaper”, which is not only targeted at visually impaired persons, but also at elderly persons and people with a reading disability such as dyslexia, a motor disability or language problems. The aim was to come to a very simple product, requiring as little skills as possible and thus being accessible to a wide range of potential readers. This could include for example elderly persons whose sight does not allow them to read the printed paper, but who do not understand Braille or know how to operate a computer.

For this reason the talking newspaper is distributed on a CD-ROM by surface mail. As most simple solution it can be listened to by means of a “Daisy” player, but also a computer with specialized software or even a regular MP3 player are possible.

This paper explains how the talking newspaper is produced, what formats are used, what the current status and challenges are and what future improvements can be anticipated.

## 2. Daisy

In the DiGiKrant project we used the DAISY format, an XML standard for digital talking books (DTB), for producing accessible electronic newspapers. Several types of books can be stored using this format: audio books, text books and audio-text combinations [4]. For the DiGiKrant we used the text only variant. This makes the file sizes very small so that it can be easily transferred by e-mail. The downside is that the electronic text still needs to be converted to an accessible format by means of a Braille screen reader or a speech synthesizer on the reader’s personal computer. This requires the reader to own a computer, an internet connection, accessibility software and/or hardware, and the skills to operate all that.

To avoid these possible barriers at the side of the reader, the talking newspaper includes both text and its audio representation (hence “talking” newspaper). Technically this means that the spoken version of the text is created at the producer’s instead of the reader’s side. As a consequence the reader does not need a computer: a small daisy player or mp3 player will do (however it can still be read on a computer as well).

A digital talking Daisy book contains a set of mp3 audio files, HTML text files, SMIL synchronization files and an HTML navigation file. Thanks to the latter the reader can browse through the book’s contents in a structural way, jumping to chapters and paragraphs or skipping to the next sentence. SMIL (Synchronized Multimedia Integration Language) [6] enables synchronization between the text and audio version of a book up to the smallest available navigation level.

When reading a DTB on a computer, users can see and hear the book’s structure, navigate to its sections, and read through its paragraphs. Thanks to the SMIL synchronization, words or sentences can be highlighted at the moment when they are spoken (see Figure 1, displaying a newspaper fragment in the application EaseReader). Highlighting can be helpful for example for dyslectic readers.

A DTB can also be read using a more compact Daisy player or even a regular mp3 player. The former will interpret the navigation file, so that structural reading is possible. A simple four arrow button interface makes operating a Daisy player very easy. Figure 2 displays a Daisy reader with a simple and straightforward design, with the usual play/pause, rewind and forward buttons known from a CD player. Four navigation buttons (up, down, left, right) in the middle of the device allow structural reading: the up and down buttons define the navigation level, the left and right buttons navigate through the items in the chosen level.

An example newspaper could contain three navigation levels: sections, subsections and articles. The reader will start with the first article in the first section. When the user pushes the down button, the device reads out the current navigation level (1). At a second push on the down button the device changes the level to 2, corresponding to the subsections) and reads out this new level. After pushing the left button the reader navigates to the next subsection and starts reading its first article. This way, navigation is possible up to the level of individual sentences or even words, as long as the DTB is structured up to this level of detail.

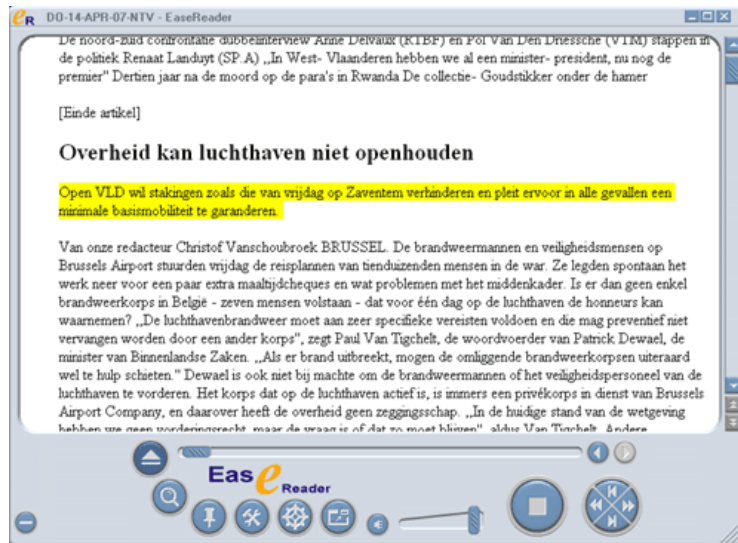


Figure 1: reading a DTB on a computer



Figure 2: Daisy reader

A list of Daisy players and software can be found in [5].

A classical mp3 player does not allow structural reading but can still play the successive paragraphs in a sequential order.

### 3. Accessible newspaper

For obtaining an accessible newspaper the Daisy format is only a starting point: several key requirements determine if the newspaper will be really accessible to and usable for readers with a wide range of visual

disabilities.

First, the newspaper **structure** is of key importance. It should be clear, well-organized and simple, and it should resemble the structure of a printed newspaper, using the same type of columns and a recognizable order of sections. Page numbering should allow referencing between the printed and the spoken version of the newspaper. In the audio newspaper typically four navigation levels are included, from sections (like Front page, Politics, Economics, Local news and Sports), subsections (like Soccer, Baseball and Basketball) and articles to the lowest level of individual sentences. Such structure allows “structural reading” of the DTB, meaning that the reader starts from the navigational “tree” structure of the book to browse to a specific part of its content.

Second, **navigation** through the paper should be straightforward and fast. Readers should have an immediate view on the paper’s contents, seeing the sections, subsections and the number of articles in each section. Figure 3 displays an extract newspaper structure, showing the section titles and the number of articles in each section between brackets. For the audio newspaper we chose for showing both the number of articles and the number of subsections (if any) in each section. For example: “Sports (23 articles and 4 subsections)”.



Figure 3: example newspaper structure

Readers should also be able to jump from one section to the other or from one article to the other and to quickly skip the remainder of a sentence or paragraph. The four button interface, described above, makes this possible if a sufficient level of detail is provided in the newspaper structure. This type of user interaction makes “sequential reading” more efficient. In the audio newspaper sequential reading is further improved by providing two types of tunes, marking the end of a news article or the end of a section. Without these tunes it could be unclear when a new article or section has started, as the reading software or hardware just continues reading.

Finally, the **quality** of the newspaper’s contents, both text and audio, should be impeccable. This seems obvious, but with a (semi-)automatic production process it is not an easy goal to achieve.

These requirements formed the basis of the analysis, design and implementation work for the “production wizard”, an application allowing the daily production of the accessible audio newspaper.

#### 4. Production process and challenges

The accessible newspaper in its three forms (Braille, text and audio) is produced at nighttime between the

journalists' deadline and the postal truck's departure time, leaving a very short production time (less than 2 hours). For this reason the production process of the spoken newspaper was optimized for efficiency, leaving little room for error and manual intervention.

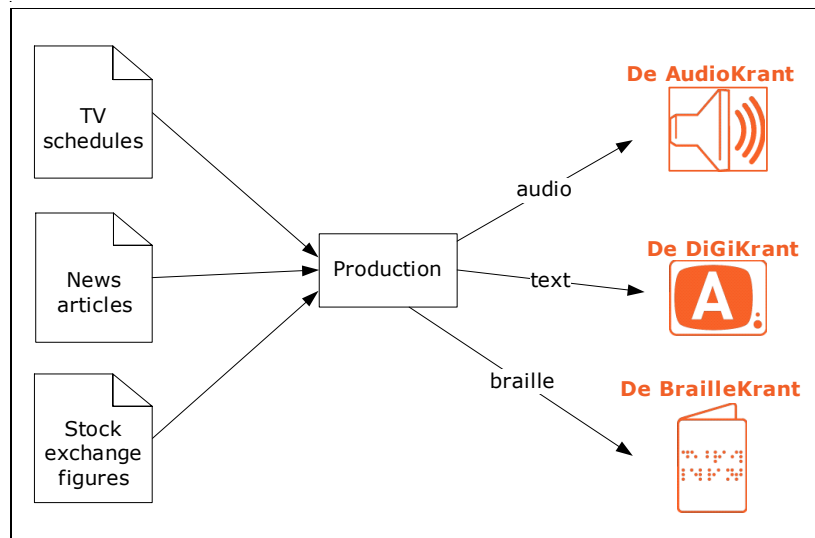


Figure 4: accessible newspaper production in three forms

As a first production step content is gathered from various sources, including newspaper articles, TV schedules and stock exchange figures. Most of the input files are in XML format, like the news article displayed in Figure 5, while some still use a text based format with simplified tags, like the stock exchange example in Figure 6.

```
<npnote np='BP' groep='het_nieuwsblad'>Pajottenland</npnote>
<npnote np='OG' groep='het_nieuwsblad'>Oudenaarde-Wetteren</npnote></nplist>
<sectnote sect='A'>NATIONAAL</sectnote>
<authordeptnote dept='NATIONAAL'>NIEUWS</authordeptnote>
<workflow.author>chs</workflow.author>
<sectpage num='6'></sectpage></dept.info>
<subject>burgemeesters worden niet benoemd</subject>
</meta.data>
<tekst.data>
<art.data><titel.groep><titel>Nieuwe slag voor
formatie</titel></titel.groep><auteur.groep></auteur.groep><inleiding><para>Minis
ter Keulen (Open VLD) beslist de burgemeesters van Kraainem, Linkebeek en
Wezembeek-Oppem niet te benoemen. Daarmee zit de oranje-blauwe formatiepoging nog
iets dieper in het slop.</para></inleiding><broodtekst><para>Wim Winckelmans
'Wij begrijpen niet dat in de 21ste eeuw een burgemeester die democratisch
verkozen is door een overgrote meerderheid van zijn bevolking, niet wordt
benoemd. Dit helpt de verzoening tussen de gemeenschappen zeker niet vooruit.'
```

Figure 5: news article source fragment

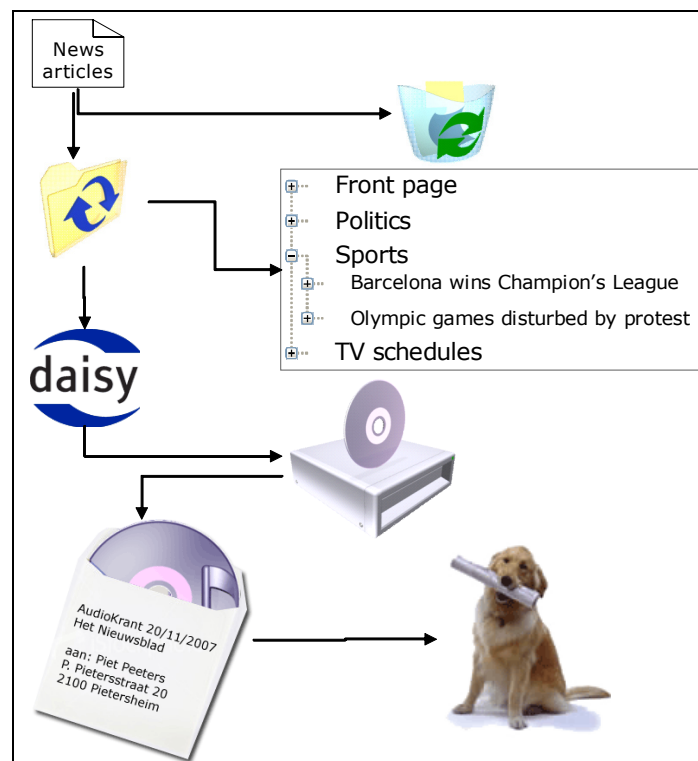
| <TITEL1>CONTINUMARKT       |            |       |         |         |         |        |
|----------------------------|------------|-------|---------|---------|---------|--------|
| <TITEL2>BELGISCHE AANDELEN |            |       |         |         |         |        |
| <HOOFDING1>Benaming        | Vorig slot |       | Hoogste | Laagste | Slot    | Volume |
| <KOERSLIJN>Ablynx          | 7.20       | 7.29  | 7.20    | 7.25    | 45980   |        |
| Ackermans-Van Haaren       | 68.00      | 69.34 | 68.45   | 68.67   | 20107   |        |
| Aedifica                   | 41.41      | 42.00 | 41.00   | 41.00   | 2872    |        |
| Agfa-Gevaert               | 7.99       | 8.18  | 7.87    | 7.96    | 1080245 |        |

Figure 6: stock exchange figures fragment

All these files are filtered to improve the quality of the resulting newspaper and are converted to a central XML format. Thanks to such a centralized format the conversion software is flexible in processing any type of input into any type of accessible output. Filtering is important for obtaining a high quality electronic publication from a source that is intended purely for paper publishing. An article title for example might be missing from the source file because it was only available in graphical form for printing. In this case a title needs to be generated from the article content.

In the next step the input file is inserted at the right place in the newspaper structure; the structure is gradually built up when new files arrive. Building such a structure is one of the most difficult tasks in the automatic production process: while the input is article-oriented (each file contains only one news article) the output is newspaper-oriented (containing the full structure).

During the third production step, depicted using the Daisy logo in Figure 7, news articles are converted into their “spoken” version using a text-to-speech converter (or speech synthesizer) such as RealSpeak [7]. Immediately a SMIL synchronization file is created, linking the written text to its spoken audio representation. Because of time constraints it is impossible to have a full daily newspaper read by a human voice, knowing that a complete newspaper can take up to 20 hours of speech. Speech generation software has improved immensely since the typical computer voices from the early days, creating speech that is not only understandable, but even pleasant to listen to. Speech can be improved further by a rule set, defining how certain characters should be read (for example: & should be “and” instead of “ampersand”), and a pronunciation dictionary, defining how specific words should be read.



**Figure 7: Audio newspaper production process**

Finally the output is created as a complete DTB in Daisy format, containing the navigation file, the news articles in text format and in audio format (mp3), and the SMIL files. This end result is burned to a CD-ROM, duplicated, packed and sent by surface mail to the subscribers overnight. As with a regular newspaper,

subscribers should receive their audio newspaper in their mailbox in the morning.

Several technical challenges arise from the fact that the source material, received from the newspaper publisher, is optimized for print rather than for a digital and accessible product. Some information is only available in graphic form, leaving no room for an accessible version, tables are poorly exported and even some article headlines are missing. The first solution for these problems was to try obtaining better source data from the publisher, for example sports results in structured tables. In some cases, where the publisher cannot provide better quality data, the production software tries to improve quality by means of several text filters.

A second major project challenge was time available for production. While the deadline for journalists is around 21:00 h, the first articles become available in XML format from around 22:00 h. At 00:30 h the first shipment is leaving, giving only about 2,5 hours for the production of the accessible newspapers. Every aspect of the production software was designed and developed for optimal production speed, for example running several speech processors at the same time in parallel threads, as the text-to-speech module is the most CPU-intensive task of the entire process. Today the total production time for all newspapers (in total about 500 MB in file size) averages around 1h20min, not including the time needed for duplicating, packing and transporting to the shipping department.

## 5. Future work

The audio newspaper was developed between May 2007 and May 2008 and was launched on June 2<sup>nd</sup>, 2008 with a press conference and seminar on June 6<sup>th</sup> in Brussels. As of that date the production wizard is operational for the accessible newspapers' production crew, allowing them to publish their products on a day-to-day basis.

After a few months of beta testing it is clear that, although we are ready to produce a daily audio newspaper of acceptable quality, not all technical challenges are conquered yet. Especially the time constraints, tied to the physical delivery of the CD-ROMs and the late availability of source material, are still a daily challenge. As a result the first delivery group (leaving at 00:10h) today receives a newspaper with less content and structure than the second group (leaving at 2:00h).

We are working on two levels to solve the problems related to the short production time. As a first solution the publisher is working on a solution for an earlier delivery of the source material. Of course the journalists' deadline cannot be changed, but the accessible newspaper production process does not have to wait for the paper production process before starting. We are now trying to obtain news articles already when they are positioned in the newspaper's layout, even if they are not set up yet on the printing plate. This gives some extra production time for the audio newspaper.

A second solution for the (too) short production time could lie in non-physical distribution channels such as the internet. Being distributed over the Internet to its subscribers, the audio newspaper production could be postponed until later at night, when all source material is available. Although this might sound as an unnatural distribution channel, given that the target audience does not have a computer or internet connection, several user friendly solutions exist for bringing the content to the reader automatically. The ORION Webbox for example is a device that downloads new content from the internet overnight, allowing the reader to start enjoying their fresh newspaper as soon as they get up in the morning, all without manual intervention. Knowing that an audio newspaper in mp3 format averages about 350 MB of data per day, a decent internet connection is necessary.

As soon as this type of distribution is used, the increased production time allows new features improving the newspaper's quality, such as personalization. Subscribers could choose in which type of content they are interested (sports but not economy e.g.) and receive a customized newspaper every day.

## 6. Conclusions

Hearing computer generated voices during the 1980's it was unimaginable that people could listen to such a voice reading an entire newspaper. Significant progress in text-to-speech technology today allows products such as a spoken newspaper that is understandable, has an acceptable speech quality and is even pleasant to listen to.

One of the major achievements of the spoken newspaper for visually impaired persons is that it gives them back the opportunity to enjoy a **daily, individual and private news reading experience**. With a small player one can read anywhere, anytime and at one's own pace without needing any assistance. In a world where ubiquitous information access is getting commonplace, this can help impaired persons to get included and overcome the digital divide.

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