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Electronics Voice for deaf and dumb people using flex sensors

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Abstract: **Paper aims at better communicating interface between normal person with deaf and dumb person. This model aims to use flex sensors for motion and gesture identification and give identified gesture information to the controller. Controller in turn gives that to text to speech converter to express the voice output representation of identified gesture. This way the ease of communication for the deaf and dumb person through the technology can be provided.**

Keywords: **flex sensor, Electronic voice, LCD, voice recording.**

I. INTRODUCTION

In general most of the time physically impaired persons require continuous monitoring. It is difficult for normal person to monitor continuously. In order to avoid these problems, the proposed system will help. The system allows the user to call the normal person at the specific time by doing the hand gestures. The system responds to the hand gestures through sound and particular command is displayed on the LCD.

Motivation:

Tongue and ear plays a major role for speaking and hearing by normal person. But it is impossible to speak and hear by deaf and dumb people. But they speak with others using their sign actions. It is easily understood by their community and in their region but they feel difficult when they communicate with normal people because normal person can't able to understand their sign symbol.

To tackle this situation, a smart sign language interpretation system is designed using a wearable hand device. This system converts their sign symbol to text as well as voice for two way communication.

Present System:

In present, one specific person is required for monitoring physically impaired person. There is no facility provided to physically impaired person so that they can easily communicate with other person. Nowadays due to busy schedule separate all time personal assistance provision for such people is impossible. So there should be a acting bridge between the normal and physically impaired person. This bridge is supported with display and sound system.

Literature Review:

In the paper of Y. Park, J. Lee and J. Bae named as "Development of wearable sensing glove for measuring the motion of fingers using linear potentiometers and flexible wires" that values of potentiometers and flexible wire can be a parameter to run a real time system in IEEE transactions on Industrial Informatics.

As published in the paper of S. V. Matiwade and M. R. Dixit titled as "Electronic support system for deaf and dumb to interpret sign language of communication" that embedded system can become the option of Communication Bridge between normal and deaf and dumb people.

S. Goyal, I. Sharma, S. Sharma introduced the system named as "Sign language recognition system for deaf and dumb people". In this system they have provided software based communication channel.

In short, there is often a little room for these impaired persons in work places. Main challenges experienced by these person communicating with normal people are social interaction, communication disparity, education, behavioural problems, mental health and safety concerns. As a result of these obstacles, these people are discouraged to speak about themselves or their situations in a public place or emergency cases or in a private conversation. Speech language of impaired person varies from place to place and country to country. Hand is one of the richest sources for communication, as we talk normally our hands moves automatically in accordance with the speech. So in recent years the researchers have been focusing on hand gestures detection and been popular for developing applications in the field of robotics and extended in the area of artificial or prosthetic hands that can mimic the behaviour of natural human hand.

This system uses the similar approach for detection of movement of fingers. However the idea is extra-polated slightly in different perspective and have come up with a small yet significant application in the field of bio engineering. This application is not only useful to physically impaired persons but also to patients with half paralyzed bodies and who are not able to speak but are able to move their fingers.

II. SYSTEM DESIGN

System block diagram is as shown in figure 1. System detects the hand gestures using flex sensors and accelerometer. The obtained values are given to aurdino to compare with predefined values in program. If the sensor values match with the values stored in the program then corresponding output is given through voice playback module and also displayed on LCD. In this model, LCD is used for displaying the name of the medicines and their quantity and also displaying the patient reply. If patient presses any button on the keypad then it displays on the LCD.

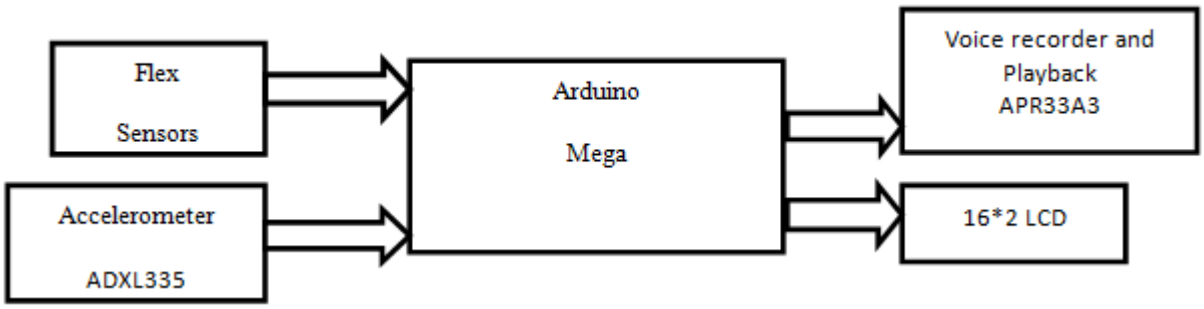

Fig 1: Block diagram of model

ADXL335 is a complete 3 axis acceleration measurement system. It has a measurement range of ±3 g minimum. The accelerometer can measure the static acceleration of gravity in tilt sensing applications as well as dynamic acceleration resulting from motion, shock, vibration. Deflection of the structure is measured using a differential capacitor that consists of independent fixed plates and plates attached to the moving mass. Phase sensitive demodulation techniques are then used to determine the magnitude and direction of the acceleration.

APR33A3 series is a powerful audio processor which is designed for simple key trigger. By using it, user can record and play back the messages in random seven sections by switch. It is suitable for simple interface.

Arduino IDE is a tool that allows us to develop program for different applications

III. SYSTEM WORKING

The system works in two phases. In first phase, comparison of current sensor values of different gestures with predefined values has been done. In second phase, output will be displayed on the LCD and corresponding audio will be played back on speaker.

Two different flex sensors are fitted on 2 fingers. These flex sensors are nothing but variable resistors and are connected to fixed resistor. The connection point gives the variable voltage as the circuit becomes voltage divider circuit. These sensors detect bent of fingers. The change in angle of bent gives change in resistance value of flex sensor. System also includes the accelerometer which gives us the facility to serve the hand movements and gestures. Sensor output connected internally to ADC whose value ranges from 0 to 1023. After conversion of sensor value, it will be compared with previously stored code values. If value matches, the output pin of arduino gives signal to LCD as well as to speaker to display and play the corresponding identified action.

IV. SYSTEM FLOWCHART

System performance is elaborated in stepwise detail with the help of flowchart shown in fig. 2. From flowchart, it is clear that first the sensor resistance variations are checked. If any variations in the resistance value are seen then those changed values are compared with the predefined values of defined actions. The matched values of the action will be then displayed on the LCD as well as the audio of the corresponding action will be played.

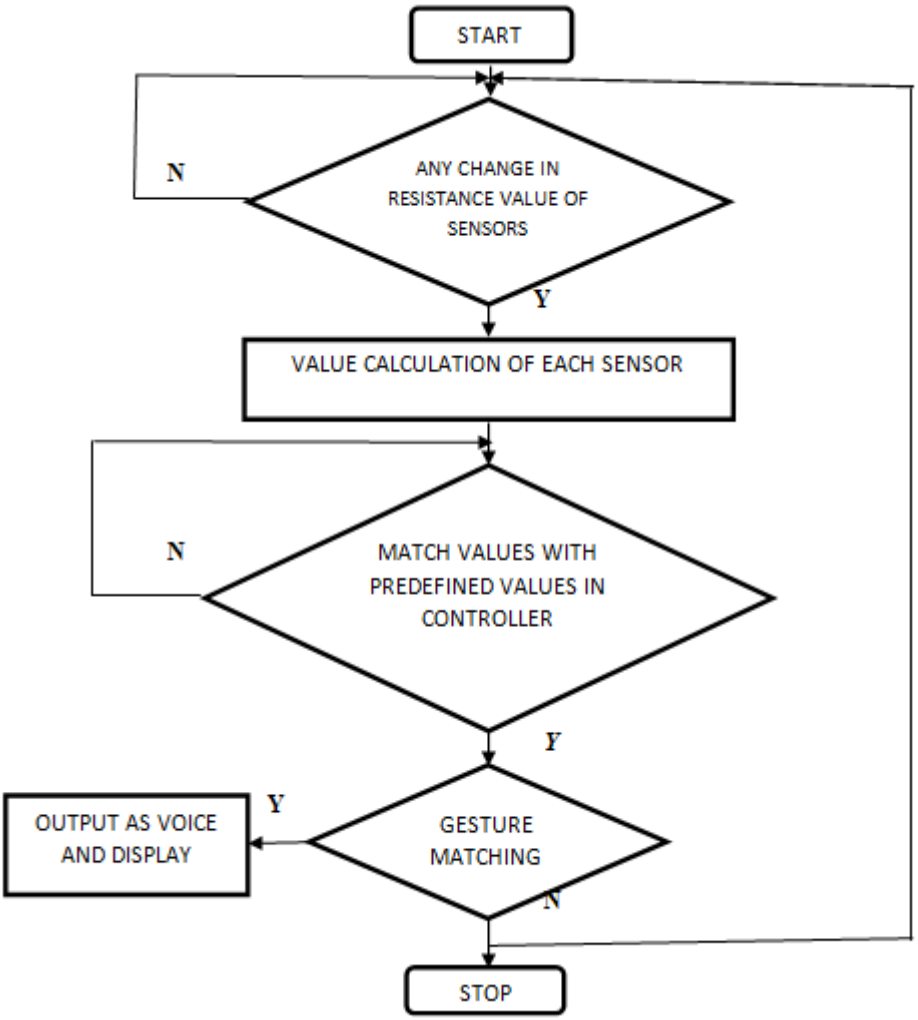

Fig.2 System Flowchart

V. SYSTEM RESULTS

The overall system layout is seen as shown in fig.3 when connections are done and power supply is off.

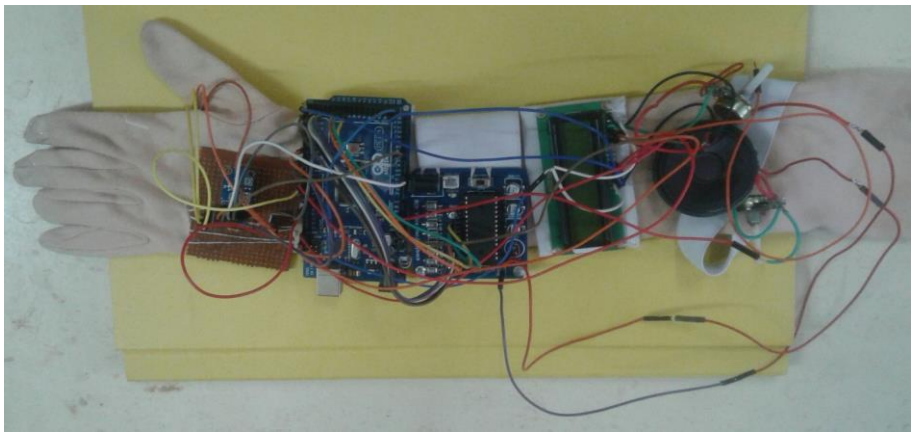

fig.3: System layout

As soon as supply is given, the sensors give the respected output as per the gesture. The sensor values and their respective command are given below in table 1. For each gesture, pictures of respective command displayed on LCD are also presented below.

Table No. 1

Accelerometer position	Flex sensor position	Flex sensors values		Accelerometer value			command
		F1	F2	X	Y	z	
front	Normal	Less than 5	Less than 5	6-9	3-5	3-5	hello
front	Close	greater than 15	Greater than 15	6-9	3-5	3-5	I need water
right	Close	greater than 15	greater than 15	3-5	7-9	5-8	I need food
right	Normal	Less than 5	Less than 5	3-5	7-9	5-8	I need your help
Up	Close	greater than 15	greater than 15	3-5	3-5	7-9	Want to go restroom
Up	Normal	Less than 5	Less than 5	3-5	3-5	7-9	I want news paper
down	Normal	Less than 5	Less than 5	3-5	3-5	0-3	Thank you
down	Close	greater than 15	greater than 15	3-5	3-5	0-3	sorry

COMMAND 1: Hello

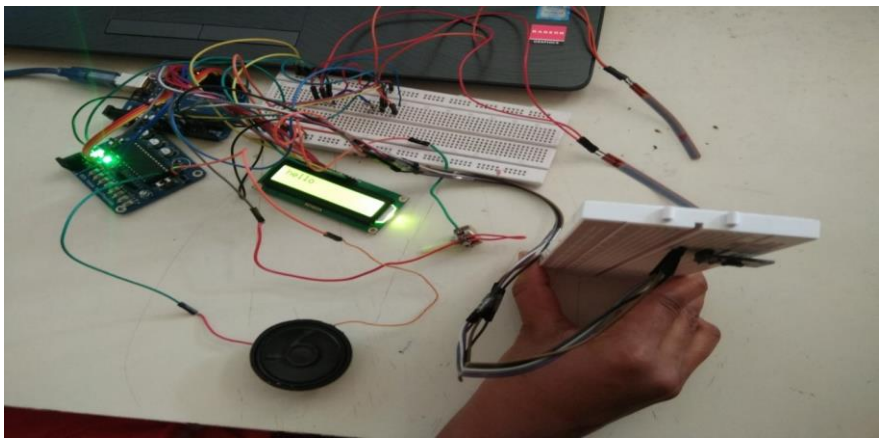

Fig. 4

Hello message is displayed on output peripherals when we keep accelerometer in front position and flex sensor in normal position as above image(refer fig. 4). The corresponding ADC readings are in Fig. 5

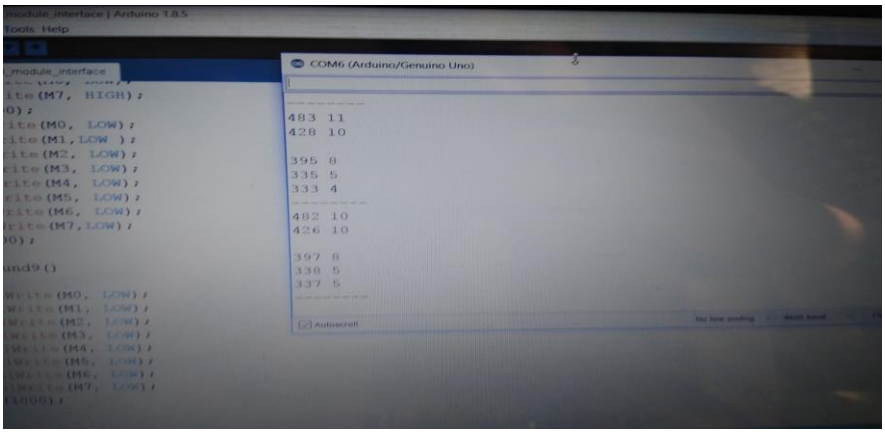

Fig. 5(Hello: sensor value)

COMMAND 2: I want newspaper

"I want newspaper" message is displayed on output peripherals when we keep accelerometer in upward position and flex sensor in normal position as in fig. 6. The corresponding ADC readings are in fig. 7.

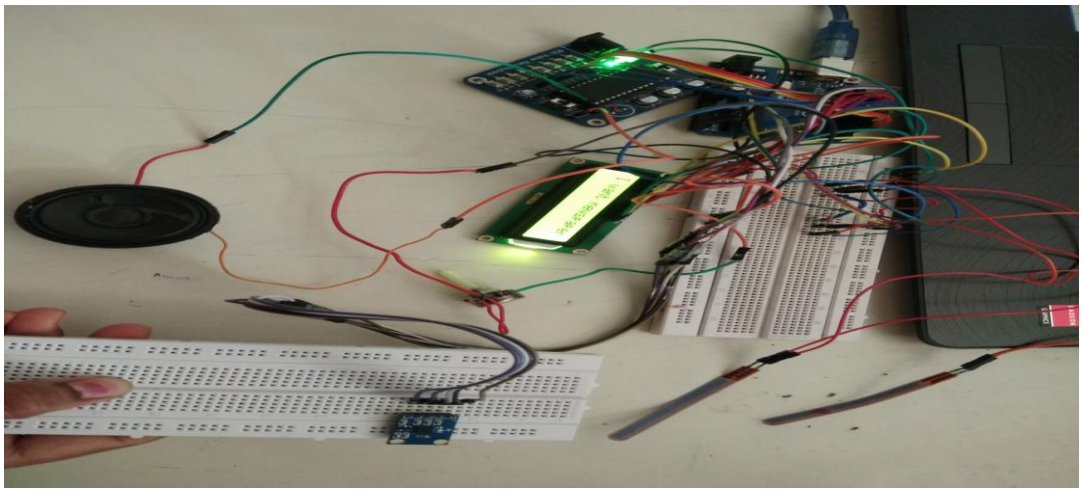

Fig. 6

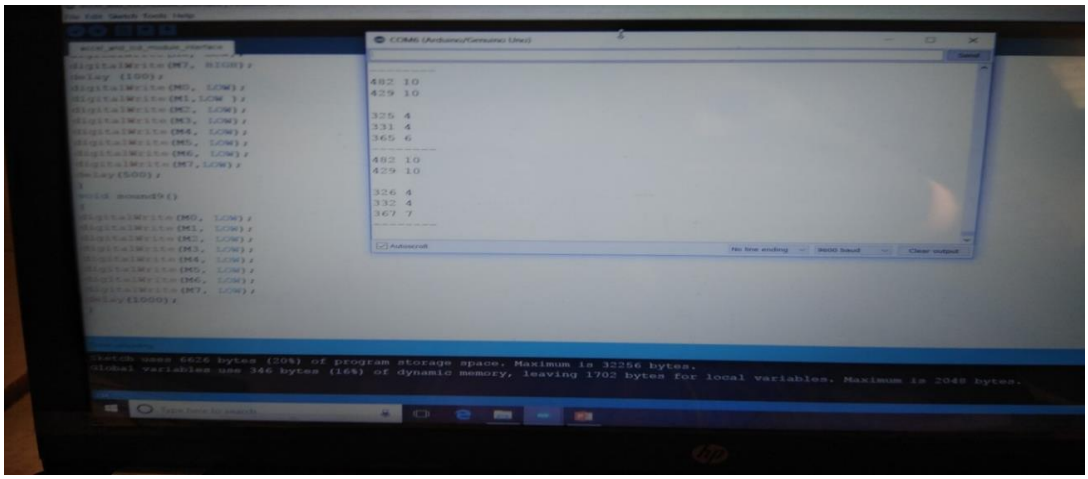

Fig. 7(I want newspaper: sensor value)

COMMAND 3: I need your help

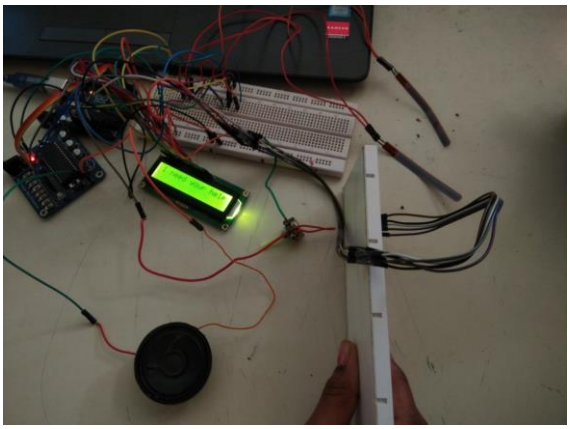

Fig. 8

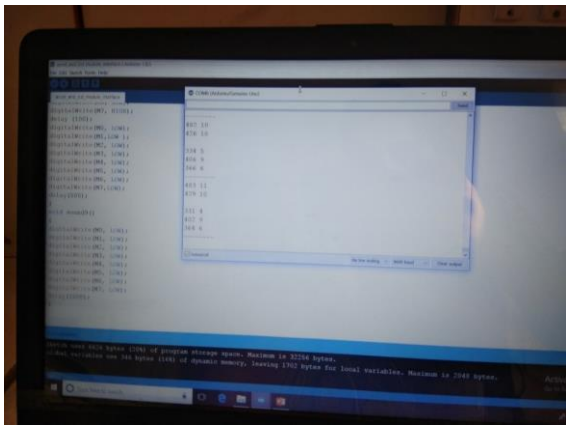

Fig. 9 (I need your help: sensor value)

"I need your help" message is displayed on output peripherals when accelerometer is kept in right position and flex sensor in normal position as in fig. 8. The corresponding ADC readings are presented in fig 9.

COMMAND 4: Thank you

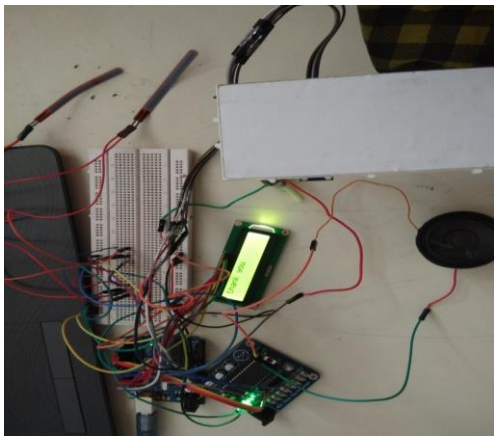

Fig. 10

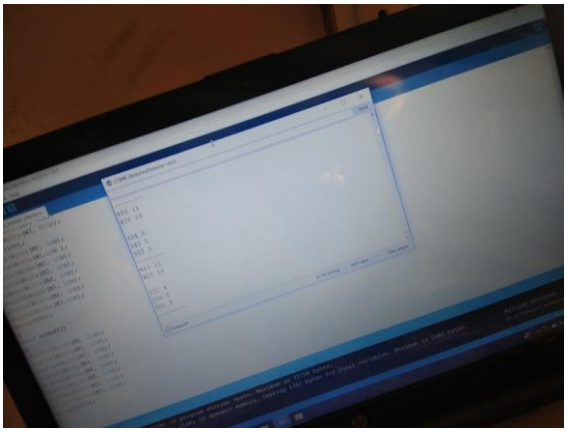

Fig. 11(Thank you: sensor value)

"thank you" message is displayed on display when accelerometer is kept in downward position and flex sensor in normal position as shown in fig. 10. The corresponding ADC readings are presented in fig. 11

VI. CONCLUSION

This system can be successfully used by deaf and dumb people for better communication between normal and deaf and dumb person. It will be acting as most convenient method as it is converting sign language to voice and also on display. This model is going to bridge the communication gap between normal person and physically impaired person using technology.

VII. FUTURE SCOPE

This system can be modified using further extension like room automation for paralysed person. This system can be made wireless for few peripherals like speaker and complicated circuit design can be minimized.

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