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Hand Gesture Recognition System for Blinds

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ABSTRACT

A real time embedded system is used to interact with an external environment. This external environment may be humans, animals, plants etc. Hand Gesture Recognition System uses a sign language in the form of hand gestures to type the characters on computer screen. Blinds face many problems in their day-to-day life. The most critical of all the problems is their reading and writing. They cannot access computers independently because of difference in the communication medium. They use Braille script for reading and writing purpose, which cannot be interpreted by the existing computers. Also their existing technology is very expensive and not up to the mark. To overcome this problem, we have made a Hand Gesture System for Blinds. The sign language is designed according to Braille script. The six fingers represent the six dots in the Braille. The microcontroller interprets the gestures and sends the data to the computer. The computer recognizes the gesture and prints it on the display. The feature of text to speech is added to the module for error detection and correction purpose.

Keywords: Braille Script, Microcontroller, Flex Sensors, Hand Gestures, Combination Matrix, Text-To-Speech

I. INTRODUCTION

There are many different technologies which are used by blind people for using computers. Many blind people use software's like speech to text. This software's uses speech for accessing or writing on computers. And also these software's are able to convert text to speech in which the things which are on computer are read by the software and the blind person can listen to it.

A hand gesture recognition system is used by the blind people to use a computer. With the help of the gestures, a person can directly write in computer without the help of any typewriter.

To represent a particular symbol in computer we used braille script. The flex sensor is attached to the gloves and the users wear those gloves. With the help of hand gestures, the analogue signal is transferred from flex sensor to the microcontroller. The microcontroller receives these analogue signals and converts them into digital signals.

These digital signals are serially transferred to the computer for identifying letter or number. In this way, the user can write the letter in both English and braille font together very efficiently. To recognize errors an error recognition module is added to the project along with auto correct module .This software is very fast and saves more time and expenses as compared to the conventional typographical systems used by the blinds currently. The autocorrect module will correct the miss-spelled words.

II. METHODS AND MATERIAL

1. Flow Chart

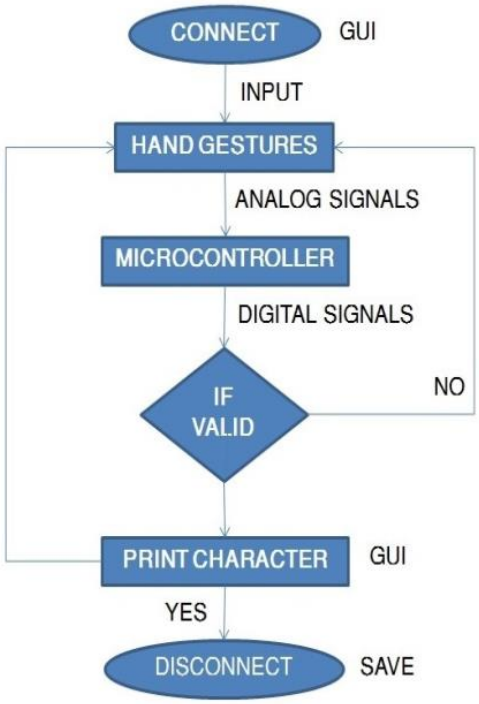

Figure 1

2. Working

The flex sensors are fixed in the gloves. The user has to wear those gloves and according to the degree of bend, the resistances of the sensors change. The resistance range of the sensors is between 250-350 kilo ohms without bending. After bending, the range is of about 45-150 kilo ohm. There are 8 sensors on eight fingers, excluding the thumbs. Each sensor sends its resistance in the form of analog signals. These values are converted into a string of 0's and 1's depending on the valid acceptance range. For example, if range for input "1" is below 125 k ohm, then the all the values below125 are converted to a digital "1" others to "0". Each bit is assigned to a sensor input and two 0's are inserted in between for two thumbs. Thus a 10 bit string is generated for each character.

This string is then sent to the computer to compare with the pre-defined combination matrix. The character matching with the input string is printed on the user interface. The fonts present in the interface are both English and Braille script. The file is saved automatically and can be printed on the braille printer.

3. Description of Modules

A. Flex Sensors

Flex sensors are the sensor which is used to read the bending angle. Flex sensor change the resistance according to the bending angle. Flex sensors produce the analog signals and these signals are passed to the microcontroller to converts the analog signals into digital signals. Then microcontroller sends the signals to the GUI and corresponding alphabets will print on the screen.

Figure 2

B. Microcontroller

Microcontroller is used basically to convert the analog signals to digital signals. Then these digital signals are passed to the GUI and corresponding number or alphabet will print on the screen. Analog signal are converted into 10 digital bits. The string is serially passed to the computer and according to the combination matrix it will print on the GUI.

Figure 3

C. GUI

The GUI receives input from microcontroller through USB drive. Body of the interface contains 2 partitions in which left hand side prints English alphabets and right side prints the Braille language.

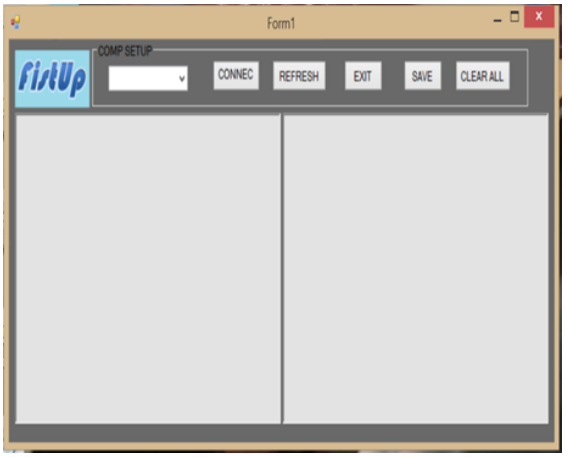

Figure 4

D. Text-to-speech and Autocorrect

In order to be able to know what has been written, a text to speech convertor has been added to the module. As the words get printed over the screen simultaneously it will be pronounced, so the user will be able to rectify the errors if autocorrect has written it in wrong way.

The detection of error and correction features will increase the accuracy of the system. It will make user more comfortable that user need not learn the spellings of each and every word. If it goes wrong then it will correct it.

III. RESULTS AND DISCUSSION

Output : Table no.1

Letter\No	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
A	0	1	1	1	0	0	0	1	1	0
B	0	1	1	1	0	0	0	0	1	0
C	0	1	1	0	0	0	0	1	1	0
D	0	1	0	0	0	0	0	1	1	0
E	0	1	0	1	0	0	0	1	1	0
F	0	1	1	0	0	0	0	0	1	0
G	0	1	0	0	0	0	0	0	1	0
H	0	1	0	1	0	0	0	0	1	0
I	0	1	1	0	0	0	1	0	1	0
J	0	1	0	0	0	0	1	0	1	0

Future Work

1) Full automation

The hand gestures can be created for full control over the system through hand gestures. This will give the visually impaired a complete independence to use a system. The user will be able to excess the computer through hand gestures, opening and closing of computer and computer applications can be done through the gestures.

2) Digitalization of books

It increases the speedy digitalization of books as they are available in softcopy format. For printing the hardcopy books it needs more time and Braille book requires more pages as compared to simple books

3) Wireless module

In order to make it portable device and easy to use, we can make it wireless. The user has to wear the sensor gloves and it has the microcontroller mounted on one of the gloves.

IV. CONCLUSION

In this paper we conclude that, the given system is quick and easy to access. It represent the use of hand gestures for writing purpose in easy method .Those gestures we used in the system have less possibility to cause error than any other method. The system is very cost effective and save time as compared to other typographical system for example their Brailler keyboard etc. The text to speech module also adds reliably to the system.

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