

Analysis and Design of E-mail Systems for Disabled Population

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Abstract— Email being a formal way of communication is an inextricable part of our life. Mostly keyboard and mouse is used as input devices and the differently abled people face problems to use these devices for accessing emails. This paper presents study of the existing email systems available for the differently abled people with their pros and cons, and suggests a generic system that can help the disabled people access email accounts efficiently. We are focusing on general population with different disabilities.

Keywords-*email; blind; differently able; generic email client; voice; physically challenged*

I. INTRODUCTION

Today with the growing rate of technology the disabled population especially the blind and the arm less are left behind and deprived of the benefits of the technological advances mainly because it all depends on where we click and what we press. Today there are more than 3,900,000 blind and armless people combined together in India alone [6]. Accessing emails is as necessary for them as it is for us. There have been different techniques and emails systems proposed in the past. In section II we review each of them and summarize their pros and cons. Finally, with reference of these summaries we present our solution and an outline of our system in section IV.

II. EXISTING RESEARCH

Here we are taking three research areas of email for physically challenged people. Those are VoiceMail Architecture in Desktop and Mobile Devices for the Blind People [1], An Interactive Email for Visually Impaired [2] Email System for Disabled [3].

- According to Research on Voice Mail for blind people, the system has efficient techniques of recording the voice to eliminate the language barrier and the use of mouse for accessing the GUI is excellent. Also, there is no extra hardware cost as most of the computers and smart phone come with the facility of sound recording and playback [1]. But there are some limitations, if the user is blind they cannot type in case of the android version of the email system. The system still depends on the users to type in the email address. Today email is mostly used for formal communication in colleges, universities and in the industry and these will mostly be text emails. Since, no text to speech is provided, the blind user will not be able to access those emails. In that case the system will be useful

for communication only between the blind or the illiterate people because normal people prefer text emails over recording voice and these text emails won't be accessible to the blind user.

- Another research proposes a way in which the blind users can access their email accounts and make them self-dependent. It also provides directions for how the users can advance towards the web applications [2]. However, the use of extra hardware is of concern and fingerprints cannot be used as authentication for every web application. Also the system will be a static one. The person would not be able to access his email account from a different computer which does not have fingerprint hardware and does not have the user's prints registered into the system. Wired connections need to be established if the user wishes to use another computer and it would be a difficult task for the differently able user.
- An email system developed has presented the efficient use of TTS (Text to Speech) and Windows SAPI (Speech Application Programming Interface) along with the voice authentication for the disabled users [3]. Voice operations enable the disabled users to give commands for composing the emails and retrieving the received emails. The research also proposes a way to incorporate languages other than English with the help of Government and Binding theory. The requirement of an administrator account to manage the accounts of the disabled people makes all the users directly dependent upon the administrator for managing their accounts. It gives only partial independence to the users to compose their emails but not to manage their email accounts. They cannot delete the emails if they want to. The administrator has to feed the email addresses in the system for them to be

available in the speed dial mechanism. Security and privacy concerns need to be addressed as the composed emails may contain private or confidential information and the administrator has to maintain the sent email list, privacy might be compromised. The voice of the user is converted to text and embedded into the body of the email but conversion from speech to text is not efficient in noisy environments. Moreover, it depends on the accent of the user and can erroneously detect words, punctuations and other semantics based on the accent of the users. In a country like India where we have 22 official languages and more than 1000 other languages [7], accent of users will largely vary thus hampering the system performance. This research lays a strong foundation for the future work to be done eliminating the limitations.

III. PROPOSED SOLUTION

Considering the limitations and future scope of the previous research done we propose a generic email system for the physically disabled Users like

- Completely blind,
- with restricted hand movement,
- suffering from paralysis,
- armless and
- partially blind.

We propose a system with the following features followed by brief explanation of the block diagram.

A. Features

- Complete voice operability
- GUI as output channel for sighted or partially blind people.
- Managing each email locally and in synchronization with the email server.
- Minimum facilities to delete or mark the email as spam. These can be extended further.
- Independently managing the inbox as well as the sent email box without involvement of another person.
- Self-learning and compatible with various email service providers like Gmail, Yahoo, Hotmail etc.
- An alternative way of text input for users with restricted hand movement.
- We adopt the technique of directly recording the voice of the user and sending as an attachment from [1].

B. Block Diagram

The major modules in our system are Compose module, Check inbox module, Database module, Voice operations and GUI module.

1) Compose email module

The compose email module allows the users to create a new email. This module can be invoked via a voice command or the GUI interface. Once invoked the user will be prompted for various required input like

email address of recipient, subject and body. The user will be able to select a default subject and voice message to avoid typing. An option to select the recipient from preloaded list of email addresses and names will be given as an option for typing the email address.

2) Check inbox module

Check inbox module contacts the server module and requests synchronization between the local email database and the email server. This module can be invoked via voice command or the GUI interface.

3) Database module

We store and manage an email database on the local machine in synchronization with the email server. We suggest the use of a light weight portable database for the purpose. This module will be active for most of the running time of the system. As we want to reduce the dependency of the system on network uncertainties we will only contact the email server for any new updated emails.

4) Server module

The server module will be configured at the time of installation and user registration of the system. The server module communicates with the email server, Gmail server for instance, and downloads all the new emails and performs local database synchronization with email server. This module is invoked by the Check inbox module.

5) Voice operations and GUI module

Voice operations and GUI are the two ways of interacting with the system. The user can configure them according to his/her own choices, preferences and the aid they require from the system. We also propose gesture recognition for taking inputs to the system. The gestures would be captured via a simple web cam which normally ships with most of the laptops today, if the user requires gesture input he/she has to plug in a USB web cam if it is not already present and plugging into USB port is an easy task. The voice operations and GUI module has some constraint. The voice operations and GUI cannot be used to give input the system simultaneously. Thus, if the user wishes to use voice operations, he can get voice response and output on the GUI.

6) Voice Response module

The voice response module is responsible for simple giving voice responses to the user of every action the system takes and every input the system receives from the user. This will give the user a complete command and control over the system.

7) Reader module

The reader module reads out the emails to the user. It can read out emails in two ways. One is to read only the new emails and other is to read out all the emails in the

local database or we can say the local inbox. This module is invoked by the user via voice command or GUI interface.

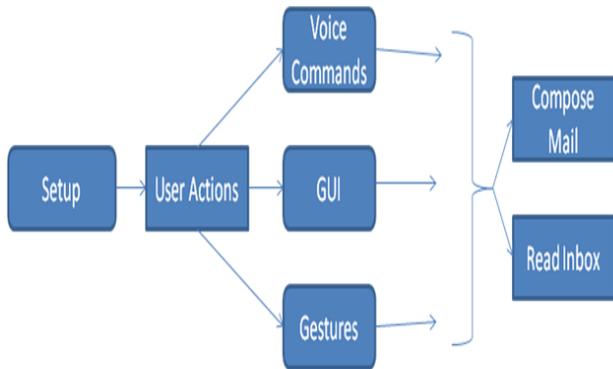


Figure 1. Block diagram of ways input can be given.

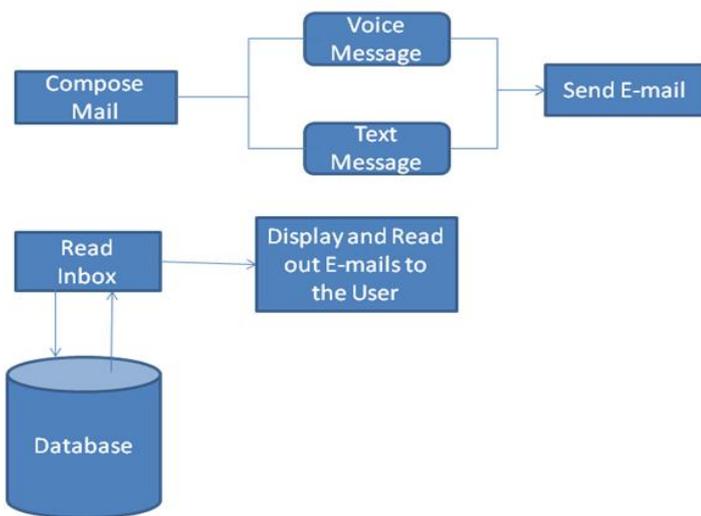


Figure 2. Compose email and Reader Module Block Diagram

IV. CONCLUSION AND FUTURE WORK

As per survey, previous research and systems made in an attempt to help the disabled population to get the benefits of technology, we conclude that all the systems were developed for people with a specific type of disability and are difficult to be used by people with different disability. So we are providing a system with a generic email client accessible to people with different kinds of disabilities, configurable with all the leading email service providers and providing different aids to the users based on their need. Because ultimately, every user is a different individual and needs may vary between individuals with same disability. Therefore, it is better they choose what they want rather than we choose what they should use.

In the next phase of our work we will implement the system we have proposed and publish actual performance results when our system is used by people with different disabilities. We will be using the KLM (keystroke level model) [5] for determining the performance of our system.

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