Creation of an IT Enabled Sinhala to Braille Conversion Engine

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Abstract— **Different text to Braille converter software for different languages is currently available. But for Sinhala language there is no such converter. Hence the visually impaired people of Srilanka who work with Sinhala language, suffer a lot. They need to operate manually for getting the desired output, which is a time consuming procedure. This software / conversion engine will easily convert the Sinhala text into the corresponding Braille document and will assist the learning process of visually impaired person of Srilanka. The additional advantage of the software is, it can produce the Braille output such that user can take Braille print of it using windows printing mechanism.**

Keywords— **Sinhala Language, Braille, Conversion Engine, COM (Component object model), ADD IN Technology, Unicode, Sinhala Pack for Microsoft windows XP.**

I. INTRODUCTION

This conversion engine has been developed using an ADD-IN application in WIN-XP platform that can be accessed from within MSWord and used to convert Singhalese documents created with MS Word into Braille. If a single Singhalese document contains Sinhala along with English then the software will convert the whole document into the corresponding Braille distinguishing English and Sinhala separately using indicators.

Windows XP Professional has multilingual support built into the operating system. Windows XP lets us enter, edit, and view data in many languages. Even these functions can be obtained by using different Foreign Languages like Sinhala. XP Service Pack2 supports these features to configure XP with Sinhala but with an additional support called SINHALA PACK FOR MICROSOFT WINDOWS XP. [18]

II. NECESSITY

At present there is no such Singhalese Text to Braille converter is available, so it requires manual operation, which is a time and labour intensive procedure. Whereas using this software Unicode Sinhala documents created with MS Word can be easily converted into Braille automatically. This automatic generation of reading/ study materials in Sinhala language will facilitate the education process of visually impaired persons of SriLanka

III. BACKGROUND

A. About Sinhala Language

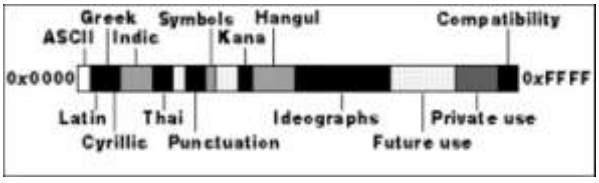
Sinhala is the national language of Sri- Lanka, even in 2004 most computer operating systems, databases and applications were in English and only a handful of Sinhala websites existed [5]. Many people thought, "Computers don't work in Sinhala". Sinhala was included in Unicode in 1998, but there were no implementations even by 2002. [13]

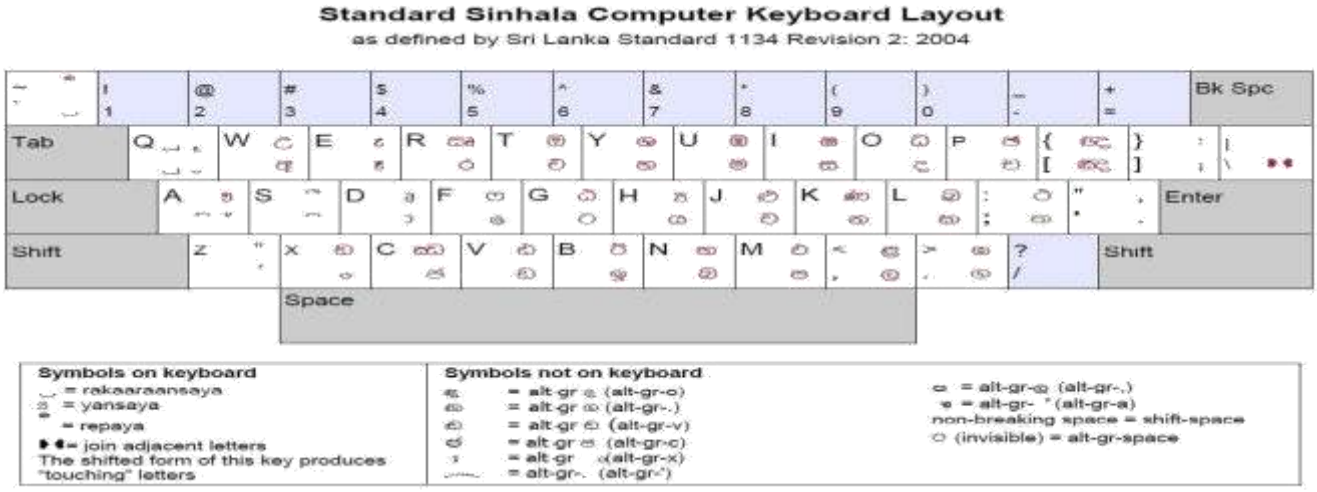
1) Standard Sinhala Keyboard Layout

Most non-Unicode Sinhala fonts use a keyboard-based encoding. i.e., the characters are encoded at the same positions as the ASCII character at that keyboard position. As in other Indic languages, the Sinhala script comprises consonants and vowels. A vowel following a consonant is represented by one or more strokes arranged around the consonant. The shape and position of a stroke may vary, depending on the base consonant. The default vowel is indicated by the absence of a stroke. A pure vowel is generally used only at the beginning of a word, and has a distinct symbol. [14]

2) Unicode

Unicode is a **16-bit**, fixed-width character-encoding standard that encompasses virtually all of the characters commonly used on computers today. This includes most of the world's written languages, plus publishing characters, mathematical and technical symbols, and punctuation marks. [12]





B. Brief History of Braille

Braille is a code, which enables blind persons to read and write. A blind Frenchman, Louis Braille, invented it in 1829. Braille is comprised of a rectangular six-dot cell on its end, with up to 63 possible combinations using one or more of the six dots. Braille is embossed by hand (or with a machine) onto thick paper, and read with the fingers moving across on top of the dots.

It is comprised of a rectangular six-dot cell on its end, with up to 2^6-1 combinations, each representing a letter. The six dots are arranged in two vertical columns, each column having three dots.[9] Each dot has a numbered position in the Braille cell. It is shown as follows:[19]

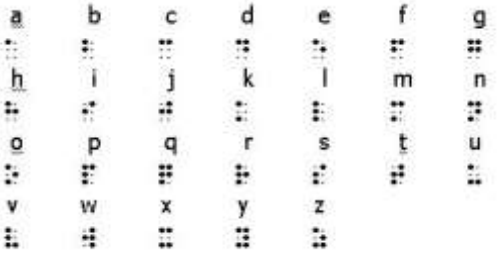


Fig. 1 Representation of Alphabets in Braille character

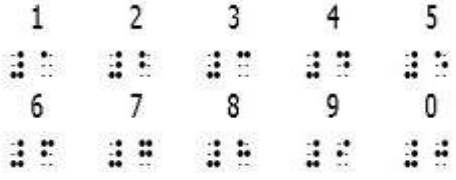


Fig. 2 Representation of Numbers in Braille character

IV. TECHNOLOGICAL AREAS

The total work has three major areas:

A. Get an editor to compose and edit Sinhala text.
B. Creating Text To Braille conversion engine.
C. Invoke the engine to get the job done.

A. Get an editor to compose and edit Sinhala text

The first requirement of this work is to type Sinhala within MS Word. But for doing that a third party utilities and services needs to be installed on Windows XP along with XP service pack-2.

As a universally accepted leading text editor with rich functionalities on Windows platform and as almost all Windows users know its operations, the solution was planned to be developed as an extension to MS Word. The most common, versatile way to customize and extend Office 2000 is by developing a Component Object Model (COM) Add-in. The solution is implemented as an ActiveX dLL type COM add-in using Visual Basic Application.

B. Creating Text to Braille conversion engine

The Text to Braille engine is implemented in Visual Basic in a component form.

C. Invoke the engine to get the job done

It is implemented such that a menu will appear on the menu bar namely “Singhalese Braille”. On a single click upon the menu, the software will convert the Sinhala text into corresponding Braille document. The converted Braille can be displayed in document view of MS Word and also can be sent to a standard Windows compatible Braille embosser, to get embossed Braille

output.

V. METHODOLOGY

The system requirement analysis reveals two main tasks.

- Implementing a text editor facility to support Sinhala language.
- Implementing the conversion engine to convert Sinhala text to Braille.

MS Word was selected as the text editor facility for creating text matters in Sinhala language along with the third party Sinhala utility on Windows XP. As MS Word is universally used as a leading text editing application with rich functionalities on Windows platform and almost all Windows users know its operations, the solution was planned to be developed as an extension to MS Word, which would include the Sinhala text to Braille conversion engine.

A. COM (Component Object Model)

COM is an acronym for Component Object Model. Simply put, COM is a way of building objects that is independent of any programming language.[11] COM tells us how to build objects in any programming language that can also be used in any programming language.

B. COM provides the following features:

- Defines a binary standard for component interoperability
- Is programming language-independent
- Is provided on multiple platforms (Microsoft® Windows®, Microsoft Windows NT™, Apple® Macintosh®, UNIX®)
- Provides for robust evolution of component-based applications and systems

C. COM Add-In

Add-in is a tool that can build to customize and extend any Microsoft Office 2000 application. Add-in performs specific tasks and are usually accessed through a menu command or a toolbar button. Add-in can also perform tasks in the background, responding to such events as selection changes in Microsoft Word[11].

The most common, versatile way to customize and extend Office 2000 is by developing a Component Object Model (COM) Add-in. A COM Add-in is a .dLL or .exe file that is registered on a user's machine and uses the same add-in code and file in any Office 2000 application. The solution is implemented as an ActiveX dll type COM add-in using Visual Basic.

VI. CREATING THE COM ADD-IN

Building an Add-in consists mainly of creating a class module that handles events specific to Add-in and any other events that are required to be specified, along with custom support modules. The class module is compiled as an ActiveX .dll file, since for deployment purpose it is advantageous than developing as an ActiveX exe. (vide Fig.3)

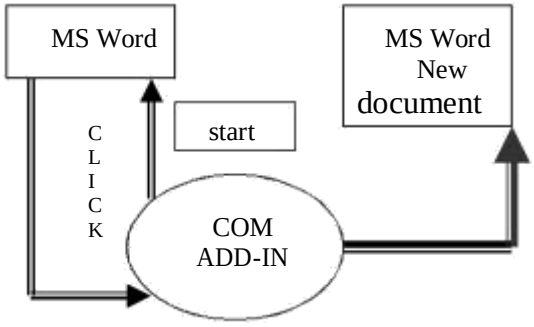
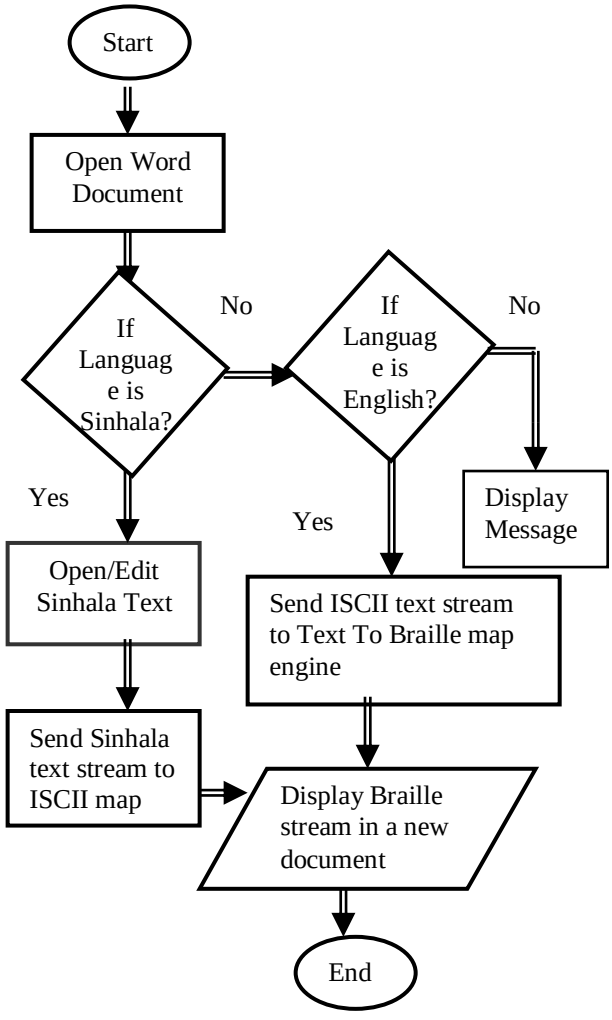


Fig.3

VII. FLOW CHART/ALGORITHM



VIII. SYSTEM IMPLEMENTATION

This project deals with the conversion of Sinhala document into Singhalese Braille.

1) Input

A Singhalese document (which may contain English or numbers as well) written in MS Word.

2) Processing

- Retrieving Sinhala/English characters from the active document.
- Passed to the Unicode to ISCII map engine.
- Checking whether it contains English in the Singhalese document, English and Sinhala text send to two different engines separately.
- Mapping of ISCII or ASCII characters to Braille.

First a string is passed into the function containing the Sinhala characters. Next this character is converted to its corresponding Braille code. Now this Braille code is collected into a string and then form the corresponding Braille output. Braille code will be displayed on the screen as a doc file and calling function to open a new doc file for the converted Braille output.

3) Output

A Braille document within MS word.

IX. BENEFITS

The following benefits observed from the proposed system:

1) It is very much User Friendly
2) It is Cost Effective in the sense that the application meets the Sinhala text processing requirement through already existing MS Word. Therefore the requirement of developing a dedicated Sinhala text processor for this Braille conversion application has been bypassed that has lowered down the development cost of the solution.
3) It is implemented with easy-to-use user interface. Single click operation coverts Sinhala documents into corresponding Braille and displays.
4) The converted Braille document is opened in a new doc file that can be saved for further usage. The user can also edit the same.
5) This software can easily convert many electronic documents available into Braille without any manual operation and brings revolutions in the lives of the visually impaired persons.
6) From the converted Braille document embossed Braille output can be taken from a standard Windows compatible Braille embosser, which will be helpful for the sightless people.
7) The Graphical User Interface can be added to make the visibility of the software better
8) Formatting can be implemented with the outputted Braille file.
9) The time factor will not be dependent on the size of the inputted doc file.

X. EXTENSIBILITY

The project has a scope for further up gradation by:

a) The time factor will not be dependent on the size of the inputted doc file.
b) Formatting can be implemented with the outputted Braille file.
c) The Graphical User Interface can be added to make the visibility of the software better.

XI. EXCEPTION HANDLING

Our program is mainly concerned about the conversion of the Sinhala text into Braille. But as English is an International language we have incorporated it into our program so that text containing both this language can be converted into Braille. The exception handling procedure is fired if any user wants the conversion to be done for languages other than Sinhala and English. If the file contains text other than Sinhala and English, a message box will be displayed and no output will be displayed as shown below

XII. CONCLUSION

In this paper a strategy is proposed to develop an IT enabled conversion engine which has got a huge impact on the life of visually impaired persons of Srilanka. This leads to the generation of a product which provides a number of functions. For example: a text editor facility can be implemented to support Sinhala language. Due to these various functionalities of the product the visually impaired persons of Srilanka are going to be facilitated.

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