

# Sign Language to Speech Using Arduino Uno

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**Abstract - All humans interact with each other through acoustic sounds to express their thoughts. But this is not suitable for the people who lack the ability to speak and sense of hearing. There are many ways such as facial expression, hand movement and its orientation to convey their ideas to normal people. Moreover, sign language is usually used in order to communicate with others. Each word has its own way of action that represents a specific expression. The success rate of gesture is limited, since the normal people are not familiar to these gestures. Hence it is appropriate to design a system that aids the deaf-mute to exchange the information. The sign language to speech conversion is obtained by folding of flex sensors. In this flex sensor based gesture recognition system, according to the resistance of the flex sensor the input is provided to the Arduino which in turn responds by giving voice output. This system has faster response and efficiency for communication is improved.**  
**Keywords: Sign language, Arduino Uno, Flex sensor, Voice output.**

## I. INTRODUCTION

Communication is an art that helps to convey the information, thoughts, ideas to each other. Human beings engage themselves in oral communication. But some are exceptional. There exist people who lack the ability to speak and sense of hearing. These people adapt to communicate via hand orientation and its movement, facial expression and body language. Sign language is the most conventional way to express their ideas. The usage of gesture is obscure to normal people. Hence the persons with this disability are prone to physiological, employment, educational problems in the society. They are much isolated and face many social problems throughout their lifetime. It will be beneficial for them with a system designed that converts the sign language to a voice output. This sign language based recognition system detects the gesture and transforms it into speech so that the normal human beings could understand the thoughts of the people who couldn't hear and speak.

### Components Required

#### Flex Sensor

A polymer ink which has conductive particles embedded in it has been printed on one side of flex sensor. While the sensor is straight, these conductive particles embedded on ink provides a resistance of about 30kΩ and when the

sensor is bent the particles move apart and expand thereby increasing the resistance value. Hence the resistance is directly proportional to the level of the bend. It can be mounted on stationary as well as flexible surfaces.

## ARDUINO

The Arduino consists both software and programmable circuit board. A software application called Integrated Development Environment provides facilities for the development of the software for computer programmers. In order to load a new code, there is no need of additional hardware but we can insert a program via a USB cable. The Arduino is based on C++ program which is easily accessible. The Arduino has the capability to collaborate with sensors, voice modules, LED's, LCD's, smart phones etc. This adaptability along with that it has its own software is responsible for its faster response. Since Arduino is cheaper, they are almost used in all electronic devices. The Arduino can be powered by USB or power supply. The Arduino provides 2KB SRAM and 1KB EEPROM. Since it is a microcontroller based that is based on ATMEGA328.

The UNO is commonly used board of Arduino family. There are 6 analog pins A<sub>0</sub>-A<sub>5</sub>. These analog pins are used to read analog signals from sensor and later it can be converted to digital value. Hence the analog pins read the inputs from the flex sensor. There are 14 digital pins that is 0-13. These pins can be used both as input and output. Digital pins 3, 5, 6, 9, 10, 11 can be used for pulse width modulation.

### APR Voice Module

The APR voice module is capable of recording the voice and plays it back according to the need. Both the playback and record operations are operated by on-chip circuitry. It makes use of 5V DC power. This APR voice module provides 8 voices. All the 8 keys are at high level. The voices are recorded by pressing the corresponding key to low level by having the module in recording mode. By pressing back, it to play mode it can give the voice output according to the movement of flex sensor. The APR9600 samples the incoming voice signals and stores the samples in non-volatile FLASH memory cell. These cells support

voltage ranges from 0 to 256 levels which act as an equivalent of 8-bit binary encoded values. During playback, the voice is retrieved as continuous signal and then amplified before given as input to the speakers. The playback capability is upto 40 to 60 seconds. It supports irregular and sequential access of multiple messages.

## II. Working

When the device is powered, the AC voltage has been stepped down and rectified since the Arduino UNO needs 0 to 5V. The Arduino UNO had been programmed already and it reads the input from the flex sensor. If the flex sensor is bent forward, it reads the input. The MEM sensor is used to measure the orientation of flex sensor. In this flex sensor based gesture recognition, the microcontroller recognizes the sign language performed by the user and provides the voice output. The whole system is controlled by Arduino UNO. When the resistance value of the flex sensor is changed, the microprocessor ATMEGA328 recognizes it and hence produces the corresponding voice output according to the program fed in the Arduino.



Figure:1 Block Diagram

## III. Result

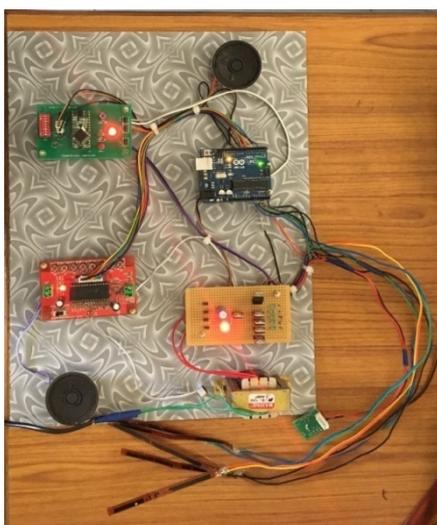


Figure:2 Hardware Implementation

Flex Sensor	Sensor Position	Voice Output
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Flex Sensor1	Forward	Welcome
	Backward	I need water
Flex Sensor2	Forward	I'm pursuing final year Biomedical Engineering
	Backward	Please Wait
Flex Sensor3	Forward	I'm sorry
	Backward	I have seen you before
Flex Sensor4	Forward	May I know the time please
	Backward	I need help
Flex Sensor5	Forward	Have a nice day
	Backward	Thankyou

Table: Output

## IV. Future Scope

In the future, this system can be extended further to include more words in a language. It may also be multi-lingual. Additionally, a translator may be incorporated in the device. This paves way for the people who lack the ability to speak and sense of hearing to travel worldwide alone. So that they can feel a secured experience and helps to boost their confidence.

## V. Conclusion

Normal people are not familiar with sign language that is used to express the ideas and thoughts of people with the inability to hear and speak. They require to train themselves to understand the gestures. The designed system overcomes this difficulty and aids improved communication. The device is portable, consumes less power and affordable.

## REFERENCE

- [1]. K. Tokuda, H. Zen, A.W. Black, An HMM-based speechsynthesis system applied to English, Proc. of 2002 IEEE Speech Synthesis Workshop, Sep. 2002, pp 227-230.
- [2]. Vinod J Thomas, Diljo Thomas, "A Motion based Sign Language Recognition Method", International Journal of Engineering Technology, vol 3 Issue 4, ISSN 2349-4476, Apr 2015.
- [3]. G Adithya V., Vinod P. R., UshaGopalakrishnan, "Artificial Neural Network Based Method for Indian Sign Language Recognition", IEEE Conference on Information and Communication Technologies (ICT), 2013, pp. 1080-1085.
- [4]. Ahmed, S.F.; Ali, S.M.B.; Qureshi, S.S.M., "Electronic Speaking Glove for speechless patients, a tongue to a dumb," Sustainable Utilization and Development in Engineering and Technology, 2010 IEEE Conference on, vol., no., pp.56-60, 20-21 Nov. 2010.
- [5]. Aarthi M., Vijayalakshmi P., "Sign Language to Speech Conversion", Fifth International Conference On Recent Trends in Information Technology, 2016.