Use Of Braille Database For Design And Implementation Of Braille Handglove For Deafblind People

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Abstract : Braille hand glove is one of the communication methods for the deaf blind. The Braille hand glove produces the vibration on the six position of the right hand of deaf blind. These six positions are matched to six values of Braille code. Here the user input is translated into Braille code by a conversion algorithm and the same is sent to hand glove to operate the corresponding vibration motors inside the glove. So instead of touching the raised dots in Braille sheet, this Braille hand glove produces vibration based on English character value. The hand glove vibration method sees to be most suitable medium for real-time communication for the benefit of deaf and blind people, who prefer to work in computer environment.

Keywords: Braille, Glove, Vibration, Cell

I INTRDUCTION

People who have both sight and hearing impairments are known as deaf 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. To obtain information for living, Braille glove vibration method is one de`vice for the benefit of deaf-blind people, who work in computer environment. There are several communication methods that involve tactile sensation, such as finger Braille, manual alphabets and the print on palm method. However, some problems arise in such conversion, such as lack of privacy for deaf blind people and not suitable for computer environment. Therefore focus has been on vibration in six different positions which matches to Braille code.

II THE BRAILLE SYSTEM

The Braille code was adapted by Louis Braille in the early part of the nineteenth century from a military system which used raised dots to send messages at night. After competition with other raised systems earlier this century, it has become the main system for

the majority of those blind people who read and write using tactile means, and can be found in many countries around the world. Braille uses the raised dots in groups of six which are arranged in three rows of two and which are numbered from 1 to 6.

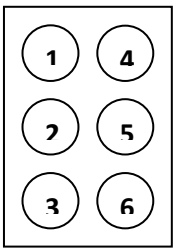


Fig 1. Braille cell

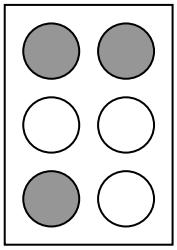


Fig 2. letter M value

These six positions which can be raised or flat, are used in combination to give just 64 different Braille characters. This clearly means that there cannot be one to one correspondence between Braille characters and text Braille code.

As mentioned earlier Braille generally consists of cells of six raised dots arranged in a grid of two dots horizontally by three dots vertically. The dots are conventionally numbered 1,2 and 3 from the top of the left column and 4,5 and 6 from the top of the right column. The presence or absence of dots given the coding for the symbol. English Braille is used to code the letters, punctuation symbol, some double letter signs and word signs directly but capital letters and numbers are dealt with by using a prefix symbol as follows

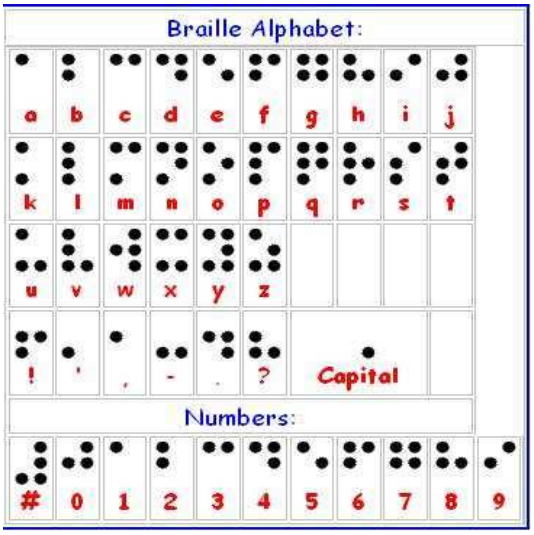


Fig 3: Braille Alphabet

III BRAILLE CODE TRANSLATION

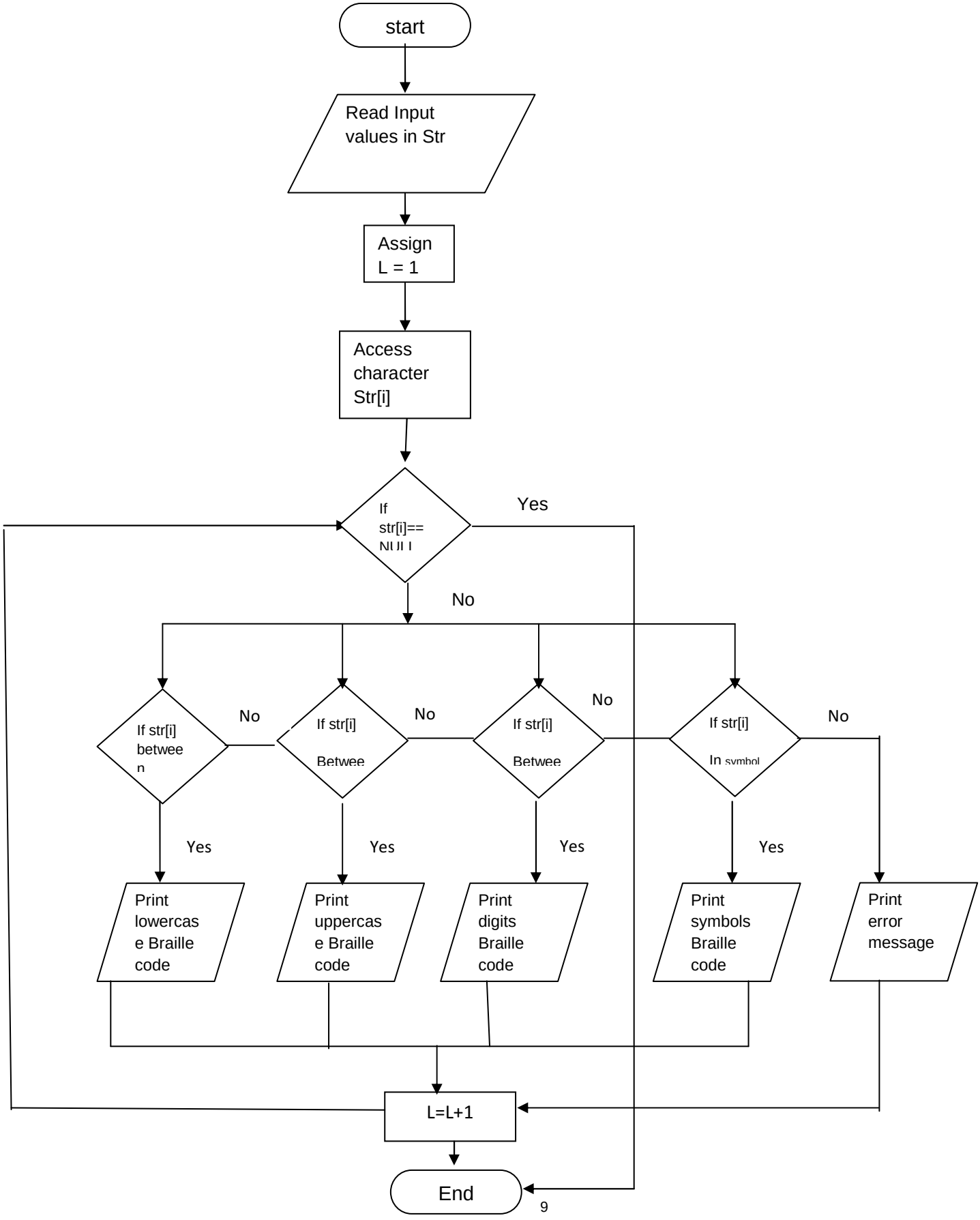
The steps which are followed when any English text is converted to Braille code are as follows

1. Read the input value up to the enter key
2. Separate the words on the basis of blank space
3. Break the corresponding word into corresponding letter
4. Access the Braille database based on the following major condition

(i) Input value is between ‘a’ to ‘z’
(ii) Input value is between ‘A’ to ‘Z’
(iii) Input value is between ‘0’ to ‘9’
(iv) Input value is in special symbol list
(v) If character matches, then print corresponding Braille code as it is
(vi) Repeat steps 4 and 5 until all the characters of input values are matched with database. If match does not occur then appropriate error messages are generated.

By following the above mentioned steps, we will be able to convert English to Braille code. This conversion is totally based on one to one matching. The flowchart for the same is as follows

Flow chart for conversion of English text to Braille code


start
Read Input values in Str
Assign L = 1
Access character Str[i]
If str[i]== NULL
Yes
No
If str[i] betwee n
No
If str[i] Betwee
No
If str[i] Betwee
No
If str[i] In symbol
No
Yes
Yes
Yes
Yes
Print lowercas e Braille code
Print uppercas e Braille code
Print digits Braille code
Print symbols Braille code
Print error message
L=L+1
End

IV SOFTWARE IMPLEMENTATION

In standard Braille, all sixty four cells will correspond to a letter of the roman alphabet. When we convert English text to Braille code then the above conversion chart is used as the database and the input text is matched for the corresponding Braille representation, Braille is displayed. Input and output window will look like as in fig no.

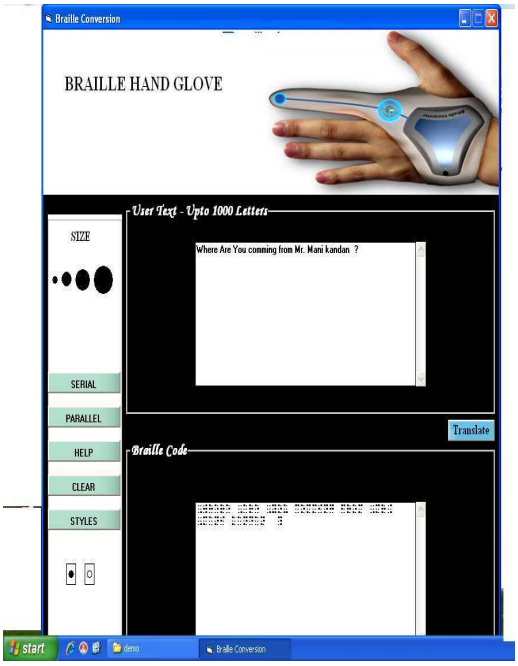


Fig 4 : Screen layout for Braille code conversion

V DESIGN OF BRAILLE HAND GLOVE

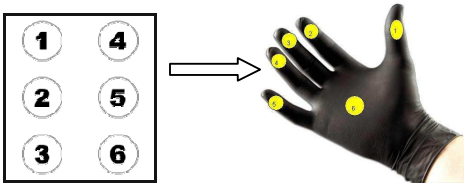


Fig 5: Hand glove with six positions

Braille hand glove principle is based on six dots. The six dots forming the cell permit sixty three different patterns of dot arrangements. It is matched with lphabets, numbers and special symbols of the English language. The Braille glove contains six vibration motors. These are fixed in five fingers and center palm. The basic technique used in the hand glove is based on the ASCII value of English letter from the user typed input in the keyboard. It is converted into Braille value and it activates the corresponding motors. So based on the position of vibration the blind person can understand the value of the letter. For example if the user types the letter “r”, it is converted to Braille value as 1,2,3,5 and this value activates the corresponding motors in Braille hand glove. This conversion program is written in hi tech C language and it is recorded in micro controller of the hand glove. Any blind person can wear this glove in right hand, and understand the English letters through vibration instead of touching the Braille sheet. Similarly the whole word or sentence is converted into Braille vibration and send to blind person. Based on this method the visible person and deaf and blind person can communicate effectively.

VI THE DESIGN CONCEPT

The Braille Hand glove comprises the following key components

1. 89C51 Micro controller
2. RS 232 C
3. Relay Driver and Relay
4. power supplies
5. Vibrator motor in hand glove

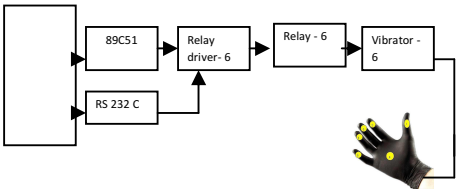


Fig. 6 Block diagram of Braille hand glove

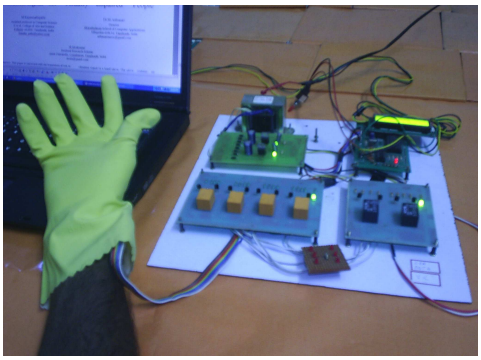
Table 1 ASCII and Binary value for Braille

ASCII Value	ASCII Character	Braille Character	Binary Representation					
			D6	D5	D4	D3	D2	D1
32	(space)		0	0	0	0	0	0
33	!	!	1	0	1	1	1	0
34	“	"	0	1	0	0	0	0
35	#	#	1	1	1	1	0	0
36	$	$	1	0	1	0	1	1
37	%	%	1	0	1	0	0	1
38	&	&	1	0	1	1	1	1
39	‘	'	0	0	0	1	0	0
40	(	(	1	1	0	1	1	1
41	)	)	1	1	1	1	1	0
42	*	*	1	0	0	0	0	1
82	R	R	0	1	0	1	1	1

VII HARDWARE IMPLEMENTATION

The main component in Braille glove is vibration motor. it is configured in coin type motor, is a simple brush motor with a traditional axial design. The eccentric movement of the weight attached to the rotor provides vibration during operation. The amount of vibration is directly proportional to the voltage applied to the motor. Cylinder motors are manufactured in high volumes and are fairly inexpensive. An electrical current applied to the coil in the direction of the arrow generates upward force on the left side of the coil and downward force on the right side, causing the coil to revolve clockwise.

The basic technique used in the hand glove based is based on the ASCII value of English letter from the user typed in input box of the editor. After clicking the serial or parallel mode in the editor, the input English characters are converted into Braille value and activate the corresponding motors. So based on the position of vibration the blind person can understand the value of English letter. Any blind person can wear this glove in right hand, and can understand the English letters through vibration



.Fig 7: Hardware prototype

VIII TESTING OF THE SYSTEM

Both hardware and software Translation programs were written in an incremental fashion, testing and verifying each section of code. This starts with reading the rules from a text file, separating them into fields and matching each field and applying the rule. Consequently debugging and corrections were made to the code at all steps of development. Both programs work well and have not had any fatal errors. The execution time of the programs in software part and vibrations in hardware are done under a few seconds making it acceptable for the Blind people to use.

For the testing of the system we have translated English newspapers heading into the corresponding Braille text and Braille vibrations. We found that it is with 100% accuracy for Braille text conversion and Braille glove is working with 100% accuracy in vibration for corresponding position. Also every conversion is done automatically. The

Translation of English text to Braille vibration is shown in the table 2.

MODE	*Total number of words*	*Percentage of words translated correctly*	
		software	*Hardware*
Serial mode	*876*	*99.62*	*99.12*
Parallel mode	*992*	*100*	*100*

Table 2 : Two modes in Braille Vibration

The little poor accuracy of the translation in serial mode was mainly due to mixing of digits and alphabets. It can be rectified by increasing the buffer size and by decreasing the speed of vibration in hand glove .

IX CONCLUSION AND FURTHER WORK SUGGESTED

The development of low cost Braille hand glove is necessary for visually impaired community. The same Translation technique can be used in various languages like Bengali, Hindi, Tamil ,French, etc., Also it proposes a new approach to blind persons to know about computer oriented technologies. The feedback from visually impaired community is that Braille hand gloves are the best kit for two way communication . This technology if upgraded can prove to be a boon for the visually impaired community so that they can perform better and on par with the visible people

The reverse engineering process for the same problem which produces Braille signal to English text, if constructed can prove to be an effective two way communication tool in online chatting and new effective teaching methodology for physically impaired people.

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