

Screen Reading Software for Indian Users: A Challenge

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Abstract – A screen reader is a software application that aim to recognize and translate what is being displayed on the screen. This translation is then re-presented to the user with Text-to-Speech, or a Braille output device. Screen readers are a form of assistive technology (AT) probably useful to people who are blind, visually impaired, learning disabled, or illiterate often in merging with other AT, such as screen magnifiers. Text-to-Speech to the many languages is available or difficult to understand the accent for the language they speak. Indian language Hindi are yet not completely available for the screen reading software [1]. The main focus of this paper is to remove difficulty of understanding the language.

Keywords – Assistive technology, Indian language, Screen reader, Text-to-speech, Visually impaired.

NOMENCLATURE

API- Application program Interface
AT- Assistive technology
BBC- British Broadcast Cooperation
CP/M-Control program for microcomputers
GW- Global window
IBM-International business Machine
JAWS- Job Access with Speech
MS-Microsoft
NVDA-Non Visual Desktop Access
PC-Personal Computers

I. INTRODUCTION

Screen reading softwares are the part of Assistive Technology (AT), There are many types of screen readers like Command-line (text), Graphical, Self-voicing programs, Cloud-based, Web-based. One of the screen reader for Microsoft Windows which is a Free, Open Source Software i.e. Non-Visual Desktop Access (NVDA). The software project was started by Michael Curran in 2006. NVDA is programmed in Python [2]. Screen readers like NVDA (Non Visual Desktop Access) is based on accessibility APIs which is a sub-type of Graphical screen reader. NVDA is currently available for Microsoft Windows operating system with the API Microsoft Active Accessibility and IAccessible2. NVDA currently supports many basic functions of Outlook Express, MS-Word, MS-PowerPoint and MS-Excel. Screen readers like JAWS (Job Access with Speech) reads the screen either with a text-to-speech output or by a Refreshable Braille display. JAWS supports all versions of windows released since windows vista with the two versions of the program: Home Use Edition and

Professional Edition. Till now 16 versions are released of JAWS. Both of these softwares are good at their own but NVDA is an open source software and freely available for users whereas JAWS is a closed source software and highly expensive. These softwares are having very frequent English speech which make it unintelligible to some users. Users, who don't know English, for them they updated some regional languages to the software but that was also unfathomable (or not so understandable).

In suggested system, people with vision impairments can easily go through the Hindi language with no difficulties in understanding the Hindi. But here Hindi is not the only language which needs an update in the software, there are many more regional languages of different states and countries has to be update. Another problem regarding the software is graphical reading on the screen which is not properly available in this software. Screen reader not able to explain the pictures, graphs etc. As the assistive technology is limited part in the market, the price of softwares are typically very high with single software costing approximately \$1000 US (₹65000 INR) [3]. People from poor community with vision impairments has a lot of influence from this high price of technology. According to the contemplate done by Times of India, 37 million people across the world were blind out of which 15 million were Indians, approximately 41%, which says 'India has the largest ratio of blinds' [4]. Out of which 2 million are children and only 5% of them receive any education [5], which shows a very unfair situation for the blind users of India.

II. LITERATURE REVIEW

Assistive technology now days are very common among people who are visually impaired. At the top of the list of AT two technologies which help visually impaired people to operate Microsoft Window applications are Screen reader and Screen magnifier. As Microsoft Window is a Graphical User Interface based operating system, most of its application depend upon the mouse and keyboard. Supplying blind users with access to Graphical User Interfaces is still a very composite problem. Expanding upon many advances that have emerged in recent years of design for all principle, an alternate approach to providing non-visual access to graphical user interfaces is presented [6]. The information display on the screen can be represented through speech or braille. Screen Readers were initially made for the BBC Micro, NEC 8201 'Laptop' and for CP/M. Then blind user started using

their personal computers with introduction to IBM PC and MS-DOS. These Screen readers can identify the basic tasks of the users like what a user have typed, characters on the screen and current focus of the cursor position. From identifying characters and keyboard commands to tracking the focus screen reading softwares like NVDA have all these basic functions to perform for the blind user [7].

A. WHICH SOFTWARE IS SUITABLE FOR OUR RESEARCH?

Table I Comparison Between Jaws, Nvda And Window Eyes.

Features	Screen Reader		
	JAWS	NVDA	Window Eyes
Creator	Freedom Scientific	NV access	GW Micro
Operating System	Windows and DOS	Windows	Windows
License	Commercial for Windows; Freeware for DOS	Free & Open Source	Commercial
Indian Language	Yes	Yes	No

From the above comparison table, as NVDA is Free & Open source with the existing option of Indian language in it. We have chosen NVDA for this research paper.

III. DESIGN AND IMPLIMENTATION OF SCREEN READER

A. Architecture Of Screen Reader

All modern screen readers have almost equivalent architecture. The basic functions of all screen readers are same. Here is the brief explanation of the architecture of screen reading software, in this software there are essentially three parts: Speech driver, Screen reader and Keyboard filter.

- a. Speech driver: Speaks out the words that can be input given by user or the word where cursor is pointed. It works through Text to speech process.
- b. Screen reader: Recognizes the words that is displayed on the screen of the computer.
- c. Keyboard filter: Filters that word only which is added to its data dictionary.

These whole bunch of programs is hooked up with operating system by input devices like keyboard, mouse. User when enters its words through keyboard it makes command to the operating system and then screen reader recognize word, handle it to speech driver where text is processed and corresponding speech waves are generated. Like this other applications in the system like MS-Word, MS-PowerPoint etc. are get translated to Speech in which direction the cursor or focus is moving.

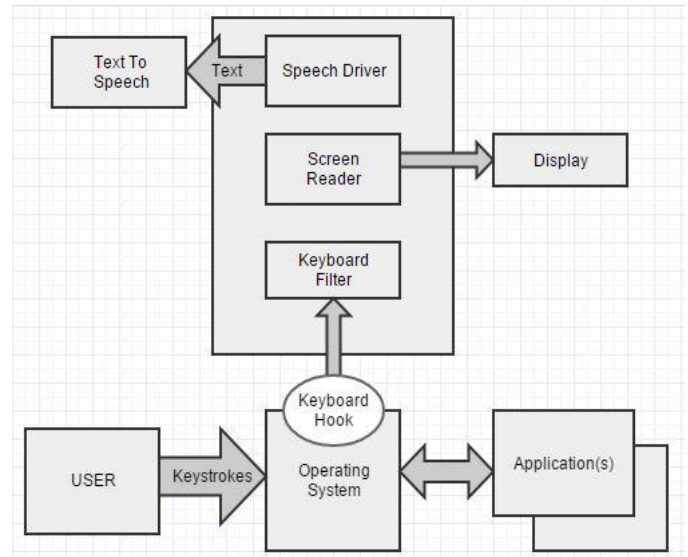


Figure 1 – Block Diagram of Screen reading software

B. Algorithm For Text To Speech

The two main components of a Text-to-Speech system are text analyzing and speech generation. When screen readers recognize text displaying on the system it will further proceed to screen drivers. Screen drivers proceed text for converting text into speech. Text is analyzed in the initial step for composing utterance of words. Then linguistic analysis (includes description of the language on the basis of Morphology, Syntactic, Semantic and Structures) of text is done in three steps i.e. Phasing of text, Intonation and lastly duration is examined.

- a. Phasing of text: the action of dividing a large text or word into phases.
- b. Intonation: the fall and rise of the voice in speaking.
- c. Duration: the time during which text or word is spoken for.

After this linguistic analysis, utterance composed of phonemes, which are the distinct units of sound that distinguish one word from another was generated. Now at the end of this phenomenon, wave form generation of particular a frequencies to produce a sound (i.e. speech). [8]

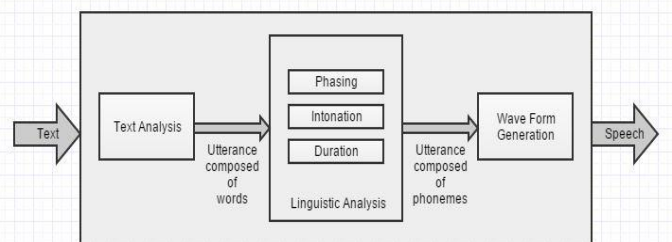


Figure 2- Block diagram of Text-to-Speech

C. Flowchart of the Algorithm

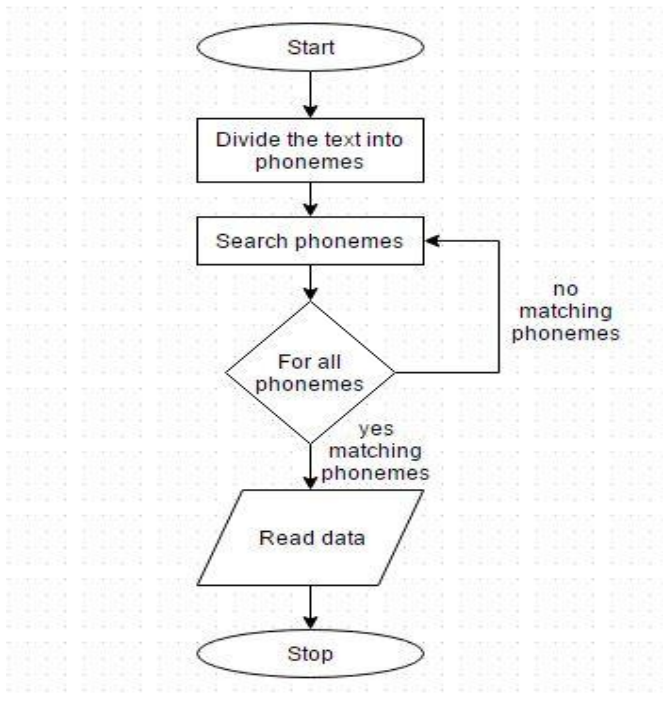


Figure 3- Flowchart for the algorithm

D. Pseudo-Code Of The Algorithm

- (1) Load the target or input text;
- (2) While (for all the characters in target text) do
- (3) {
- (4) Divide the text into phonemes;
- (5) } /*end for (2)*/
- (6) For all the phonemes of text
- (7) {
- (8) Linguistic Analysis: search the phonemes
- (9) If (matching phonemes are found) then
- (10) {
- (11) Read the output data for all the phones;
- (12) } /*end for (9)*/
- (13) If (no matching phonemes found) then
- (14) {
- (15) Repeat the search of phonemes;
- (16) } /*end for (13)*/
- (17) Repeat the procedure for all phonemes of the target text;
- (18) } /*end for (6)*/

E. Adding Indian Language

Many of the screen readers don't have any option of speaking in Indian languages. NVDA and JAWS have option of Hindi language, but they need to be updated and fluency of speaking words needs improvement, so that it will be easy for a visually impaired person to hear the words spoken by screen reading software. There are many other languages in India for which no version of screen readers was available. So it constructs difficulties for a blind user those who know only regional language. For this situation, screen readers can encompass the attribute of other languages to Text-to-speech procedure.

IV. CONCLUSION AND FUTURE SCOPE

In all over the world there are 37 million people who are blind and in this 15 million are from India. Being an aware and active citizen of our country we need to help them in education, so that they can become self-dependent and can spend their life happily. The software we discussed here will help visually impaired to learn computers in easier way as maximum number of them are more comfortable in Hindi language instead of English.

As we all know that education rate of our country is approx. 75% in which percentage of visual handicap is very less (Around 5%). And if we also look for the language English the number of people who can speak and write English well is around 30% out of which very less are visual handicaps. To enhance the knowledge of computers among them we need to make it more user friendly for which Hindi language is more comfortable because for English first we need to teach them English than anything else but in Hindi we can directly start with computer.

By a system which converts text to speech in Hindi will be more useful to the user as well as number of user will increase as it will be more user friendly and understandable.

It will also be less time consuming because we don't need to teach them Hindi, we just need to introduce them with the functionality of the system. If the guidelines are also in Hindi then the user can work according to their need. Working on such a system where percentage of mistake is reduced will be more beneficiary.

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