



English to Braille Conversion Tool using Client Server Architecture Model

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Abstract: *In order to understand the fundamentals about Braille, English to Braille conversion tool is a GUI based tool for beginner, this paper explains the software design of English text to Braille code conversion and it is displayed in various styles based on client/server concept. Braille is an important language used by the visually impaired to read and write. It is vital for communication and educational purposes. The papery puts forward the new idea for the benefit of visually impaired and Braille learners those prefer to work in computer environment.*

Keywords: *Braille system, Braille code, Braille Key Board Model, Code conversion*

I. INTRODUCTION

All over the world, persons who are visually impaired have used Braille as the primary means of accessing information. Also, the concept of Braille has been accepted as a universal approach that works across the boundaries of the world. Different countries of the world have adapted the system of Braille to suit their languages. Irrespective of these changes or modifications, visually disabled persons understand standard Braille for the English language making it possible to exchange information in a consistent fashion across different countries. Standard Braille is an approach for creating documents which could be sensed through touch. This is accomplished through the concept of a Braille cell consisting of raised dots on thick sheet of paper. Also there are several communication methods that involve tactile sensation, such as Braille-Based typewriter [1] a system for converting print to Braille [2], Braille text on a finger using Braille pin textile method [3] and various Braille emulator method [4]-[6] available. However, some problems arise in such conversion, like lack of privacy for slow learners, complexity operation and mismatch for computer environment. Also person having problem like long term diabetics often have a condition known as “diabetic neuropathy a circulatory problem causing many of the complications that the diabetics might encounter. Neuropathy causes not only insensitivity in the fingertips and toes; it causes more blindness, kidney failure, heart attacks and other related medical problems. The continuous readings in Braille produces swelling in the ankles which cause reading times are very slow [7], [8]. So in this proposed system gives easy conversion of English text to Braille with various styles and format.

II. BRAILLE SYSTEM

People who have both sight and hearing impairments are known as deaf and blind. Because of their impairments they face many problems in their normal daily life. It is particularly difficult for totally deaf and blind people to acquire vital and sufficient information necessary for daily living, compared with sighted hearing people. In standard Braille, the concept of a Braille cell consisting of raised dots on thick sheet of paper as mentioned in figure 1. The protrusion of the dot is achieved through a process of embossing. A visually impaired person is taught Braille by training him or her in discerning the cells by touch, accomplished through his or her fingertips. The image below shows how this is done.

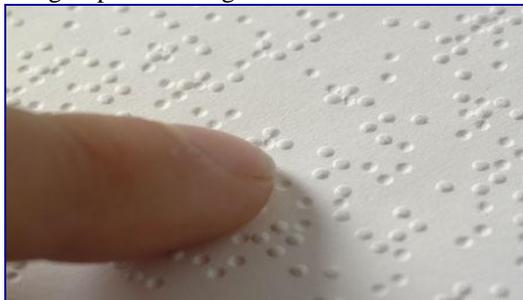


Fig 1: Braille sheet

Each arrangement of dots is known as a cell and will consist of at least one raised dot and a maximum of six. The visually impaired person can touch the raised Position of each Braille cell from left to right in the Braille sheet using their fingertips and understand the equivalent English letter value. Braille uses a group of six raised dots which are arranged in a matrix of three rows to two columns. These six positions (raised or flat) are used in combination to give 64 (2^6) different Braille characters. This clearly means that there is a one to one correspondence between Braille characters and English text.[9]-[11]. Similarly English capital letters, numbers and symbols are constructed using different combination Braille dots. Based on this method the keyboard design of Braille is represented as shown in figure 2.

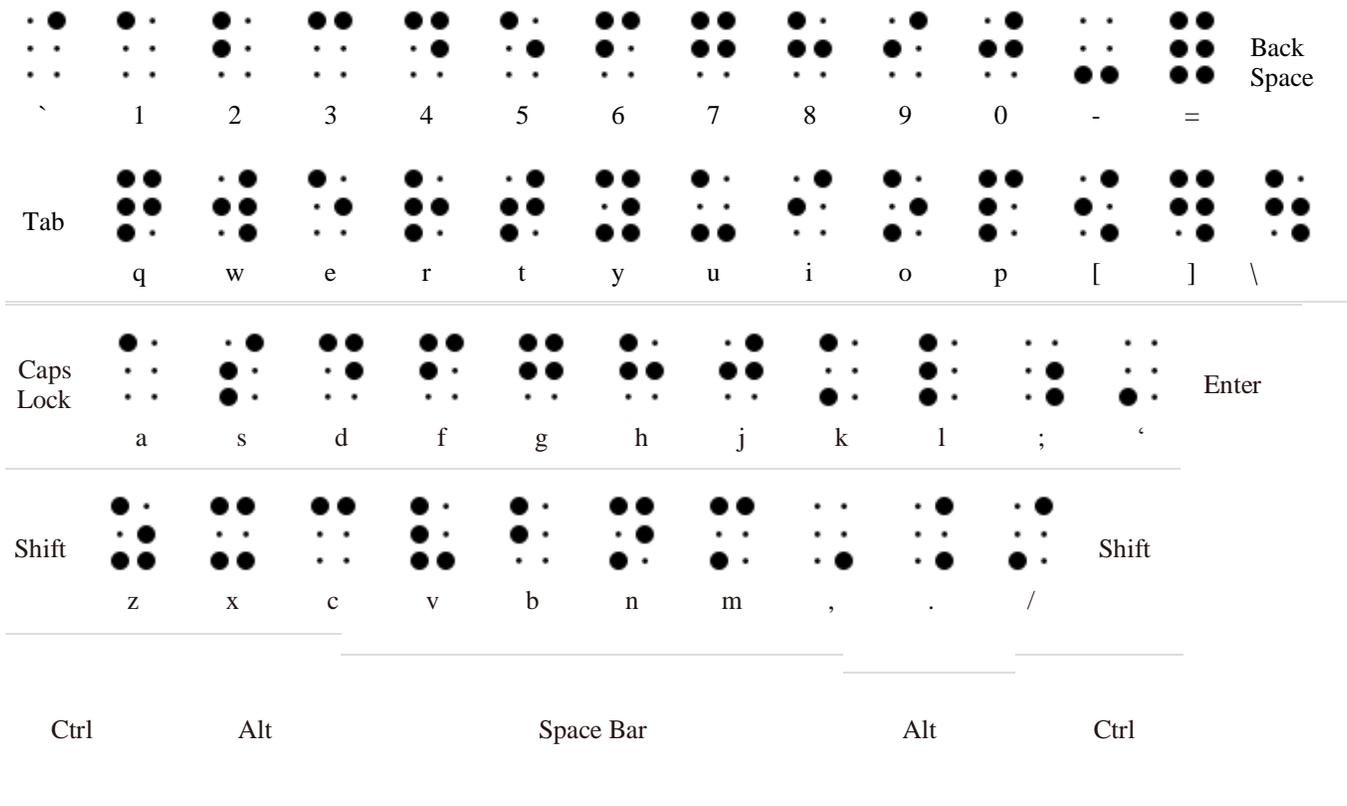


Fig 2: Braille Keyboard Model

III. English Text to Braille Code Conversion Mechanism

The English text to Braille code software tool has been developed by comparing several algorithms of Braille hardware devices like Braille Printer, Braille keyboard and chording gloves. This gives the idea of translation algorithms and functions of converting English to Braille symbols. But these hardware devices are constructed using a language rules table which consists of a set of translation rules and a decision table. During translation the software works along the input text, character by character. It attempts to match a window of input text starting with the current character with one of the translation rules in the language rules table. A successful match with a translation rule must match a segment of text, the context – the text to the left and right of the window - and the state of the engine. The engine state is controlled by a finite state machine, using the contents of the decision table, and regulates which subset of the language translation rules can be used. This allows both contracted and non-contracted translation that can be supported from the same language rules table. The translation rule then provides the translation for that window of input text, which is appended to the growing output text and this conversion, moves along the input text to the next unmatched character.

IV. BRAILLE CODE TRANSLATION ALGORITHM

The steps to convert English text to Braille code are as follows:

1. Read the input value up to the enter key.
2. Separate the words on the basis of blank space.

3. Break the word into single letters.

4. Access the Braille database based on the following major conditions:

If the input value is between 'a' to 'z', then it prints the corresponding small letter Braille Symbol from the Braille Database. If the input value is between 'A' to 'Z' then it prints the corresponding Capital letter Braille symbol from the Braille Database. (Capital letters are indicated by placing a dot in the 6th position of the Braille cell followed by lowercase Braille symbol of the same letter).

If the input value is between '0' to '9' then it prints the Braille Numbers from the Braille Database. (Braille numbers are constructed using the first ten letters of the alphabet "a" through "j" and a special number sign(#) i.e. dots 3, 4, 5 and 6 in front of the each value).

Suppose the input value is in special symbol list (! @\$ % ^ & * () _ + ; ' < > ? [] ; / , . Etc) then it prints the corresponding Braille symbol from the Braille Database.

- Repeat the step 4 until all the characters of the input values are matched with database.

If a character does not match in Braille Database then appropriate error message is generated.

By following the above mentioned steps, the English text is converted into Braille code. This conversion is totally based on one to one matching.

Before translation starts, the input text is checked, ensuring that any character in the text is appropriate for that language. This may be upper and lower case, for instance. It can simplify translation and can also allow more flexibility if required. If the user types wrong input characters or non special character or any non available character in the Braille list it generates appropriate error message.

V. SOFTWARE IMPLEMENTATION FOR ENGLISH TEXT TO BRAILLE CODE

Based on new proposed algorithm, the software tool is constructed using VISUAL BASIC 6.0 and MS ACCESS 2002, which converts all English Text documents into Braille code format one at a time as shown in figure 3.

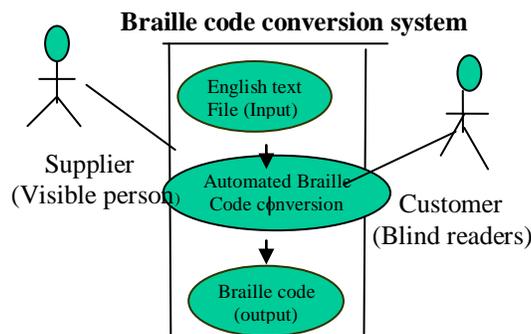


Fig :3 Use Case Diagram for Text to Braille code conversion

In standard Braille, all sixty four cells will correspond to a letter of the English alphabet. During the conversion from English text to Braille code, the database plays an important role. It is used to store all the Braille cell formats. (Braille cell formats are either downloaded from Braille fonts or drawing from several tools). Braille code conversion is coded in the Visual Basic 6.0 language. It is designed to be compiled and run on one of the Microsoft Windows 32-bit operating systems (Windows '95/'98/ME or Windows NT/XP). When compiled to an executable program, in native code, it resides on a machine as a Windows Dynamic Linked Library (DLL). This is a binary executable that supplies a public interface to the Windows operating system and can thus be utilized by other Windows applications with comparative ease.

All Braille cells are stored in MSACCESS 2002 database. So this concept looks like client/server Architecture. Here Braille database stored in MS ACCESS 2002 acts as a backend tool .Input text box, output text box, format designs, hardware link, help

facility are designed in VISUAL BASIC 6.0. It acts as a front end tool and it is connected through ODBC connectivity to Braille database.

The user typed information is stored in the input box of the software tool. During conversion time the software algorithm is applied to the input value, which converts equivalent Braille code resides in the Database and stored in the output box of the software tool.

The screen layout of Braille conversion is as follows. It contains major components like:

1. Input Box for English letters.
2. Output Box for Braille code.

3. Control Button for English to Braille code Conversion.
4. Control Button for sending all Braille codes to Hand Glove.
5. Online help facility for Braille and its functions.
6. Radio Button for Text Size adjustment.
7. Grid Button for Text Style Adjustment

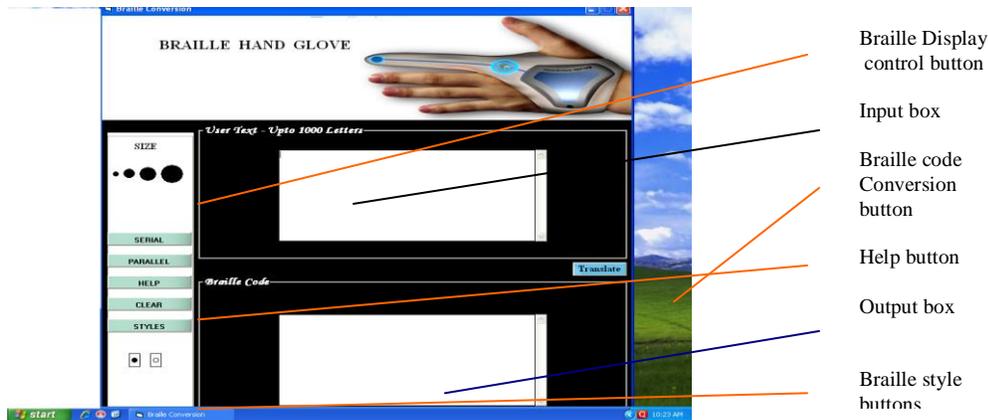


Fig.4 Input Screen for Text to Braille Code Conversion

VI. EXAMPLE FOR BRAILLE CODE CONVERSION

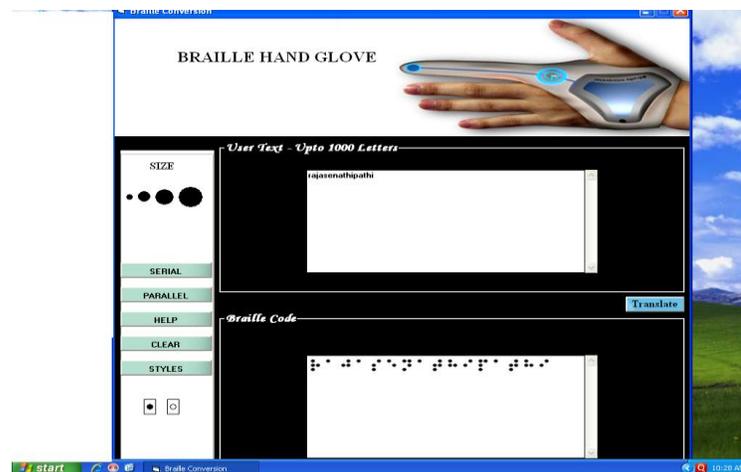


Fig. 5 Screen layout for Braille Code

Here the input value is “rajasenathipathi”, after clicking the translate button, the corresponding Braille code is displayed in the output box. Here initially a sentence is broken up into words and then to characters, then total number of input characters is found out with the software tool. The input characters are moved to Braille conversion software engine from the first letter to NULL value. The software will check all 64 combinations of Braille matching value for all the input character values. If a character match occurs, and then it will send the matched input value to the database and produces the corresponding Braille code as output. If no match occurs then the appropriate error message is generated in error box window. Also the maximum number of input characters is restricted to 1000 due to Braille Design format and font style is fixed as Times New Roman.

VII. Conclusion

The development of low cost English text to Braille is necessary for Braille teaching people and help to visually impaired community. It will show the new way of conversion method for people working in computer environment. In recent past Even though a number of private translation kits are developed, very few could access because of the private ownership. The software algorithm which is coded in Visual Basic 6.0 reads the sentence from the Input box of the Braille software tool and breaks them into characters and are counted up to the value of the enter key. The Braille code equivalent of each character is generated in the output box of the tool. The same technique can be used in various languages like Bengali, Hindi, Tamil, French, etc., The Braille code conversion process is a single step and the data transfer rate is normal and it is controllable. It is one of the best tool for visually impaired people and Braille learning people using computer technology.

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