

# Devnagari Sign Language Recognition

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**Abstract :** Sign language is used by the Deaf people for communicating with others. This proposed system provides an opportunity for deaf persons to communicate with normal people without the need of an interpreter. This paper presents an Automatic translation system for gesture of manual alphabets in Marathi sign language. This system provides system and methods for the automatic recognition of Marathi sign language. This system contains two steps; first step is to create a database of Marathi Sign Language and in second step hand gesture recognition. We have experimented the use of this sensor glove on people of different age groups and proposed system provides the better recognition rates near about 94-95%.

**IndexTerms - Deaf People, Gesture, Interpreter, Recognition.**

## I. INTRODUCTION

Sign language (SLs) uses hand movements, facial expressions and body language for communication and used by the deaf and people who can hear but cannot speak. It is a structured language where each gesture has some meaning assigned and many techniques developed by the researcher to make the deaf people communicate very fluently. In sign languages postures are nothing but the Static morphs of the hands and gestures are nothing but together with hand movements [1].

India is the 2nd most populated country in the world, in that one percent who are deaf and twelve percent for the hearing problems and over million people are suffering from a problem of hearing and loss of vision also [5]. Hand gesture recognition (HGR) plays a significant role in any sign language recognition (SLR), but in India sign language varies from state to state as well as Indian people also use different sign languages for communication. Body language plays an important role when two people are communicating with each other, but when both people are Deaf people then communication is very complicated [2]. We proposed a system for the Marathi sign language recognition, which is designed to recognize the Marathi alphabets or signs.

## II. EXISTING WORK

Mr. Gaurav Kumar et al. [3] provides the American Sign Language (ASL) Translator system. A sensory data glove using flex sensors as finger bend measurement sensors, these sensors is continuously checked by the microcontroller (ATMega16) and when the gesture of an alphabet is made respective alphabet is shown in the 16x2 Liquid Crystal Display (16x2 LCD means it can display 16 characters per line and there are 2 such lines). Anetha K. and Rejina Parvin J. [4] present an automatic American Sign Language recognition system is developed using artificial neural network (ANN). This system translates the American Sign Language (ASL) alphabets into text and sound. In this proposed system, to capture the gestures a glove circuit is designed with flex sensors, 3-axis accelerometer and sEMG sensors. When finger gets bend data is obtained from the flex sensors on each finger and the trajectories of the hand motion is provides by the accelerometer. Features are extracted from the ASL (American Sign Language) alphabets and are then classified using neural network.

Prof. Abhijit V. Warhade and Prof. Pranali K. Misal [5] present Hand Gesture Recognition System by using image processing, which contains three steps; Image capturing (the image is captured using 8 Mega pixel web cam), Image preprocessing (consists of image acquisition, Gaussian filtering methods; filtering techniques are used to remove noises from images, So that we can get a smooth convex hull) and Feature Extraction (ANFIS classifier is trained with the designed feature set to more accurate result or experimental result). Gaurav Pandit et al. [6] used histogram matching algorithm for the Devnagri Sign Language Translation System. The steps of algorithm are Image capturing (is captured in RGB color space using general Laptop camera), Image Pre-processing (in this stage morphological operation like blurring, noise removing is done), Hand region extraction (here hand region is extracted and then edge detection is done), Feature extraction (the histogram of cropped image is taken) and histogram matching (here obtained histogram is compared with the histogram of image in the training dataset).

Prof. Mrunal Pathak et al. [7] presents Marathi sign language recognition system, which will translate hand gesture into textual and vocal format without any requirement of special sign language interpreter. In this proposed system firstly system, creates the database of Marathi sign language. Here hand movements are captured using two DG5-V hand gloves and compared with data set and output of system is displayed using speaker and LCD. Priyanka Lokhande et al [9] present a system, which consists of a glove that will be worn by a dumb person to facilitate the communication with the normal person. it translates the hand gestures to corresponding words using flex sensors and 3-axis accelerometer. The signals are converted to digital data using comparator circuits and ADC of microcontroller ARM LPC 2138.the microcontroller matches the binary combinations with the data given in the look up table of the databases and produces the speech signal. The output of the system is displayed using the speaker and LCD.

## III. PROPOSED SYSTEM

Figure 1 shows the block diagram of proposed system, in which ARM Cortex M3 Microcontroller, Flex Sensor, LCD, voice processor and OLED are used. Figure 4 shows actual setup of proposed system.

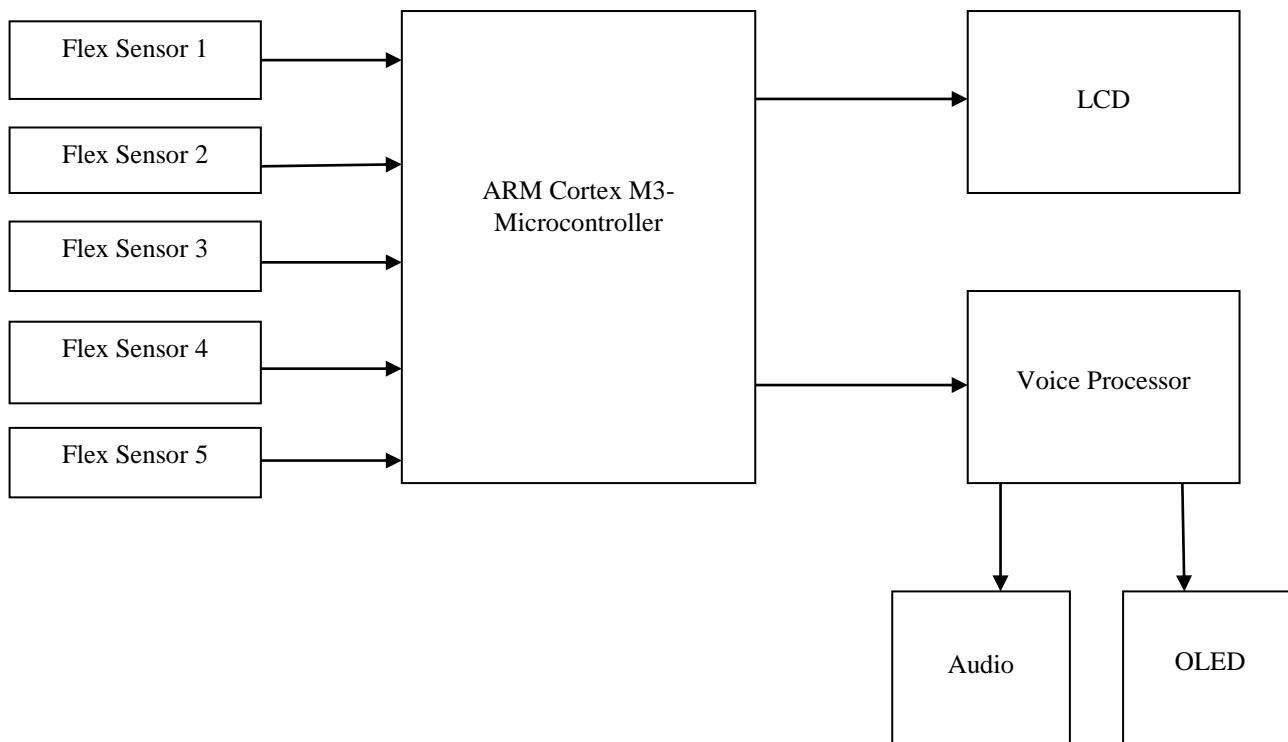


Figure 1 block diagram of proposed system

### 3.1 Flex Sensor

It is based on resistive carbon elements as well as analog resistors and achieves great form-factor on a thin flexible substrate. Sensor produces a resistance output correlated to the bend radius i.e. the smaller the radius and the higher the resistance value, when the substrate is bent. When the substrate is bent the sensor produces a resistance output relative to the bend radius. With a typical flex sensor, a flex of 0 degrees will give 10K resistance will a flex of 90 will give 30-40 K ohms. The Bend Sensor lists resistance of 30-250 K ohms [3]. Figure 2 shows the flex sensor.

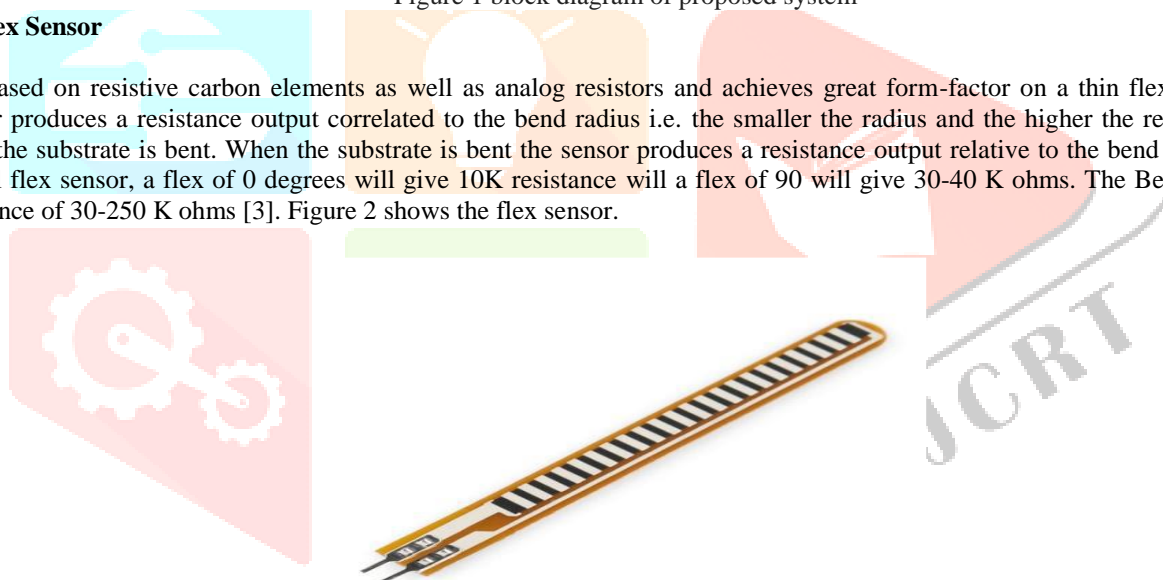


Figure 2 Flex Sensor.

In the proposed system Flex sensor generates the different values, when the glove is used by the deft people. The movement of each finger generates the different values and catch by the different flex sensor attached to the glove. Table 1 shows the values of different flex sensor when sensor is up and down. Table 2 shows the movement of different finger i.e. different flex sensor generates the different alphabets of Devnagari.

Table 1 Values of flex sensor when sensor is up and down.

Sr. No.	Value of Resistance when sensor is up	Value of Resistance when sensor bends down
Flex sensor 1	1675	1850
Flex sensor 2	1600	1710
Flex sensor 3	1656	1858

Flex sensor 4	1569	1797
Flex sensor 5	3450	3400

Table 2 Movements of Flex Sensor Generates Different Alphabets of Devnagari

Sr. No.	Flex Sensor 1	Flex Sensor 2	Flex Sensor 3	Flex Sensor 4	Flex Sensor 5	Result
1	Down	Up	Up	Up	Up	क
2	Up	Down	Up	Up	Up	ख
3	Up	Up	Down	Up	Up	ग
4	Up	Up	Up	Down	Up	घ
5	Up	Up	Up	Up	Down	च

### 3.2 Liquid Crystal Display (LCD)

Liquid Crystal Display screen is an electronic display module which display 16 characters per line and there are 2 such lines, which provides economical; easily programmable; have no limitation of displaying special & even custom characters [3].

### 3.3 ARM Cortex M3 Microcontroller

ARM embedded processors address many different market segments like enterprise applications, automotive systems, home networking and wireless technologies and ARM family include three different architecture; A (profile for sophisticated, high-end applications running open and complex operating systems), R (profile for real-time systems) and the M profile (optimized for cost-sensitive and microcontroller applications). Different advantages provides by ARM Cortex M3 Microcontroller listed below [8]:

- Higher performance through better efficiency
- Ease of use for quick and efficient application development
- Reduced costs and lower power for sensitive markets
- Integrated debug and trace for faster time to market
- better performance
- power efficiency

### 3.4 OLED (Organic Light Emitting Diodes)

It is a flat light emitting technology, in which placing a series of organic thin films between two conductors. OLED provides many advantages over the LCD given below [10]

- Improved image quality
- power consumption is low
- Simpler to design
- Better durability

The proposed system is experimented with the use of this sensor glove on people of different age groups and got the accuracy of the sensor near about 94-95%. Table 3 shows the practical result of the proposed system.

Table 3 Practical Result of Proposed System

Sr. No.	Flex Sensor 1	Flex Sensor 2	Flex Sensor 3	Flex Sensor 4	Flex Sensor 5	Result
1	Down	Up	Up	Up	Up	मला पाणी पाहिजे
2	Up	Down	Up	Up	Up	मला भूक लागली

3	Up	Up	Down	Up	Up	मला वाचायचं आहे
4	Up	Up	Up	Down	Up	मला झोप येते आहे
5	Up	Up	Up	Up	Down	मला बाहेर जायचे आहे
6	Down	Down	Up	Up	Up	माझ डोकं दुखतय

## 5. Conclusion

Sign language is used by the Deaf people for communicating with normal people, but it is very difficult to communicate with the people who never know the sign language or lack of knowledge of sign language. This paper removes this communication barrier converting sign language directly into vocal and textual format for the understanding of normal people. This proposed system converts the sign into the text by using the flex sensor glove, ARM Cortex M3 Microcontroller, Voice Processor and LCD. Gloves detect the hand gesture by using flex sensor and send the analog input to the microcontroller and compare with the database. Final output is observed on the LCD display and the speaker, in this way hand gesture can be automatically converted in to vocal and textual format with the help of this system

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