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Assistive Translator for Deaf & Dumb People

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Abstract **– Communications between deaf-mute and a normal person have always been a challenging task. The project aims to facilitate people by means of a glove based deaf-mute communication interpreter system. The glove is internally equipped with five flex sensors, tactile sensors and accelerometer. For each specific gesture, the flex sensor produces a proportional change in resistance and accelerometer measures the orientation of hand. The output from the sensor is analog values it is converted to digital. The processing of these hand gestures is in ARM processor. Processor compares the input signal with predefined voltage levels stored in memory. According to that required output sound is produced which is stored is SPI memory with the help of speaker. In such a way it is easy for deaf and dumb to communicate with normal people**

Keywords **– Deaf-Dumb, Communication, Gesture, Flex Sensor, Accelerometer.**

I. INTRODUCTION

About nine billion people in the world are deaf and dumb. How often we come across these people communicating with the normal world? The communication between a deaf and hearing person poses to be a serious problem compared to communication between blind and normal visual people. This creates a very little room for them with communication being a fundamental aspect of human life. The blind people can talk freely by means of normal language whereas the deaf-dumb have their own manual-visual language known as sign language. Sign language is a non-verbal form of intercourse which is found amongst deaf communities in world. The languages do not have a common origin and hence difficult to interpret. Deaf-Mute communication interpreter is a device that translates the hand gestures to auditory speech.

A gesture in a sign language, is a particular movement of the hands with a specific shape made out of them. Facial expressions also count toward the gesture, at the same time. A posture on the other hand, is a static shape of the hand to indicate a sign. Gesture recognition is classified into two main categories i.e. vision based and sensor based. The disadvantage of vision based techniques includes complex algorithms for data processing. Another challenge in image and video processing includes variant lighting conditions, backgrounds and field of view constraints and occlusion. The sensor based technique offers greater mobility. The main aim of this paper is to present a system that can efficiently translate American Sign Language gestures to both text and auditory voice. The interpreter here makes use of a glove based technique comprising of flex sensor and accelerometer.

For each hand gesture made a signal is produced by the sensors corresponding to the hand sign the controller matches the gesture with pre-stored inputs.

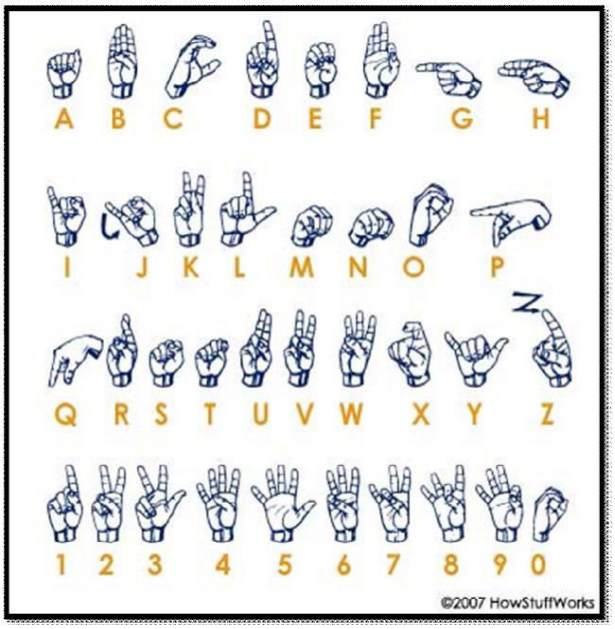

Fig.1. Sign language gestures

II. MATERIALS AND METHODS

The various methodology are as follows,

Image processing:

Hand gestures are captured by camera and according to algorithm image processing takes place. It needs serval ideal situations such as sufficent light and plane background. Its not possible all the time. Another challenge in image and video processing includes variant lighting conditions, backgrounds and field of view constraints and occlusion. The sensor based technique offers greater mobility.

Using pot and mechanical assembly:

It required very precise assembly and it is bit delicate. A pot is connected to various strings connected to fingers. This whole assembly is placed on palm. As per finger moment position of pot varies. Resulting in variable voltage. But this mechanism is uncomfortable and inconvenient for daily use. Also precision required is more but system does not provide enough accuracy to match the requirement.

Using Smart Phone:

Various gestures can be made on touch screen. These can be converted to sound by various inbuilt software. But this is not convenient as user must be educated which is not possible all the time.

Using Flex Sensor:

The interpreter here makes use of a glove based technique comprising of flex sensor and accelerometer. For each hand gesture made a signal is produced by the sensors corresponding to the hand sign the controller matches the gesture with pre-stored inputs. The device not only translates alphabets but can also forms words using made gestures

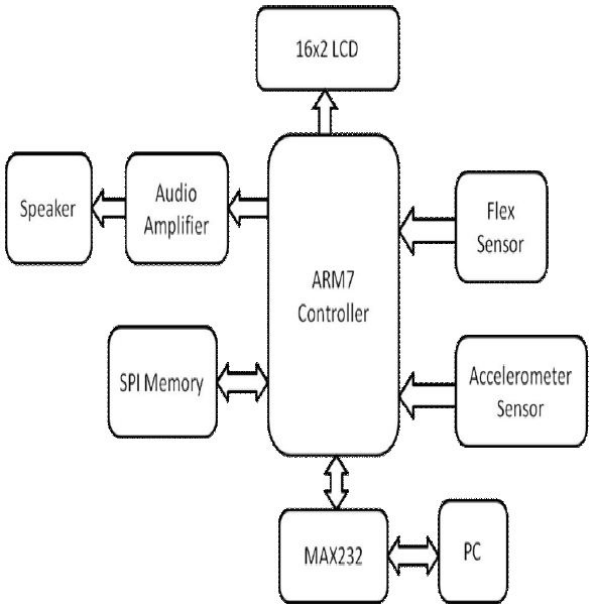

Fig.2. Block diagram of system

Figure 2 shows the entire block of Deaf-Mute communication interpreter device. The controller used in the device is an LPC2138. Five flex sensors are used to measure the degree of bending of the fingers. The flex sensors are interfaced with the controller using the voltage divider circuit. Accelerometer is directly interfaced to the digital ports as it includes the signal conditioning circuit. LPC2138:16/32-bit ARM7TDMI-S microcontroller512 kB of on-chip Flash program memory.32 kB of on-chip static RAM.In- System/In-Application Programming (ISP/IAP) via on-chip boot-loader software. Single 10-bit D/A converter provides variable analog output.Low power Real-time clock with independent power and dedicated 32 kHz clock input Vectored interrupt controller with configurable priorities and vector addresses. Operating voltage range of 3.0 V to 3.6 V

LCD 16 X 2:

5 x 7 dots with cursor

Built-in controller (KS 0066 or Equivalent) + 5V power supply (Also available for + 3V) 1/16 duty cycle

N.V. optional for + 3V power supply

Flex Sensor

Flex sensors are resistive carbon elements. When bent, the sensor produces a resistance output correlated to the bend radius [9]. The variation in resistance is approximately 10 to 30 KOhm‘s. An unflexed sensor has 10Kohm resistance and when bent the resistance increases to 30Kohm at 90o [3]. The sensor is about ¼ inch wide, 4-1/2 inches long.

Vout = Vin [R1/ R1 + R2]

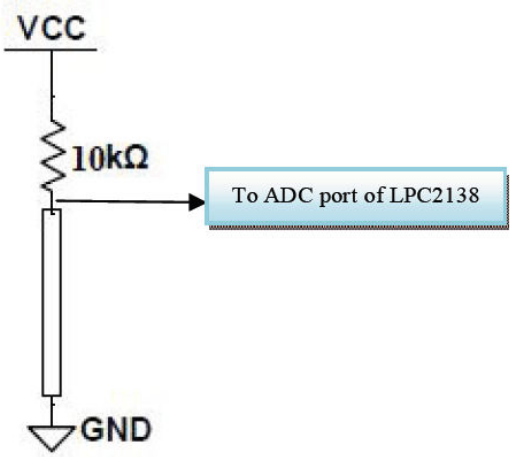

Fig.3. Voltage divider circuit

The sensor is incorporated in device using a voltage divider network. Voltage divider is used to determine the output voltage across two resistances connected in series i.e. basically resistance to voltage converter. The resistor and flex forms a voltage divider which divides the input voltage by a ratio determined by the variable and fixed resistors.

Axis Accelerometer:-

We will use MMA 7260 accelerometer sensor The MMA7260 low cost capacitive micro machined accelerometer features signal conditioning, a 1-pole low pass filter and temperature compensation and g-Select which allows for the selection among 4 sensitivities.

AUDIO AMPLIFIER 386:-

Low power audio frequency amplifier
Low level Power Supply Voltage: 4-12V
8 pin IC
Quiescent Current: 4-8mA
Output Power: 325 mW
Voltage Gain: 26-46 dB
Input Resistance: 50K Ohm

SPI MEMORY AT45dB161:-

Low power audio frequency amplifie
Low level Power Supply Voltage: 4-12V
8 pin IC
Quiescent Current: 4-8mA
Output Power: 325 mW
Voltage Gain: 26-46 dB
Input Resistance: 50K Ohm

III. Results and Discussions

The evaluation of Deaf-dumb communication interpreter was carried out for ten beginners for letters A,B,M,G,Q,H,I and also some sentences were allotted. The binary table for some gestures is as shown:

Table 1: Binary logic table for gesture.

Word	F5	F4	F3	F2	F1
A	1	1	1	1	0
B	0	0	0	0	1
M*	0	0	0	0	1
G	1	1	1	0	0
Q*	1	1	1	0	0
H	0	1	1	0	1
I	0	1	1	1	1

Algorithm:

1. Initialize the ARM processor, ADC, LCD and other modules.
2. Get the values from flex sensor and accelerometer.
3. Convert them to binary using ADC.
4. Tally the o/p from ADC with stored data.
5. If data matched, then show o/p on LCD as well as speaker.

Flowchart:

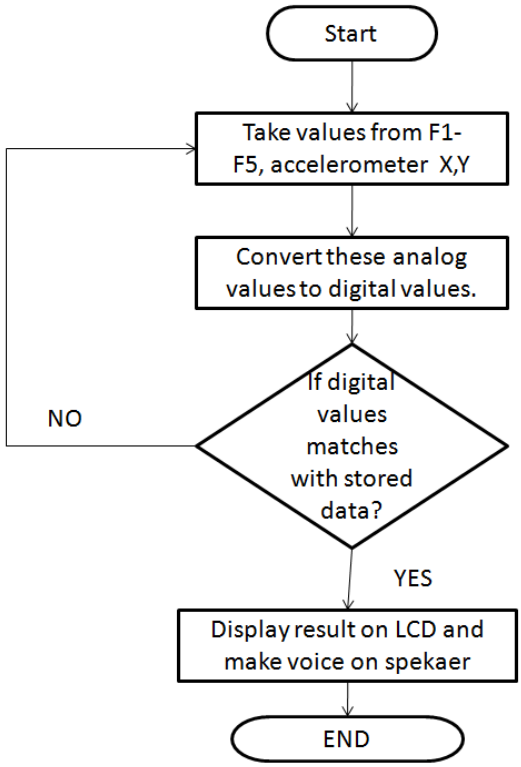

Fig.4. Flowchart

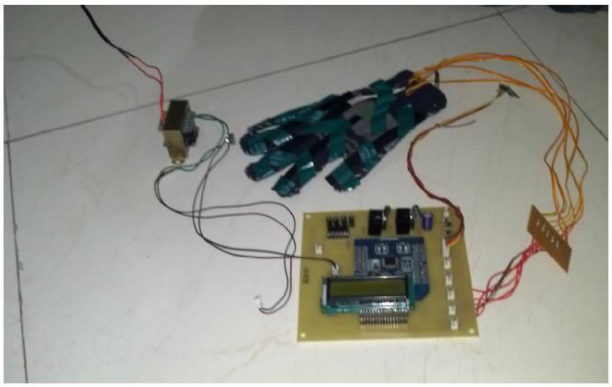

Fig.5. Assistive translator for deaf and dumb

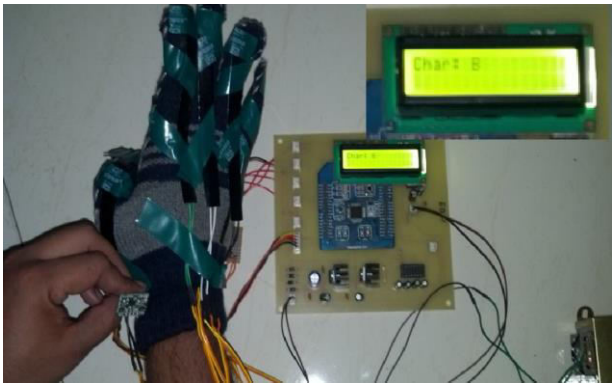

Fig.6. Image for gesture “B”

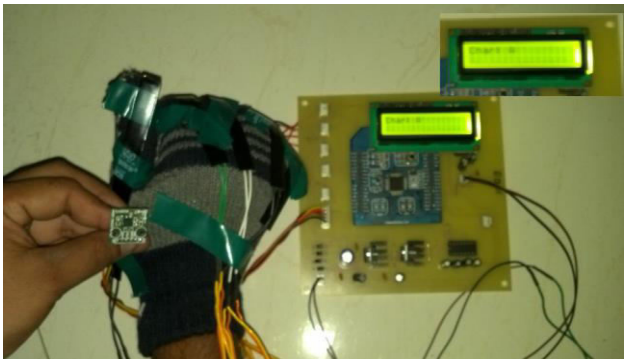

Fig.7. Image for gesture “A”

Fig.8. Image for gesture “G”

IV. CONCLUSION

The project proposes a translational device for deaf-mute people using glove technology. The proposed technique has enabled the placement of five flex sensor, microcontroller and an accelerometer on to a glove. The results demonstrate that sensor glove design with tactile sensor helps to reduce the ambiguity among gestures and shows improved accuracy.

Further the device will be an apt tool for deaf mute community to learn gesture and words easily. The project can be enhanced to make it compact. This will expand the capability to handle it and make it portable.

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[5] Also there is article in sakal dated 7/08/2013 named as “Bolanare Hatmoje” by Dr. Abhay Jere. As per article Mr. Vinod Guruswami from sheffield university , UK. Had developed a hand gloves which converts gesture in to voice

[6] We also visited many deaf and dumb schools and one of them is Mamta School For Deaf And Dumb, solapur