

# E-mail management system for blind people in Spanish Language

Guillermo Arturo Hernández Tapia  
Tecnologías de la información  
Tecnológico de Monterrey campus Puebla  
México  
guillermoart132@gmail.com

Ana Lilia Reyes-Herrera  
Tecnologías de la información  
Tecnológico de Monterrey Campus Puebla  
México  
alreyes@itesm.mx

## ABSTRACT

Nowadays, due to advances in the media, in particular after the emergence of the Internet, millions of people are communicating through e-mail. Unfortunately, this type of communication is not accessible to blind people. Currently these people need assistance to be able to access their email in reading and writing. This paper presents an application for the reading, writing and sending of emails using voice as a mean of communication between the computer and the person, in the Spanish language. This application was evaluated by five people with visual impairment at the special education school "Baltazar Maldonado Olvera", in the community of San Andrés, in the municipality of Tzompantepec, Tlaxcala, México; obtaining very good results.

## CCS CONCEPTS

Human computer Interaction, interactive voice commands, speech recognition, interaction for people with disability.

## KEYWORDS

E-mail management, user experience, natural interface, blind people.

## 1. INTRODUCTION

After the emergence of the Internet and advances in the media, millions of people around the world daily share enormous amounts of information. Using mainly e-mail and social networks, people who are not communicated under those means, are practically out of all the information exchange around the world. On the other hand, we supposedly have the same opportunities to get a good job and achieve our goals. However, not all technology is designed for people with a disability, just as Brady et al. [1], mentioned in their research.

The International Committee for Blind IAP [2], tries to make blind and visually impaired people productive in our society through teaching in elementary, secondary and high school; as well as, crafting, baking and computing workshops; among others. Such learning in our days requires access to information and especially to communication, thus having to use electronic mail to interact with others.

In the United States, there are 1,179,800 visually impaired people who speak Spanish [3]. About 10,000,000 people suffer from visual impairment in Latin America. According to data from INEGI [4] the second disability in Mexico is the visual, with 1,292,201 of blind and visually impaired in 2010. And most of them without the purchasing power for a complete system in a custom device for blind people.

For blind people, to access their e-mail is a challenge, which they cannot do without the help of a person who can see. Limiting their communication and depriving them of their privacy in some occasions, since their mail is practically public. That is why it arose the need to create an e-mail management system completely assisted by voice, allowing the user access his mail without the help of some person and giving him the desired privacy.

The system is an application that allows people with visual disabilities have access to their email, in the Spanish language; incorporating the functions of reading and writing of mails through synthesis and speech recognition.

## 2. RELATED WORK

There are systems such as the touch-screen tablet for the blind, [5] which was developed at the Stanford engineering school in the United States. This screen uses the Braille system, which allows to optimize the writing and the data management in this type of devices. One of their problems is that it is based on the recognition of the fingers and their position which makes it difficult to handle. There are also devices oriented to the Braille writing as personal computers specialized for blind people. But their cost is very high and is inaccessible for many blind people.

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Another system, is JAWS (Job Access with Speech), it is a screen reader software for blind or visually impaired [6]; from Microsoft. That is, those personal computers that have the Microsoft Windows operating system can install JAWS and make communication more accessible to people with visual impairment. JAWS convert the content of the screen into voice, so that the user can access the system without having to see it. In fact, one of our system evaluators, specifically, the teacher Perez Luna uses it on his personal computer. However, it does not manage the email, and it only supports the English language; Therefore, the need to develop a system to assist the 10,000,000 visually impaired whose native language is Spanish. Furthermore, the interface is very difficult to use since the commands are inputted by keyboard; thus, compelling the blind people to memorize the location of the keyboard keys.

An alternative system for e-mail management for blind people is created by Shabana et al [7], this system makes use of speech recognition, interactive voice response (IVR) and mouse click events. In our case, we did not use keyboard nor mouse for the interaction, only the voice; thus, making the user experience easier and more natural.

The user gives short and spoken commands in his own language, the Spanish. They are more straightforward to learn because they are used on a daily basis. Just as, "open", "close", among others.

The e-mail management system that we propose is highly innovative because the communication between the computer and the user is only by means of the speech, thus being easier and more natural to use; as well as, it is in the Spanish language.

In the case study from Hillen and Evers [8], who focused on solving the problems that blind or visually impaired people encounter when they try to navigate a website, they mention that, when developing their prototype called NavAccess, the most important challenges to overcome were: to provide guidance within the website, to train users more easily and to reduce the cognitive load they make when browsing a website. In their evaluation, they focus on a specific page and consider essential to achieve the three challenges mentioned above. In the e-mail management system, the interaction is smoother since the commands are short and simple; thus, the cognitive load is smaller, and after several interactions with the system the voice commands become natural.

### 3. DESCRIPTION OF THE SYSTEM

The main features of the system are:

- Access the user's mail through the use of voice commands.
- Allows access to any email server, using the SMTP address. As they are: Gmail, Yahoo, Outlook.
- Access to mail functions is through user authentication. This is done by providing the system with a nickname that allows the user to be identified.

- Writing a new mail or replying to an existing one is via the speech recognizer.
- The search for the mail to which the written message is addressed is done by giving the first name of the recipient and if there is more than one, the system mentions the names that it has registered, as well as their surnames for identification
- The reading of an email is by means of the voice synthesizer, that is, the text-to-speech converter.
- Incorporates the spelling function, which is activated after three failed attempts detected in the system. This only in the case of providing name and / or surname of the user.
- The description of images contained in the mail.

For voice synthesis and recognition functions, the system makes use of the "Microsoft Speech Platform-Software Development Kit (SDK)" v.11 [9], which provides the necessary tools such as text-to-speech converter (synthesizer) and speech recognition (voice-to-text converter). This is possible through the use of redistributable speech engines provided by Microsoft. The main reason to use this platform is that both the synthesizer and the speech recognition can be programmed in the Spanish language.

The system architecture is shown in Figure 1, where the system can be installed on a personal computer, tablet or mobile, and has audio input and output.

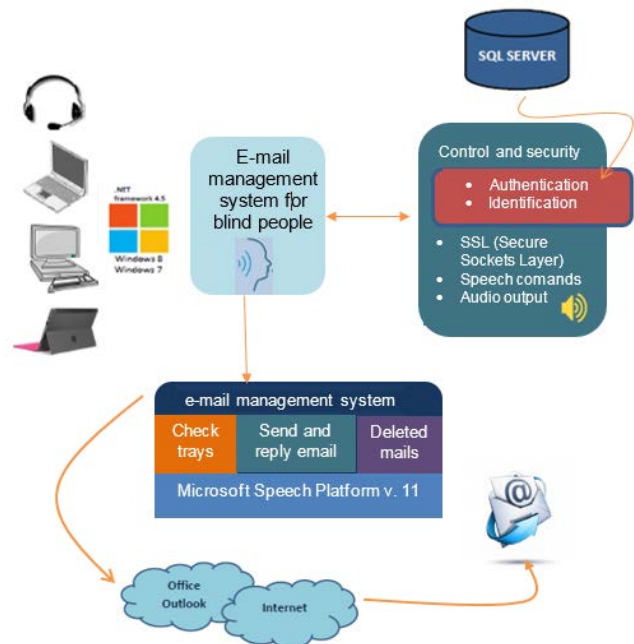


Figure 1. The system architecture

Main functions in the interface:

- Register a new user.
- Login to the system with a registered user.
- Exit.

User functions:

- Review mail.
- Dictate mail.

In order to register a new user, the system goes by steps giving the user the opportunity to give his answers by means of the speech, the system makes a sound to notify the user that he can start speaking. After a time, if the user has not answered, the system repeats the question by making a sound so that the user knows that it is waiting for a response again. The system confirms what the user said to then continue, this step is very important because the user feels more confident. Moreover, it is the way to avoid wrong entries.

When a person writes with the keyboard, usually makes writing errors, the current systems already have integrated an auto-corrector function, in our case the system repeats out loud what the user has said, in order to confirm that there are no errors in the dictation, or that simply the system understood another word. After, it can be corrected. If you have made a mistake for the third time, then the system prompts you to spell the word; in this case, there is no longer confusion. This step might seem tedious, but for our users it works like the auto-corrector.

The past procedure is repeated for the surname request and the nickname. For future access to the mail, the user is able to use just the nickname in order to use to system.

Since the computer-human interaction for this system is only through speech; there is no visual interface; added to the system are console screens only to guide the test system and are not useful to the end user.

To check the mail, the system mentions all the unread mail that the user has, then mentions the titles and senders of each unread mail. After asking if the user wants to read a particular one, the user indicates to the system which e-mail wants to read by the sequence of numbers. When the mail contains images or links to sites, the system reads the title of the image, for example: "sam20.jpg", and gives a very simple description of the image, for example, how many people there are, what is behind the people, colors, among other things. When it contains a link, the system reads the full link, but does not ask if he wants to go to the link. This is a feature that is planned to include in the future. In order to send an email, first, the system requests the subject of the mail and the content. Afterwards, it requests the name of the receiver. For this last step, the system has already preloaded the addresses of the people, referenced by a nickname. Therefore, the user does not have to dictate the complete address with special characters. This facilitates communication between the system and the user. Above all, it avoids the cognitive load to the user.

## 4. TEST DEVELOPMENT

The system was tested with five blind people, three of whom are teenagers and two teachers from the special education school "Baltazar Maldonado Olvera", in the community of San Andrés in the municipality of Tzompantepec, Tlaxcala, México.

In each test users were asked to perform the following tasks:

1. Access their email by authenticating on the system.
2. Accessing inbox contents.
3. "Reading" of a specific email.
4. Dictate a new message and send it to a specific address.

At the end, they were given a semi-structured interview, where users were asked about their experience with the system; as well as, what could be improved. Finally, their general opinion of the system.

The number of participants was reduced, in this type of tests, this amount of participants is considered representative using the same structure as the tests from Y. Rogers, et al. and Stearns, et al. [8,10]. So, the results of the evaluation were qualitative.

The users completed all the tasks easily obtaining good results. Two examples of the results are the following comments:

The comments of the teacher Juan Manuel Pérez Molina (see Fig. 2) are *"the software has improved a lot compared to the previous version, the voice is clearer and more fluid. In addition, it made fewer mistakes by recognizing the words"* and comments by the teacher José Héctor Pérez Luna (see Fig. 3) are: *"It is a very good program, even more accessible and easy to use compared to other applications for the blind as JAWS. On other hand, I would prefer if it could be complemented by allowing the use of commands via the keyboard and not just by voice commands"*



**Figure 2: Operation of the system by the teacher Pérez Molina.**

In general, their experience with the e-mail management system was good; although, they consider that some changes would be adequate to complete their tasks in a much simpler way. The five men mentioned that there is no application to manage their e-mail and that this system gives them privacy to read their emails, since they always needed help for this type of tasks. They are people who try to be self-sufficient and this system pleases them a lot as it helps them to achieve this goal. Especially, for teenagers who use technological devices more often.



**Figure 3: Operation of the system by the teacher Pérez Luna.**

## 5. DISCUSSION OF RESULTS

The problems that occurred during the evaluation were due to the speech recognition engine of the platform. After the three attempts, the system asked to spell the name and until that it recognized the word correctly. With similar results in the dictation of the e-mail body. We can see that the tests performed show an adequate performance of the e-mail management system. We will work on improvements on existing functions and also on the development of new functionalities.

We can conclude that the improvements made to make the system more usable and simple for users blind or visually weak are:

- Allow the user to create their own voice commands to perform specific tasks.
- Remove unnecessary content such as advertisements or irrelevant information that may lose or distract the user.
- Organization of information by blocks.
- Full browsing experience. Allowing to use the e-mail in the same way a person able to visualize the content does.

- Delete read and unread emails.

## 6. CONCLUSIONS

The e-mail management system is in a development stage. We have detected that there is a real need for users with differentiated abilities to be able to perform a common and very important task such as reviewing and replying their e-mail. The test sessions results gave us the kind of functionality that users need, as well as the type of interaction design we need to do, such as more detailed in some aspects and less information in some commands. We have work to do with the application architecture to include new features. On other hand, it is under development to expand the system to manage one of the most popular social networks. It seems to us that this work will allow the participation of more blind people on the internet. It also gives us perspectives for new technological developments and for research problems in the area of human-computer interaction for people with different capacities.

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