THE PATENTS ACT, 1970

COMPLETE SPECIFICATION

SECTION 10

TITLE

METHOD AND APPARATUS FOR RECOGNITION OF HAND GESTURES OF DIFFERENTLY ABLED PERSONS

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THE FOLLOWING SPECIFICATION PARTICULARLY DESCRIBES AND ASCERTAINS THE NATURE OF THIS INVENTION AND THE MANNER IN WHICH IT IS TO BE PERFORMED.

ABSTRACT

Deaf and dumb persons who have difficulty in communicating with others generally learn one of the standard sign languages for communication. However, difficulties arise when others are not conversant with any standard sign languages. The present invention involves a new method and apparatus which facilitates a deaf and dumb person to easily communicate with normal persons who are unfamiliar with any standard sign language as the apparatus converts the hand gestures into text on a display screen, as well as human speech. The apparatus accurately converts hand gestures into readable text as well as audible speech and additionally enables the user to configure the sensitivity of the apparatus according to his abilities and convenience.

DESCRIPTION

1. Field of Invention

The present invention relates to the field of sensors and transducers, and embedded systems dealing with the conversion of hand gestures or motions into electrical signals, resulting in audible speech and readable textual information.

2. Prior Art

The existing products such as Meta Motion's Data Glove Series and UC Berkeley's Accelerating Glove Sensing prototype can detect the hand gestures made by a user and translate them into speech.

The existing products such as Meta Motion's Data Glove Series and UC Berkeley's Accelerating Glove Sensing prototype [1] can detect the hand gestures made by a user and translate them into speech. Features of the existing system are : Comfort for use, open architecture, mouse emulation mode, right/left hand versions, VR(Virtual Reality) program drivers, 8-bit flexure resolution, one size fits many Built-in tilt sensor High update rate, bundled software, and low drift [2]. Nevertheless some of the limitations of these existing meta motion gloves are: High cost of device, and inability to differentiate the degree of movement per knuckle. Basically, a five sensor glove records the curl of each finger, from open palm to closed fist. A sixteen sensor glove records each finger joint and adduction (recording how close or far apart each finger is). A twenty two Sensor glove measures motions of the palm, including more complex motions of the figures [2]. Thus, in order to achieve higher sensitivity, the device should be having a more number of sensors making the technology complex and additionally expensive. Infact, the impetus for the present invention is the need for alternate devices which are cost effective and without having any of the existing limitations. In order to overcome these limitations

in existing devices, we came up with a new method and apparatus for recognition of hand gestures of differently abled persons which is simple, easy to use and yet inexpensive.

another inexpensive and cost effective technology called HandTalk.
The impetus for the present invention is the need for alternate devices which are cost effective and without having any of the existing limitations.

References

1.John Kangchun Perng, Brian Fisher, Seth Hollar, Kristofer S.J. Pister, "Acceleration Sensing Glove," iswc, pp.178, Third International Symposium on Wearable Computers (ISWC'99), 1999
2.http://www.metamotion.com/hardware/motion-capture-hardware-glovesDatagloves.htm

3. Objects of the Invention

It is thus the primary object of the invention to transform hand gestures into audible speech and readable textual information.

An object of this invention is to enable deaf and dumb persons to communicate with other persons using hand gestures.

Another object of the present invention is for other persons to comprehend any standard language used by a person by listening to the audio output or by looking at the text displayed by the device.

Another object of the current invention is to enable persons to compile novel gesture data bank that can be bundled with the present system.

Yet another object is to provide a better sensitivity and accuracy for the recognition of gestures.

Another object is to provide multi-form outputs in both text and speech.

Yet another object of the current invention is to provide the features of portability with low power consumption.

Another object of the current invention is to design and provide a device that is simple and easy to use by the differently-abled.

Another object is to make the whole system cost effective compared with the existing systems.

4. Summary of Invention

The above mentioned objects are achieved through the development of the current invention that can aid the millions who need a technology that can redress their communication difficulties. The current invention can be viewed both as a product and as a service. As a product, it can be a part of the market where people can buy it. As a service, it can be provided to the non-profit organizations that are working for the deaf/dumb community.

5. Brief Description of the Drawings

Example embodiments of the present invention and their advantages are best understood by referring to the drawings, like numerals being used for like and corresponding parts of the various drawings.

Figure 1 is a schematic illustration of the hand glove with the hardware components attached to it. The hardware comprises of flex sensors, a microcontroller, an LCD display, power supply, speech synthesizer chip and a speaker mounted on top of the glove.

Figure 2 is the system architecture diagram showing the various sub systems consisting of Glove ③, Power supply ④, Flex Sensors ⑤, Micro Controller ⑥, Speech Synthesizer ⑧, Speaker ⑨, LCD Display ⑫ of the new apparatus being claimed.

Figures 3 to 10 are schematic illustrations of the system. Here a glove connected to a laptop demonstrates how the proposed idea could work. As gestures are made with the glove, the degree of angle bending of each flex sensor changes and those analogue values are digitized, and converted to text based on a data bank for conversion, as shown in the figure.

The Finger Bends panel in Figure 3 shows the values of finger bends that each of the flex sensor shows. The frames information panel shows the Gesture Preview and the Text Preview. In the Gesture Preview '*l*' means the flex sensor is straight, '*r*' means the flex sensor is partially bent and '*n*' means the flex sensor is fully bent. Hence a gesture '*nllnn*' means that the user is displaying a gesture of 'victory sign' using the hand.

The software that demonstrated in the above mentioned figures, stores all gestures and their corresponding texts so that when a user performs a gesture, the gesture can be converted to the corresponding text.

6. Detailed Description of the Invention

Figure 1 shows a schematic view of the main components of an embodiment of the invention. There are five flex sensors stitched to each of the fingers of the glove, a microcontroller planted to a circuit board that does all the processing of the values corresponding to degree of bend of each finger, and the conversion into corresponding text, a speech synthesizer chip to convert this text into voice, a speaker to speak an LCD display that shows the gesture performed and the text converted and a power supply unit.

When a user performs a gesture using this glove, the flex sensors are bent according to the gesture. As the flex sensors bend, the resistance value for each of the flex sensor changes and this is read by the microcontroller mounted on the circuit board. The microcontroller does the Analog to Digital conversion (ADC) and does the digital processing. The output of the resistance for each flex sensor is now converted to the corresponding text that the gesture is mapped to. This text is converted to voice by the speech synthesizer chip which is connected to a speaker to speak the converted text. There is a LCD display which displays the gesture once the user waits with particular gesture until the gesture is read by the microcontroller. It also shows the converted text that the gesture is mapped to, in the microcontroller. Thus, the user can verify if the gesture performed by him is read correctly by the device. If not, then the user can manipulate the gesture until it displays correctly. Hence, a deaf or a mute person can communicate using this glove to a normal person by performing gestures.

7. Working Example 1

Consider a user who wants to tell “hello” using this glove. Suppose the gesture he wants to perform with the glove is the one shown in Figure 3.It is observed that the software converts the gesture to “hello”, as u can see in Figure 4 in Gesture Preview panel. When the user clicks a button to speak, it is observed that a voice “HELLO” is heard from the laptop.

8. Working Example 2

Consider a user who wants to add a space using this glove. When the user presses a button in the glove, as shown in Figure 5 a space is added to the result. The Gesture Preview panel shows “space”.

9. Working Example 3

Consider a user who wants to tell “this is glove” using this glove. Suppose the gesture he wants to perform with the glove is the one shown in Figure 6 and 9 for the words “this is” and “glove”. It is observed that the software converts the gesture to “this is” and “glove”, as u can see in Figures 7 and 10 in Gesture Preview panel. When the user clicks a button to speak, it is observed that a voice “THIS IS GLOVE” is heard from the laptop.

10. Claims

What is claimed is:

1. A stand-alone gesture to audio and gesture to textual information display device that can aid the differently abled persons to communicate with normal persons.
2. A method and apparatus mapping the digitized signals into corresponding gestures.
3. A method and apparatus for the compilation of a new gesture dictionary.
4. A method and apparatus for projecting the obtained output in multiple formats say, text and speech in a single device.

5. A method and apparatus for integrating a LCD unit in the data glove for displaying the textual output.
6. A method and apparatus for integrating a speaker unit in the data glove for producing the voice output of performed gestures.
7. A method and apparatus introducing a stand-alone power source for the glove.
8. A method and apparatus building a low cost, low power consuming and portable stand-alone data glove.

11. Drawings

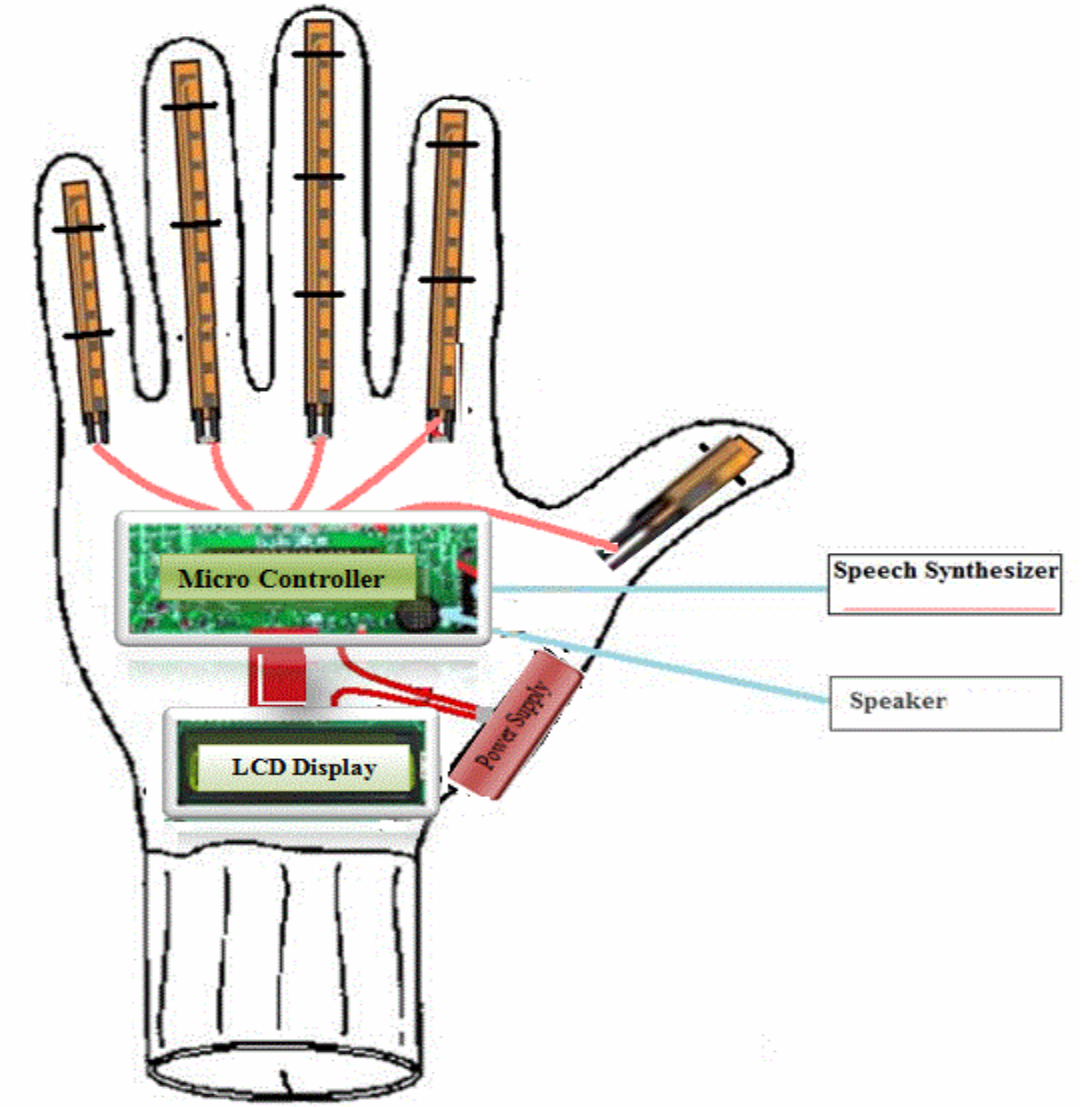

FIG. 1

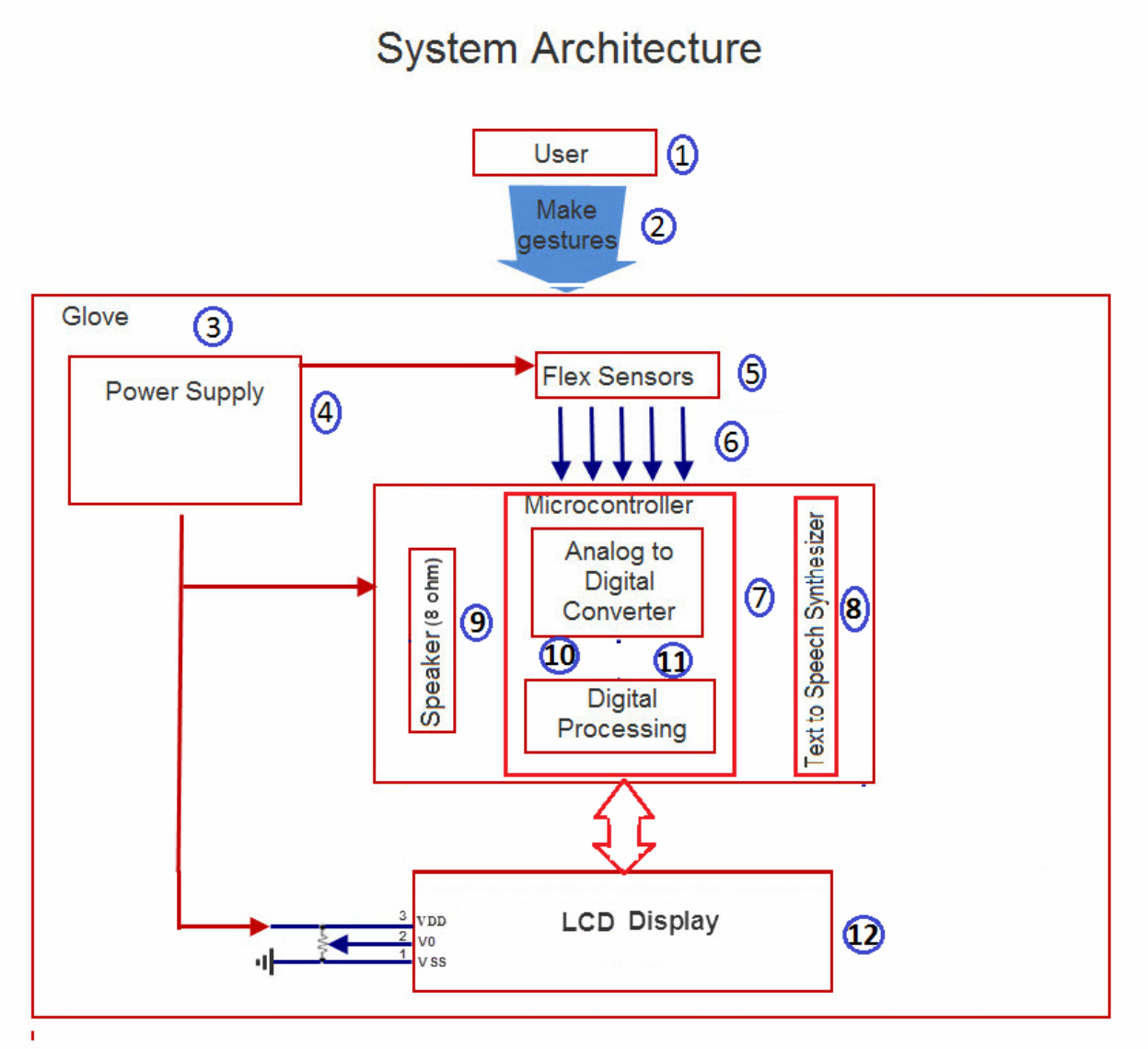
System Architecture
User
1
Make gestures
2
Glove
3
Power Supply
4
Flex Sensors
5
6
Microcontroller
Analog to Digital Converter
7
Text to Speech Synthesizer
8
Speaker (8 ohm)
9
10
11
Digital Processing
LCD Display
12
3 VDD
2 V0
1 VSS

FIG. 2

FIG. 3

FIG. 4

FIG. 5

FIG. 6

FIG. 7

FIG. 8

FIG. 9

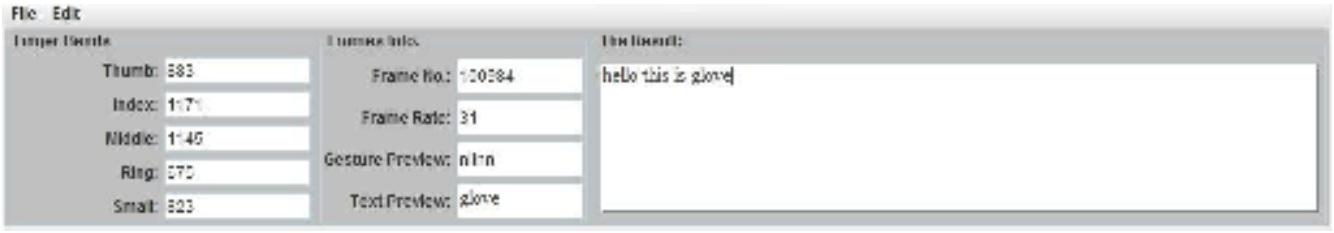

FIG. 10