Development Of An Assistive Aid For Speech Impaired

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Abstract-
Speech impairment refers to the inability to produce normal speech. Dysarthria is a kind of speech disorder where there is a difficulty in producing the normal speech. The proposed system makes use of an acoustic plate that senses the vocal cord vibrations. When a set of unpatterned words are spoken by the user, the words are compared with the preprogrammed words in the speech IC where it is analyzed and corresponding audio output is heard through the speaker. This system can be implemented in real-time to express the basic needs of speech impaired.

I. INTRODUCTION

Speech impairment is a communication problem in which the normal speech is disrupted due to articulation problems. Difficulties in pronouncing the sounds and sluttering are some examples of speech impairment. Speech difficulties can also be associated with cerebral palsy, hearing impairment and brain injury. People with speech disabilities have difficulty in understanding and expressing their ideas.

Speech disorders affect the content of speech and the function of language in communication. The disorders associated with speech are articulation deficiency, speech disturbances, dysfluency, aphasia, dysphonia and dysarthria. People with the nerve or brain disorder have the inability to control the larynx and the vocal cords, which causes a condition known as dysarthria. Dysarthia is a common speech disorder which is found among the verbally challenged people. People with dysarthria have weak and impaired speech muscles, resulting in the improper pronunciation.

People with complex communication needs often struggle with verbal language and require an Alternative and Augmentative communication (AAC) strategy. These aids can be used for the people with communication defects. These aids are categorized in two types namely, low tech and high tech communication aids. Low tech communication aids are non-electronic form of communication by means of books, words and letters. High tech communication

aids are in the form of electronic communication which permits the storage and retrieval of electronic messages.
Recognition systems can be broken down into two main types. Pattern Recognition systems that compare patterns to known/trained patterns to determine a match and Acoustic Phonetic systems use knowledge of the human body (speech production, and hearing) to compare speech features (phonetics such as vowel sounds).

Project key features are :
• Fully embedded
• Portable
• Less weight
• Single Li-ion battery for longer operation
• Low power consumption
• Less hardware
• Robust

II. Related Work

Many researchers have found out a number of possible solutions. Bhatti et al developed a hand glove with the support of text on LCD display via computer interface with PIC 18F8680 micro controller having DC power supply instead of battery. Edin et al developed a robotic hand for grasping and lifting different object. Wald developed software for editing automatic speech recognition in real time for deaf and hard-hearing people. Simone et al developed a low cost method to measure hand and finger range of motion. Zhao et al developed a five-fingered prosthetic hand system. Aparna et al developed Assistive Aid for Speech Impaired.

III. DATA ACQUISITION METHODS

To start with our research, on obtaining a bio-signal from the fingers, which require obtaining a signal proportional to the movement of the fingers? Fingers are able to interpret different hand gestures, research showed that many haptic devices used in prosthesis utilized the conventional method of using EMG signals. Following is the list of possible methods which could be used to sense the hand's movements.
• EMG (Electromyography)
• MMG (Mechanomyogram)
• Load cell
• Wearable conductive fiber
• Deterioration of fiber optic cable
• Sliding fiber optic cable • Strain gauge tactile sensor
• Flex Sensor
After analysing all of the above methods for signal acquisition the best solution to use flex sensor in this paper as it is comparatively reliable and a cost effective solution.

FLEX SENSORS

Flex sensors [3] change in resistance depending upon the amount of bend on the sensor.They convert the change in bend to electrical resistance - the more the bend, the more will be the resistance value.

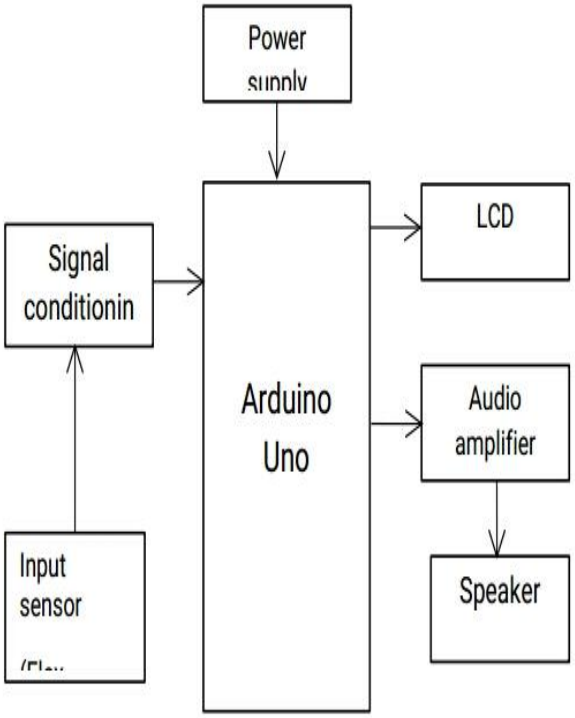
They are usually in the form of a thin strip from 1 "-5" long that vary in resistance from approximately 10KΩ to 50KΩ. They are frequently used in gloves to sense finger movement. The flex sensors are used as input and are placed inside the glove that is to be worn. The sensor is so flexible that it bends easily even with a small bend. As it is

very thin and light weight so it is also very comfortable.

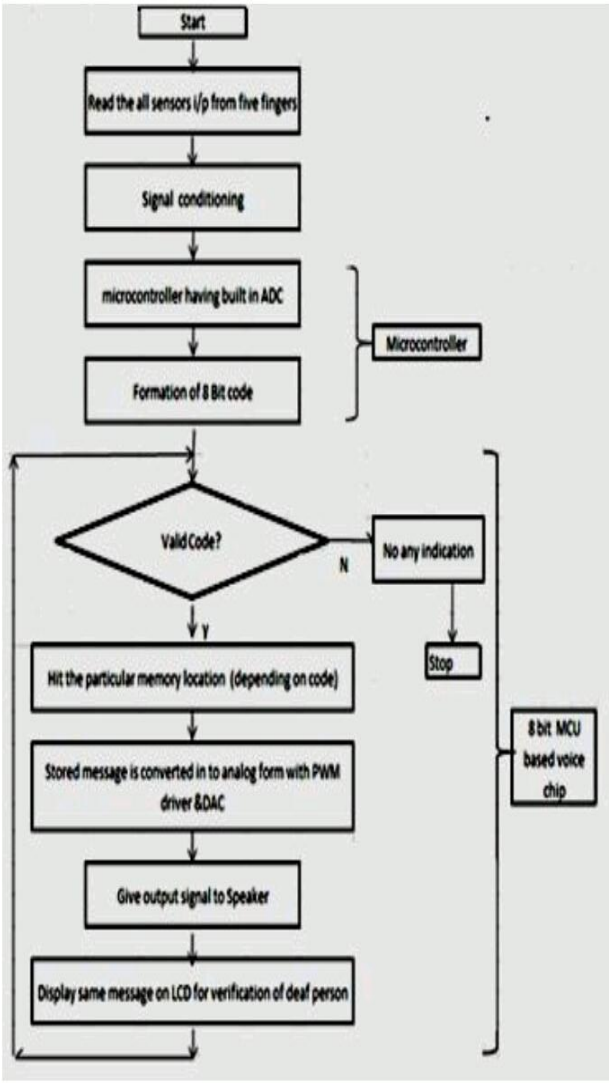
Inside the flex sensor are carbon resistive elements within a thin flexible substrate. When the substrate is bent the sensor produces a resistance output relative to the bend radius. Pragmatically deflection of 00 , 200 , 400 , 450 , 500 , 700 and 900 will give 10KΩ, 14.5 KΩ, 18.8 KΩ, 20 KΩ, 21.1 KΩ, 25.5 KΩ and 30 KΩ of resistances respectively.

BLOCK DIAGRAM AND FLOW CHART

BLOCK DIAGRAM

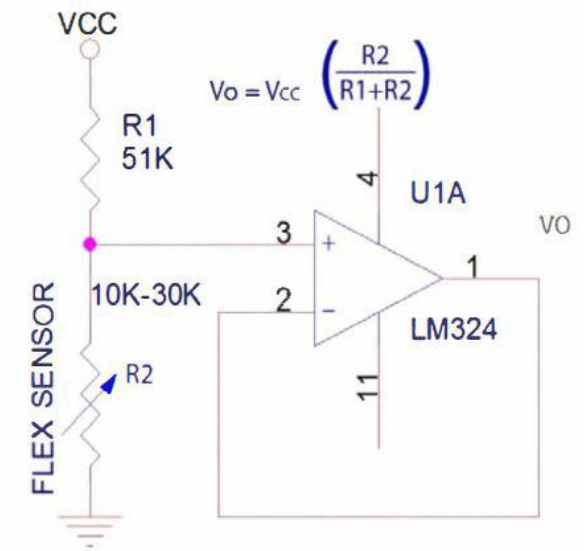


FLOW CHART



SIGNAL CONDITIONING

It has been done by the circuit shown in Supply voltage is applied on the divider circuit having 51 KΩ resistance in series with flex sensor as load resistance. When it is bent, its resistance increases that causes increase in voltage on it which is an analog voltage change. That is fed to voltage follower; an operational amplifier (LM324, which is recommended by the flex sensor has been used to boost-up the circuit current, which makes it comprehensible for the microcontroller to proceed further.



Flex Sensor Signal Conditioning Circuit

The corresponding values of graph which is output of Fig. Calculations are as following:

Formula for voltage divider circuit:

$$Vo = Vcc\left(\frac{R2}{(R1+R2)}\right)$$

For Vo minimum when sensor deflection is 00 Rl=51KΩ, R2=10KΩ and Vcc= 3.7V

$$Vo(\min) = 3.7V\left(\frac{10K}{(51K+10K)}\right) = 0.60656V$$

For Vo middle when sensor deflection is 450 Rl=51KΩ, R2=20KΩ and Vcc= 3.7V

$$Vo(mid) = 3.7V\left(\frac{20K}{(51K+20K)}\right) = 1.04225V$$

For Vo maximum when sensor deflection is 900 Rl=51KΩ, R2=30KΩ and Vcc= 3.7V

$$Vo(\max) = 3.7V\left(\frac{30K}{(51K+30K)}\right) = 1.37037V$$

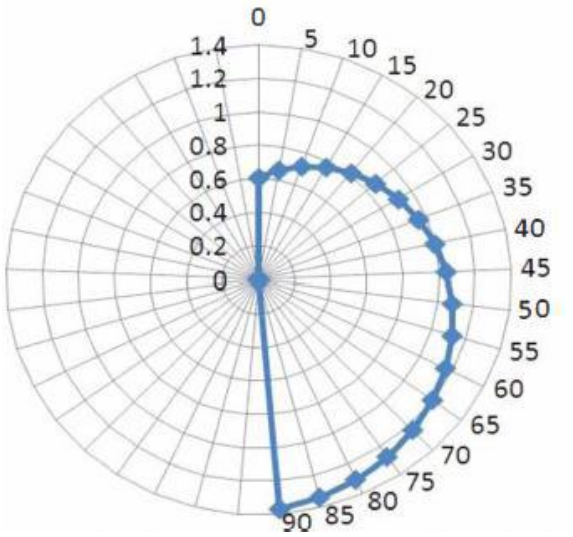


Fig. Signal Conditioning Graph (Deflection vs. Voltage)

MICROCONTROLLER(ARDUINO UNO)

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduno, moving forward. The Uno is the latest in a series of USB

APR9600 VOICE IC

The APR9600 device offers true single-chip voice recording, non-volatile storage, and playback capability for 40 to 60 seconds. The IC is 28 pin device used to record & playback of maximum of 5 messages. The device supports both random and sequential access of multiple messages. . Sampling rate for a 60 second recording period is 4.2 kHz

that gives a sound record/replay bandwidth of 20Hz to 2.1 kHz.

CONCLUSION

1. This paper is a useful tool for speech impaired and partially paralysed patients which fill the communication gap between patients, doctors and relatives.
2. This paper will give dumb a voice to speak for their needs and to express their gestures.
3. As it is portable, requires low power operating on a single lithium ion rechargeable battery and having less weight and robust give patient liberty to carry it anywhere at their will.

ACKNOWLEDGMENT

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REFERENCES

B. Ali, S. Munawwar, B. Nadeem, "Electroni Speaking Glove for Speechless Patients", August 2010, Bachelor of Electronic Engineering FYP Report, FEST, HIIT, Hamdard University, Karachi, Pakistan

N. P. Bhatti, A. Baqai, B. S. Chowdhry, M. A. Unar, "Electronic Hand Glove for Speech Impaired and Paralyzed Patients", EIR Magazine, May 2009, pp. 59-63, Karachi, Pakistan

B. B. Edin, L. Ascari, L. Beccai, S. Roccella, J. J. Cabibihan, M. C. Carrozza, "Bio-Inspired Sensorization of a Biomechatronic Robot Hand for the Graspand-Lift Task", Brain Research Bulletin, Volume 75, Issue 6, 15 April 2008, pp. 785-795

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