

Quality Assessment of Human Hand Posture Recognition System

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Abstract

Human Hand posture detection is a way to help the hearing impaired people to communicate with normal human or computer. Sign Language (SL) are gesture based language which have symbolic encoded message for communication without speech channel. In this paper, we give history, need and scope of human hand posture detection. The related work done in hand posture, various algorithms, feature extraction and classification are also presented in this paper. The performance of the developed Hand posture for hearing impaired people is evaluated.

Keywords— SL, hand posture, key-point, HCI

INTRODUCTION

The hand posture with sign language is an important way of communication for hearing impaired and dumb persons. Every gesture of sign language has a meaning assigned to it and is the simplest natural way of communication. Human hand postures sign language is frequently used as intuitive and convenient communications for deaf and dumb people. The recognition of sign language of hand gestures can be widely applied in human computer interfaces and robot control. In the last few years, there has been tremendous increase in this field among the researchers. They develop sign language recognition to introduce means of interaction from human to human and human to computer interaction [1].

A number of hardware systems are used for gathering information about hand positioning; typically either image based (using cameras, moving lights) or device based (using instrumented gloves, position

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trackers). The advancement of human civilization causes the difficulty of inter-personal communication; not only in terms of language, but also in terms of communication between common human and hearing impaired human is gradually being abolished. The development of sign language is the first step and the development of hand recognition system using computer vision is the second step. Various research works have been carried out using Artificial Intelligence for different sign languages. For proper gesture detection of the hand, it should be modelled in a manner understandable as an interface in Human Computer Interaction. A Human Computer Interface (HCI) system that can understand the sign language accurately aids in the communication of hearing impaired with the normal world [2]. The main aim of sign language human hand detection system is the interpretation of the semantics that the hand location, posture, or gesture conveys.

The developed system of human hand posture is able to detect gestures efficiently and accurately. The generalized block diagram of gesture based approach is as shown in the figure 1.

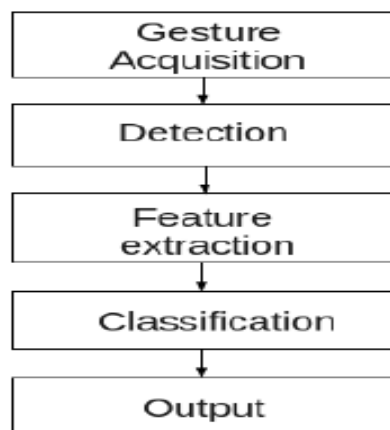


Fig 1: Block diagram of Hand gesture based approach.

Hand Gesture Acquisition can be done by using a camera to grab images of deaf & dumb person. Through this process we obtain hand gestures of hearing impaired person. Human hand detection includes segmentation and edge Detection. In any hand gesture detection system, a well defined and strong set of features, description and representation are required. The major advantages of sign language are [3, 4]:

- Awareness and use of computer interface through sign language interpretation.
- Training & Education will be easier through interpretation / visualization.
- Serving the mankind by use of technology

- Social aspect such as humanity can increase in peoples mind by involving hearing impaired people in our day to day life.
- Blind people can also use the same system by extending it for voice interface.

The developed method of hand gesture recognition was implemented and tested with set of images shown in figure 2.

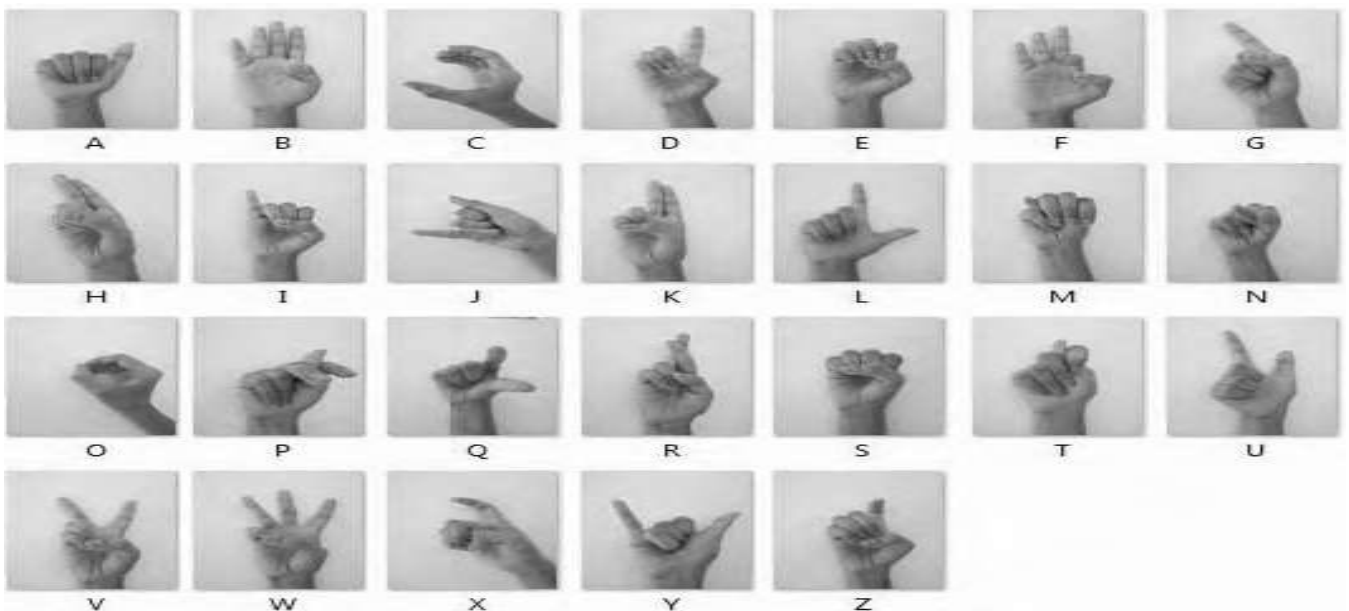


Fig 2: Database of 26 sign alphabets.

RELATED WORK

Various research works have been carried out on human hand sign language recognition techniques. **Xiaolong Teng et al. [5]** proposed a real time vision system within visual interaction environments through hand posture Identification. The algorithm has the ability of a fast detection process to obtain the meaningful hand region from the whole image. The developed system is able to deal with a large number of hand gestures against different backgrounds and varying lighting condition. **Zhiquan Feng BoYang, et al. [6]** deals with human hand shape features extraction from image frame sequences. In order to satisfy the need of human hand tracking in real time, a fast and accurate method for acquirement of edge features from human hand images. The proposed approach is composed of two steps, the coarse location phase (CLP) and the refined location phase (RLP) from coarseness to refinement. **Ho-Sub**

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Yoon et al. [7] gave the use of hand posture provides an attractive alternative to cumbersome interface devices for human computer interaction (HCI). Many hand posture recognition methods using visual analysis have been proposed: syntactical analysis, neural networks, the hidden Markov model (HMM). **Siddharth S. Rautaraya, Anupam Agrawala** [8] proposed Human Computer Interaction techniques have become a bottleneck in the effective utilization of the available information flow. **Feng-Sheng Chen et al**[9] introduced a hand posture recognition system to recognize continuous posture before stationary background. The system consists of four modules: a real time hand tracking and extraction, feature extraction, hidden Markov model (HMM) training, and posture recognition. **Attila Licsa'ra, Tama's Sziranyi** [10] proposes a vision-based hand posture recognition system with interactive training, aimed to achieve a user-independent application by on-line supervised training. Usual recognition systems involve a preliminary off-line training phase, separated from the recognition phase. **J. Molina Vilaplana, J. Lopez Coronado** [11] represents a neural network model for spatio-temporal coordination of hand posture during pretension is proposed. The model includes a simplified control strategy for whole hand shaping during grasping tasks that provides a realistic coordination among fingers. **Liu Yun, Zhang Lifeng, Zhang Shujun** [12] proposed Vision-based hand posture recognition methods commonly use a single feature of hand posture for classification. There are some problems as follows: recognition inaccuracy, system instability and ambiguous recognition results.

IMPLEMENTATION OF SYSTEM IN MATLAB

Gestures can originate from any bodily motion or state but commonly originate from the hand. Current focuses in the field include hand gesture recognition. The developed system of human hand gesture detection is invariant to image translation, scaling and rotation. The Matlab implementation of the system is described in four consecutive steps are:

- *Scale space local extreme detection*
- *Key point localization*
- *Orientation assignment*
- *Key point descriptor.*

RESULTS & DISCUSSION

In order to evaluate the performance of developed hand posture system we have used Matlab software. The results reveal the effectiveness of the developed hand posture system at different angles of rotations in terms of number of correct recognition and incorrect recognition.

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Database of sign language of deaf & dumb images have been used. The comparative analysis has been done. The performance of the developed system is evaluated for different hand posture for different angle of rotation, distance and background.

The performance of developed system is shown in figures results show that if image to be inquired is rotated at the angle of 80 degree then there is a probability that half of the results may be incorrect. Moreover, at rotation angle of 60 degree the proposed hand posture system gives very good success rate. Rotation of input image at smaller angles has negligibly small effect on output image.



Fig. 3: Results of input and database matched images with varying contrast.



Fig. 4: Result for correct match with rotation of input image.

CONCLUSION

Human Hand posture detection system is an interface between physically hearing impaired persons and computers. Our developed system helps a lot the physically challenged persons who are not able to make the exact hand posture before computer with 100% accuracy and precision, as both the parameters are interlinked. Our system works with 50% accuracy in worst case as shown in table 1. To broaden the scope of our research work, one can work out on colour images including the feature of movement.

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