

# A Comparative study for approaches for Hand Sign Language

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## ABSTRACT

The sign language recognition and translation can be achieved which involves static and dynamic gesture recognition in which static gestures can easily be interpreted. But, for Dynamic gestures the sign language can be recognized with motion of the hands or movement of it for which Image based i.e. vision based mechanism can be applied. The Vision based technique involves either capturing the image of action or position or even directly visually recognizing the action. This technique which is very easy to understand as vision based can include both images as well as sequences of actions. Then, the feature i.e. signs action extraction and processing can be done according to type of sign recognized during visual gestures. Then compare with existing gestures and display the message and can be translated into text and speech as well. Also different image preprocessing algorithms can be developed.

## Keywords

Recognition, Static Signs Analysis, Sign language recognition, gestures, image processing

## 1. INTRODUCTION

For many deaf people, sign language is the principle means of communication. A sign language is a language which, conveys the meaning in visual gesture patterns, uses visually transmitted sign patterns and simultaneously combining hand shapes, orientation and movement of the hands, arms or body, and facial expressions to express the thoughts via different methods like visual based or by dynamic actions.

One problem is that very few people who are not themselves deaf ever learn to sign. This therefore increases the isolation of deaf people; they may be confined in many of their interactions to communicating only with other deaf people. It seems that technology might have a role to play here, if computers could be programmed to recognize sign language and to translate it into another form, such as speech or written text.

## 2. LITERATURE REVIEW

There are a number of sign languages that emerged from French Sign Language (LSF), or were the result of language contact between local community sign languages and LSF. These include: French Sign Language, Quebec Sign Language, American Sign Language, Brazilian Sign Language (LIBRAS) and others. A subset of this group includes languages that have been heavily influenced by American Sign Language (ASL), or are regional varieties of ASL. Bolivian Sign Language is sometimes considered a dialect of ASL. Even in India, lot of work is going on the standardization of Indian Sign Language (INSL). A survey paper highlighting the details of Indian Sign Language and its dialect & regional varieties is shown in paper [1]. The Sign language differs from oral language in its relation to writing. The phonemic systems of oral languages are primarily sequential, that is, the majority of phonemes are produced in a sequence one after another, although many languages also have non-sequential aspects such as tone. Most deaf signers read and write the oral language of their country. However, there have been several attempts at developing scripts for sign language.

A review of the abstraction approach can be found in [2]. We must understand that HMM topology was used and is applied for Sign language as stated in [3]. The research on hand gesture and sign recognition has two main dimensions: isolated and continuous recognition. Isolated recognition focuses on a single hand gesture that is performed by the user and attempts to recognize it. In continuous recognition, user is expected to perform gestures one after the other and the aim is to recognize every gesture that the user performs. The continuous recognition problem is slightly different for hand gesture recognition and sign language recognition systems. For instance the method discussed in [4] is based on basic approach for sign language and its feature detection and extraction and pattern matching. On the other hand researchers like [5] concentrate on the accuracy of stored standard sign with the runtime sign and their results.

In hand gesture controlled environments, the problem can be considered as a gesture spotting problem, where the task is to differentiate the meaningful gestures of the user from the unrelated ones. In sign language recognition, the continuous recognition problem includes the co-articulation problem. The preceding sign acts the succeeding one, which complicates the recognition task as the transitions between the signs should be

explicitly modeled and incorporated to the recognition system. Moreover, language models are used to be able to perform on large-vocabulary databases.

The proposing methodology is based on Sign Language Recognition based on Hand Gestures [2] and positions using one of the HMM methodologies. One simple approach with reference to vision based methods such as thresholding and statistical angle based on color hand gloves is best described in [7]. The methodology of Sign language Recognition is reviewed here.

### 3. VISION BASED APPROACH PROCESS

The basic belief of the algorithm is that you don't need to understand the meaning of a whole sign completely so as to effectively generate its match. The principle of working is based on run time static sign orientation and position. This proposed method is aimed to develop an automatic Indian Sign Language Recognition platform for hearing impaired community of India. The system can recognize different hand gestures of Indian Sign Language. Humans naturally use gestures to communicate. Gestures are natural means for conveying information and used by humans for diverse purposes ranging from pointing at a person to get his/her attention to conveying information in day-to-day life. Gesture literally means "an expressive movement of a part of the body, the hand or head, in order to bring forward intentions and attitude". Gesture recognition is the interpretation of a given gesture into text and speech form. This importance has motivated to use gestures for communicating with computers. The focus of the proposed work is to develop a Human Computer Interaction (HCI) platform in context to Indian Sign language (INSL). The development of a system for translating Indian sign language into spoken language would be great help for deaf as well as hearing people of the country.

The process discussed here is very similar. It relies on the use of one of the Image processing algorithms, which are effective and in correspondence with HMM for Sign language interpretation.

#### A. Method

The process involves two layer classifications. At first, coarse classification is done according to detection of hand motion and tracking the hand location and second classification is based on key frame selection and hand shape recognition of key frames. Motion history image and Fourier descriptor are used for motion direction recognition and key frame selection respectively. Generic cosine descriptor (GCD) has been proposed for feature extraction of hand postures. GCD is invariant (not changeable) to scale, translation and rotation of hand shapes. The system can test different hand gestures of persons.

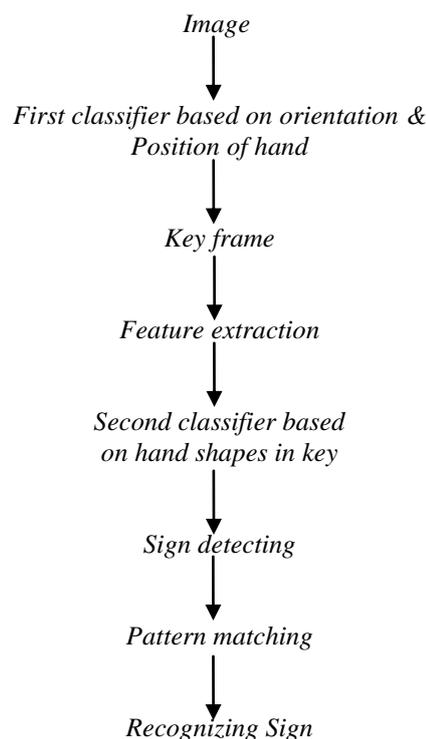
#### B. Technique

Gesture (or sign language) has been widely used in the deaf community. In the foreseeable future, gesture inputs can be ideally applied for human-computer interface. Review of the most recent works related to hand gesture interface techniques: glove based technique, vision-based technique, and analysis of drawing gesture. Vision-based technique is the most natural way of constructing a human-computer interface which has many applications. However, it has difficulties in (1) segmentation of moving hands; (2) tracking and analysis

of hand motion; and (3) recognition. Sign language consists of static hand gesture and dynamic hand gesture. Hidden Markov Model (HMM) [5],[6] is implemented for visual recognition of complex, structured hand gestures such as ASL. They used moments and normalization to separate the rough posture estimate from spatial specific (translation, rotation, and scaling).

### C. Flow-analysis

Figure 3.1 shows the flow diagram of the sign language recognition system. The use of two levels classifier is done. Firstly, the recognition is only, based on global analysis of motion. After first classification, shape information is used for key frames selection. Key frames are used for Feature extraction and hand shape analysis. Second classifier is used for hand shape matching and gesture recognition.



**Fig. 1 Flow diagram of proposed sign language recognition system.**

Image is captured as Input is taken in either RGB or gray scale for in 1st stage of flow. Then based on image classification is done either on first and second classifier which involves position and orientation and hand shape in static sign of image. Then key frame analysis is done. The hand gesture image sequence is analyzed for key frame selection. Since the hand shapes between two consecutive view models are very similar to each other, we only need to select some key frames for the stored model generation and the input model generation. The closed boundary of segmented hand shape can be described by a Fourier descriptor (FD) vector or any transform methodology on images.

The phase of feature extraction involves in sign language recognition, it is desirable to use a shape representation technique that will sufficiently describe the shape of the hand while also being capable of fast computations, enabling the

recognition to be done in real time. It is also desirable for the technique to be invariant to translation, rotation, and scaling. In addition, a method that will allow for easy matching would be beneficial compared the shape descriptors in terms of good retrieval accuracy, compact features, general application, low computational complexity, robust retrieval performance, and hierarchical coarse-to-fine representation. The generic Fourier descriptor is obtained by extracting various scaled Fourier coefficients from the 2-D Fourier transform of the polar-raster sampled image.

Then, sign detection is done of static sign. After, detecting the stored standard model of static sign and runtime model is matched known to be as pattern matching. Hence, a static sign is recognized with some amount of common/different accuracy.

Implementing the proposed work may involve trajectory motion tracking, key frame selection, computation of Fourier descriptor, feature extraction and analysis, pattern matching and finally based on hand shapes recognition can be done.

#### D. Measures

In sign language recognition both hand movements and hand shape variation are meaningful. The contributions of this work can be summarized as follows: First: A general method for sign language recognition system which consists of two layer classifier. One layer for classifying signs according to their hand movements and another one for classifying each group of movements, based on their hand shapes. Second, we use a GCD features (any image transform) to recognize hand shapes. It is invariant to scale, translation and rotation.

#### 4. STANDARD TEMPLATE OF STATIC SIGNS



Fig. 2 Static Signs

- The above signs are stored to be as static signs in database as stored model and can be performed even after the summary of result is generated.
- The run time static sign is matched (pattern) (input model) with the stored model (standard model).
- The accuracy of sign is measured with the help of matching values (of generated transform) which may not be totally precise or exact but approaches a relative value.

#### 5. APPLICATIONS

The concept of Sign language recognition can be applied to almost any area but basic purpose is for mostly non-verbal communication for people who are deaf and impaired.

Some of applications are as follows:

- SLR's basic application is for Interactive Communication
- Can be used for E-learning in an Online System
- SLR Assisted Sign Language Education
- Sign Tutor: An Interactive System for Sign Language Tutoring
- Can be applied in field of deaf and dumb reading and understanding

#### 6. ADVANTAGES AND DISADVANTAGES

##### A. ADVANTAGES

The main advantage is that the entire process of Sign language recognition is bridging of the communication gap. It helps in also converting visual gestures translated into the speech form.

Several Static signs can be recognized with more accuracy based on different features of hand signs.

The results obtained can be improved and refined into a later stage based on the preciseness of sign.

##### B. DISADVANTAGES

The image pre-processing is required so as to normalize the image to be recognizable from.

The constraint of using colored gloves is a drawback to be removed.

Different features are required to be acquired for recognizable to different hands.

Lot of speed up computations and image transformations are done which leads more computational time.

As such many of drawbacks are removable but totally cannot be eliminated to get more closer and accurate results.

As the Sign language recognition is not yet Standardized for Indian Sign Language, there is a lot of wide scope of development and future work to be done.

#### 7. CONCLUSIONS

To conclude we state that the comparative study simultaneously uses both the static signs and combination of those parameters.

As stated above, automatic sign language recognition offers enhancement of communication capabilities for the speech and hearing impaired, promising improved social opportunities and integration. The objective of the proposed research/project work is to build a system that uses natural gestures as a modality for recognition in the vision based setup. The focus of the proposed project is to develop a platform in context to Indian Sign language. In a country like India there is a need of automatic sign language recognition system, which can cater the need of hearing impaired people. The ultimate gain of the proposed system is enormous.

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