# Sign Language Recognition – A Recent Trend

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## Abstract

*In the world of sign language, and gestures, a lot of research work has been done over the past three decades. This has brought about a gradual transition from isolated to continuous, and static to dynamic gesture recognition for operations on a limited vocabulary. In present scenario, human machine interactive systems facilitate communication between the deaf, and hearing people in real world situations. In order to improve the accuracy of recognition, many researchers have deployed methods such as HMM, Artificial Neural Networks, and Kinect platform. Effective algorithms for segmentation, classification, pattern matching and recognition have evolved. The main purpose of this paper is to analyze these methods and to effectively compare them, which will enable the reader to reach an optimal solution. This creates both, challenges and opportunities for sign language recognition related research*
*Keywords: Sign Language Recognition, Hidden Markov Model, Artificial Neural Network, ANFIS.*

## 1. Introduction

Sign languages are the most raw and natural form of languages could be dated back to as early as the advent of the human civilization, when the first theories of sign languages appeared in history. It has started even before the emergence of spoken languages and this has wide range of application.

The research is motivated because it has a wide range of application first is that a sign language system would be potentially beneficial in aiding communication between members of the Deaf community and the hearing community with the common people. The second is that the process of developing  distance learning teaching assistance also it is beneficial in medical field also it is very help full in monitoring of patients  It is also help full in enabling very young children to interact with the computer. In the present research is a prototype system for the automatic recognition of sign language, based on a series of artificial neural networks, , HMM,ANFIS.

This language used for developed a system which is beneficial for a common man and deaf and dumb people. A simple sign language with one hand has the same meaning all over the world and means either ’hi’ or ‘goodbye’. Many people travel to foreign countries without knowing the official language of the visited country and still manage to perform communication using sign language. These examples show that sign language can be considered international and used almost all over the world and convey proper information to all.

## 2. Related Work

In the past, several method of gesture recognition also Human computer interface (HCI) suggested such as Neural Network, HMMs and Fuzzy Systems     but these differ from one to another in their models. Some of them are Neural Network, HMMs [1] and Fuzzy Systems [2].
 The past decades have witnessed two specific patterns for categories of sign language recognition The first system is categories into the  electromechanically device such as a glove based system when this system developed research has been limited to small scale systems able of recognizing a minimum subset of a  sign language. Christopher Lee and Yangsheng Xu [3] developed a glove-based gesture recognition system that was able to recognize 14 of the letters from the hand alphabet, learn new gestures and able to update the model of each gesture in the system in online mode, with a rate of 10Hz. Over the years advanced glove devices have been designed such as the Sayre Glove, Dexterous Hand Master and Power Glove [4]. The most successful commercially available glove is by far the VPL Data Glove as shown in figure
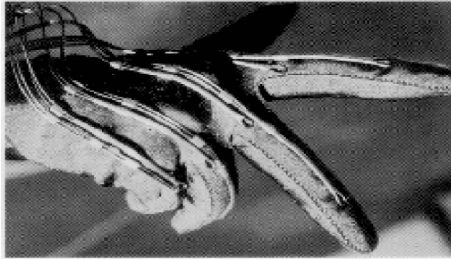
Fels and Hinton 1995a, Fels and Hinton 1995b)

Although sharing the same name, authors and much of the same technology as the Glove-Talk system, Glove-TalkII takes a fundamentally different approach to the mapping of hand gestures to speech. The original Glove-Talk maps each gesture to a single word. Glove-TalkII is based on a much finer grained approach in which features of the hand are mapped onto the articulatory features which control the production of speech.

American Sign Language is the language of choice for most deaf people in the United States. It is part of the "deaf culture" and includes its own system of puns, inside jokes, etc. However, ASL is one of the many sign languages of the world.

As an English speaker would have trouble understanding someone speaking Japanese, a speaker of ASL would have trouble understanding the Sign Language of Sweden. ASL also has its own grammar that is different from English. ASL consists of approximately 6000 gestures of common words with finger spelling used to communicate obscure words or proper nouns. Finger spelling uses one hand and 26 gestures to communicate the 26 letters of the alphabets. [5] Examples of signs shown in Figure.
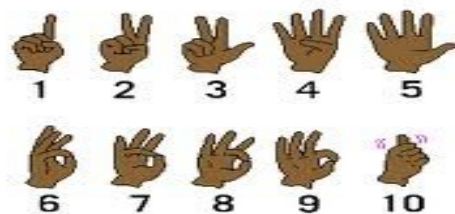


There are few technologies already using vision based analysis system. Example, Hand gesture recognition which using *'Vision-Based'* approaches use only the vision sensor (camera) for understand musical conduction action. This system works by when the conductor uses only one-side hand and must in the view range of camera..When the camera capture the image of hand gesture, the system extract the human hand region which is the region of interest (ROI) using the intensity color information.

The system is obtained the motion velocity and the direction by tracking the center of gravity (COG) of the hand region, which provides the speed of any conducting time pattern. [6] For this Hand Gesture Recognition project, is based on Human-Computer Interaction (HCI) technology. The computer can perform hand gesture recognition on American Sign Language (ASL). [7]The system use MATLAB Toolboxes, Neural Network to perform the gesture recognition. It work by feed numerous types of hand gestures images then into 'neural network' and the system will train the network itself. Once the 'neural network' is trained, this 'neural network' can perform multiples of hand gesture recognition of ASL. [8]

MacLean James[9] proposed the use of a back propagation neural network for recognition of gestures from a set of segmented hand images. This system showed promise in the field of language invariant teleconferencing. Loeding and Sarkar[10] developed a system which made use of Signemes i.e. parts of signs that are present in most occurrences, taken from videos. Extaction of Signemes is done using Iterated Conditional Modes (ICM). The feature extraction aspect of image analysis seeks to identify inherent characteristics, or features of objects found within an image. These characteristics are used to describe the object, or attribute of the object, prior to the subsequent task of classification.

Shreenivasan and Geethapriya[11] formulated a real-time system, which has applications in video games. Extraction and clustering of key points is done using rotation and scale invariant matching (RASIM) and k-harmonic means techniques. Ghosh and Ari [12] developed a system for human alternative and augmentative communication (HAAC).

## 4. **Exiting Method**
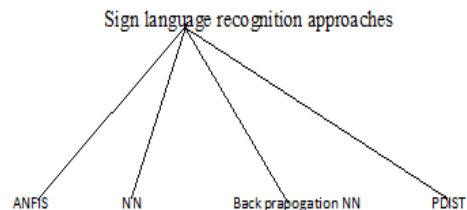


Above method used for recognition but according to Sir jang paper after training 50 sample the error index in ANFIS is very low that's why we are trying to implement a system of sign language recognition by using ANFIS.

## 4.1 Neural Networks:-

Neural network is also known **as Artificial Neural Network (ANN)**, is an artificial intelligent system which is based on biological neural network. Neural networks able to be trained to perform a particular function by adjusting the values of the connections (weight) between these elements. [13]
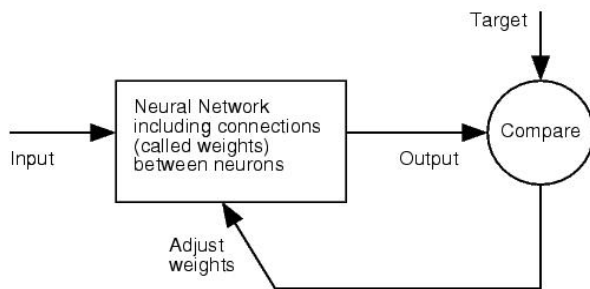


**Figure 4.1 : Neural Network Block Diagram**

Neural network is adjusted and trained in order the particular input leads to a specific target output. Example at Figure, the network is adjusted, based on a comparison of the output and the target until the network output is matched the target. Nowadays, neural network can be trained to solve many difficult problems faced by human being and computer

### 4.2 Hidden Markov Model: (HMM)

In case of dynamic process modeling, the approach to be chosen is stochastic. In nature, e.g. Hidden Markov Models (HMMs) [14] or Dynamic Bayesian Networks [15]. A timedomain process illustrates Markov property if the conditional probability density of an event, given all present and past events, depends only on the jth most recent event. If the current event depends solely on the most recent past event, then the process is termed a first order Markov process. It is considered as a useful assumption, while considering the orientations of hands of a signaler for time axis. The HMM, known for its rich mathematical structure, is considered to be a widely used tool for efficiently modeling spatio–temporal information in the most natural way possible. The algorithms that can be employed in the pass include the Baum–Welch and Viterbi [9], for evaluation, learning, and decoding before the interpretation can actually be started upon The Hmm generalized topology is known as the „Ergodic model□, as per Acharya□s term conditions, wherein any state can be reached from any other state

## 5. Recent Trends

| YEAR | WORK DONE | METHOD | INFERENCE |
|------|-----------|--------|-----------|
| 1992 | Developed a systems able of recognizing a minimal subset of a sign language | Glove-based sign language recognition system that was able to recognize sign from the hand | New gestures able to update the model of each gesture in the system in online mode, with a rate of 10Hz. |
| 1995 | Although sharing the same name, authors and much of the same technology as the Glove-Talk system, | . Glove-TalkII is based on a much finer grained approach in which features of the hand are mapped onto the articulatory features which control the production of speech | Because of the small set of recognition of language and use of synthesizer for conversion |
| 2004 | ASL is one of the many sign languages of the world Finger spelling uses one hand and 26 gestures to communicate the 26 letters of the alphabets | HMM for gesture recognition | Finger spelling uses one hand and 26 gestures to communicate the 26 letters of the alphabets |
| 2009 | A system used HMM for boundary tracing and figure tip detection | Boundary edge detection algorithm used for figure tip edge detection[16] and HMM for gesture recognition[17] | The accuracy obtained in this work but only a spelling error |
| 2010 | G.R.S. Murthy developed a Hand gesture recognition using neural network in this work he proposed a | To detect hand, count fingers and find the direction in which user is pointing he had trained the neural network [17] | He experimented with gesture images captured by a camera and achieved satisfactory |

| | vision based gesture recognition using a simple system connected with a web camera | | results. |
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## 6. Conclusions

After the survey on the approaches used in various vocabulary-based sign language recognition systems, we can give an opinion about the methodologies and algorithms involved. Most of the times, a combination of different methods and algorithms has to be used to achieve a moderate to acceptable rate of recognition. For example some methods are suitable only against dark backgrounds. A system which gives maximum efficiency, has low cost, and is an optimal mixture of methods, giving results against complex backgrounds as well, should be preferred. From a technical point of view, there is a vast scope in future for research and implementation in this very field. The upcoming years could witness a combinatorial explosion of different methodologies, such as using several HMMs in parallel, independent or coupled usage of ANN and HMMs etc. The ultimate gain of the proposed study is enormous.

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