Audio News Reading System for Visually Handicapped People

Emin Borandag, Fatih Yucalar

*Abstract***:** *Visually handicapped people need to access news sites in an easy way in order to benefit from the working conditions and social rights in their daily lives. Today, there are a variety of software developed abroad with different features for the use of visually handicapped people living in our country. In this study, a software named "Audio News" converting text to speech was developed for visually handicapped people by using possibilities of mobile technology. This software will allow them to listen news on national news sites by entering them with a convenient, easy and fast interface. This software enable visually handicapped people to access information on the news portals. In addition, the usability of information technologies for visually handicapped people was questioned and some suggestions are made for the software developed along with national and international studies in the literature.*

*Index Terms***:** *Audio, Software Developed, Handicapped People*

I. INTRODUCTION

Within the scope of the protocol made with the Presidency of Disability Administration, the "Research on the Challenges and Expectations of Disabled Individuals, 2010" was conducted for the first time in the country for disabled individuals registered in the National Database for Disabled Individuals [1]. With this research, it is aimed to determine the problems and expectations in the daily life of the disabled individuals and to be able to effectively form policies in this area. In the study, the National Database for Disabled Individuals created by the Presidency of Disability Administration was used as a framework, and the fieldwork of the study was carried out in June 2010.

Of all the disabled individuals registered in National Database for Disabled Individuals, 29.2% of them are mentally disabled, 8.8% orthopedically disabled, 8.4% visually impaired, 5.9% hearing impaired, 3.9% psychologically or emotionally disabled, 0,2% language and speech handicapped, and 18% have more than one obstacle. 58.6% of the registered disabled individuals are men while % 41.4 of them are women [1,2].

12.29% of the total population of our country are disabled and 0.6% of them are visually impaired. This rate comprises 8.4% of the total disabled population.

In the first survey conducted in 2010 for disabled individuals by the Presidency of Disability Administration, it was found out that the disabled individuals had problems in their daily lives and met with many obstacles. There are a number of studies which aim at making the lives of the visually impaired

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individuals easier by using technology. For this purpose, software has been developed for transforming the texts in web sites into the speech. In the second part of the study, the scope was examined and literature review was carried out. In the third part, information was given on the software called reading out loud developed to remove some of the obstacles against the blind. In the fourth part of the study, the results obtained will be mentioned.

II. THE SCOPE OF THE STUDY AND LITERATURE REVIEW

An ideal system for the blind is a software that reads out loud and provides the fastest and the easiest access to the news. This software ought to be developed in a way to make it easier for the blind to read the news on a chosen web site. In this context, software solutions in the literature concerning the visually impaired individuals are examined under two headings: screen reader programs and voice-activated programs.

According to a survey conducted in 2010 by TURKSTAT, visually impaired individuals use mobile phones more than other disabled individuals by 52.9% [1].

For this reason, the software to be developed for the visually impaired individuals should include the following:

- Phone screen reader software
- Voice-activated phones
- The vocabulary and voice recognition grammar in Turkish and software integration
- Audio user's guide

A. Screen Reader Software

Screen reader programs are essential components for visually impaired individuals. In all menus, it is a means of interacting with the blind when approving what's written, reading news and messages etc. Since the user cannot see the screen, these kinds of software are everything for the blind. The information displayed on the screen is synthesized and transformed into voice by means of text-to-speech (TTS) technology. With these programs, you can:

- Make and accept phone calls
- Read and write SMS
- Manage contacts and calls
- Read the number on the call screen and the caller on incoming calls
- Navigate the Web
- Send and receive e-mails
- Manage calendar appointments, and reminders
- Create audible and written notes
- Make calculations

- Listen to music
- Change phone settings
- Share files between devices

When we look at the software, developed for the same purpose, in the literature,

Mobile Geo: The software intended for the blind and developed by Code Factory to be used on Windows Mobile platform. It is the first and the largest software solution that offers a wide range of support for visually impaired users. Mobile Speak software, which is offered by the same company, is also used for audio screen reading [3].

Code Factory: The Mobile Speak screen reader program, which is another products sold separately by the company mentioned above, is very successful and it provides a consistent service with its own Mobile Geo engine application. It is a screen reader for Symbian and Windows Mobile devices and screen contents can also be presented in Braille. It can also run Nokia Ovi Maps [3].

Freedom Scientific: The JAWS application, the screen reading software of Freedom Scientific Company who produces different products for the visually impaired, is a popular program that is widely used. JAWS is compatible with almost all Windows programs and is generally used in computers [4].

Figure 1 Screen reading software of freedom scientific company [4]

Handy Tech: Talks & Zooms, a product of the company that produces various solutions for the visually impaired individuals, works only on phones with Symbian operating system and has Braille support. Text Scout, another application of the same company, is a handy software that describes the camera's view through the phone's camera [5].

Figure 2 Text scout application of handy tech company [5]

The photo captured by the camera is sent to a server, where the text is resolved and then read from the phone to the user.

Figure 3 How text scout application works [5]

NV Access: The greatest feature of NVDA, a software developed by the company is that it is an open source and a free screen reading application. Since it is open source, it can be developed for other platforms and other use of purposes.

B. Voice-activated Software

Voice-activated programs are one of the first things the visually impaired individuals will need to start using phones and applications that help them navigate. These applications have an audio technology that is used to put the given voice commands in a way that the computer will perceive them. The chosen software should understand and synthesize Turkish words.

Microsoft: Thanks to the Microsoft Voice Command application, which is available for mobile phones with Windows Mobile operating system and is free, allows users to manage their devices with voice commands [7].

Figure 4 Voice-activated software of Microsoft [7]

It does not have screen reading feature but is an important component since it has voice-activated for navigation.

Cyberon: It is one of the strongest companies in the field of voice recognition and TTS technologies and its application is downloaded on some smart phones. With this application, phone calls can be made,

Contact information can be viewed and applications can be opened with voice. It can also be used with a Bluetooth headset, providing the user with more flexibility [8].

Figure 5 Voice-activated software of Cyberon [8]

The software can run on many operating systems such as Symbian, Android, Microsoft Windows Mobile, Windows CE and Linux.

eSpeak: This software is free because it is an open source program written in C language. This program is advantageous in that, in addition to its fast operation, it supports many languages and it is very small in size because it uses a "formant synthesis" method as opposed to human voice used in other synthesizers. Since it is open source, it has been transferred to many operating systems such as Android, Mac OSX, Windows and Solaris, and it has a shared library (DLL) that other programs can use. Since it also supports SAPI5, it can be integrated with programs that use the same interface. Additionally, SSML (Speech Synthesis Markup Language) and HTML supports are also available [9].

III. DEVELOPED SOFTWARE

A barrier-free news reader application for visually impaired individuals has been developed. The system draws the news details from different online news sources and according to the authors by taking advantage of RSS technology and HTML tags. The system sorts these articles and news articles by their authors and related news categories (technology, current affairs, politics, sports, etc.). The application consists of two modes, normal mode and disabled mode, according to the system user. When the application is first opened, the user is asked for once only whether the disabled mode will be activated or not. If the user responds "yes", the disabled mode will be activated. If the user responds "no", then the normal mode will be activated.

In disabled mode, the system reads the names of news sources in turn. The user can call the name of the news source that s/he wants to open by clicking on anywhere on the screen while the system is reading or immediately after reading is finished. Once the disabled user selects any news source, the system starts reading the category names in turn. The user can call the name of the category that s/he wants to open by clicking on anywhere on the screen while the system is reading or immediately after reading is finished. After the disabled user selects the news and the category, the system reads the news headlines in turn. If the user wants to listen to

the contents of the heading that has been read, s/he must click anywhere on the screen and say "read" right after the headings have been read. Once the system has detected the "read" command, it can read the selected news content out loud. In normal mode, the voice command will be disabled, only control over the application is valid. Normal users can read the news from the news source list and from any category as well as listening to the news while they are being read.

Listed below are the features provided by the system.
- Online news and articles are categorized.
- The application consists of two modes: normal and disabled.
- The user selects a mode when the app is first opened.
- The disabled individuals can control the application with voice activation.
- The system offers voice activation in both modes.
- The application has been developed for Android.
- The system takes news content using RSS and HTML tags.
- The system waits 1 second before reading the news headings.
- The system is able to convert the text into voice using Text To Speech technology.
- Speech To Text, which allows the system to convert voice data into text can perceive voice commands that are defined.

The system developed consists of taking news from the Internet, user mode selection, voice-activated control, news reading and news listening sections. Figure 6 shows the screen shots of the system developed.
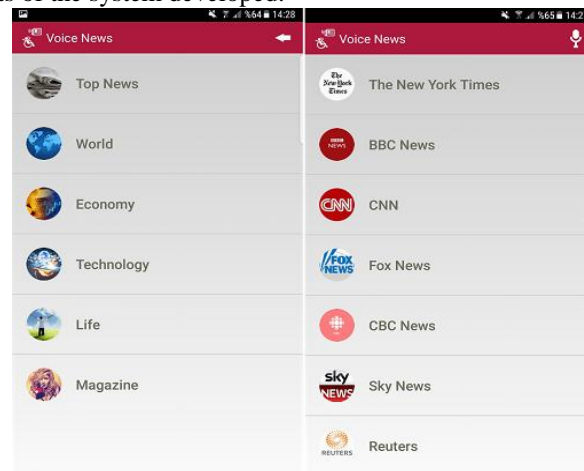

Figure 6 Screen shots of the system developed

A. Used Technological Infrastructure and Its Features

Read out loud software has benefited from different technologies in the development process. The technologies and features that are used are given below.

Android: It's a free, Linux-based operating system developed by Google and the Open Handset Alliance for mobile devices.

Eclipse: It is an open source and free integrated development environment. Although its main focus is Java and Java technologies,

It is also used for different languages like C and Python thanks to its flexible structure.

RSS: It is a web page notification that is often used by news providers, blogs, and podcasts, allowing new added content to be easily tracked. File formats that it uses are .rss feeds and .xml.

XML (Extensible Markup Language): It is a markup language for creating documents that can be easily read by both humans and data processing systems. It is a standard designed by W3C. In addition to storing data with this feature, it also serves as an intermediate format for exchanging data between different systems.

Voice recognition: Voice recognition technology, also known as Speech Recognition, allows human voice to take action by removing buttons between machine and human communication. Speech recognition, which transforms into a form that can be read by machines by recognizing spoken words and expressions, allows users to manage applications with voice commands.

Text to Speech (TTS): Texts prepared in advance by the integrated software of the Communication Machine are played. Any word, sentence, figure or number can be converted into sound without any problems.

B. System Requirements

Some system requirements are needed for the operation of the application called read out loud. These system requirements are given below.

- API 17 (Android 4.2. X) Jelly Bean and above
- Google Speech To Text Turkish language support
- Google Text To Speech Turkish language support
- 3G Internet or Wifi Internet connection

IV. CONCLUSION

It is our duty to facilitate the lives of millions of disabled citizens in Turkey. Since visually-impaired individuals use technology more closely and with the development of technology every day, we can help our citizens live a more accessible life.

The system implemented is an Android application developed in the Eclipse environment. In practice, the system uses RSS technology to extract data from news sources as XML. The application will be managed with voice commands and can also read news and articles out loud. These kinds of projects will make it easy for news sites to be followed and for news to be read. This will make it easier for the visually impaired individuals to socialize and participate in the society. Thanks to this software which can be uploaded to the smart phones, the visually impaired individuals will be able to actively follow the latest news.

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