LITERATURE SURVEY ON HAND GESTURE TECHNIQUES FOR SIGN LANGUAGE RECOGNITION

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Abstract: Hand gesture recognition provides an intelligent, natural, and convenient way of human–computer interaction (HCI). Sign language recognition (SLR) and gesture-based control are two major applications for hand gesture recognition technologies . SLR aims to interpret sign languages automatically by a computer in order to help the deaf communicate with hearing society conveniently. Since sign language is a kind of highly structured and largely symbolic human gesture set, SLR also serves as a good basic for the development of general gesture-based HCI. In this paper we are discussing work done in the area of hand gesture recognition and analyze the methods for recognition of hand gesture .
Index Terms: Sign language Recognition (SLR), Hand gesture recognition, Image processing techniques.

1. INTRODUCTION

Gestures are expressive, meaningful body motions involving physical movements of the fingers, hands, arms, head, face, or body.

1.1 They can Broadly be of the Following Types

- Hand and Arm gestures: recognition of hand poses, sign languages, and entertainment applications (allowing children to play and interact in virtual environments).
- Head and Face gestures: some examples are: nodding or shaking of head, direction of eye gaze, raising the eyebrows, opening the mouth to speak, winking, flaring the nostrils and looks of surprise, happiness, disgust, fear, anger, sadness, contempt, etc.;
- Body gestures: involvement of full body motion, as in tracking movements of two people interacting outdoors, analyzing movements of a dancer for generating matching music and graphics and recognizing human gaits for medical rehabilitation and athletic training.

2. SIGN LANGUAGE

Sign Language is the means of communication among the deaf and mute community. Sign Language emerges and evolves naturally within hearing impaired community. Sign Language communication involves manual and non-manual signals where manual signs involve fingers, hands, arms and non-manual signs involve face, head, eyes and body. Sign Language is a well-structured language with a phonology, morphology, syntax and grammar. Sign language is a complete natural language that uses different ways of expression for communication in everyday life. Sign Language recognition system transfers the communication from human-human to human-computer interaction. The aim of the sign language recognition system is to present an efficient and accurate mechanism to transcribe text or speech, thus the "dialog communication" between the deaf and hearing person will be smooth. There is no standardized sign language for all deaf people across the world. However, sign languages are not universal, as with spoken languages, these differ from region to region.. A person who can talk and hear properly (normal person) cannot communicate with deaf & dumb person unless he/she is familiar with sign language. Same case is applicable when a deaf & dumb person wants to communicate with a normal person or blind person. So, there are two main approaches used in the sign language recognition that is Sensor based and Vision based Approach.

2.1 Sensor Based Approach

This approach collects the data of gesture performed by using different sensors. The data is then analyzed and conclusions are drawn in accordance with the recognition model. In case of hand gesture recognition different types of sensors were used and placed on hand, when the hand performs any gesture, the data is recorded and is then further analyzed. The first sensor used was Data gloves then LED's came into existence. The invention of the first data glove was done in 1977. Sensor based approach damages the natural motion of hand because of use of external hardware. The major disadvantage is complex gestures cannot be performed using this method.

2.2 Vision Based Approach

This approach takes image from the camera as data of gesture. The vision based method mainly concentrates on captured image of gesture and extract the main feature and recognizes it. The colour bands were used at the start

of vision based approach. The main disadvantage of this method was the standard colour should be used on the finger tips. Then use of bare hands preferred rather than the colour bands.

3. LITERATURE SURVEY

Deaf Mute Communication Interpreter- A Review   [1] : This paper aims to cover the various prevailing methods of deaf-mute communication interpreter system. The two broad classification of the communication methodologies used by the deaf –mute people are - Wearable Communication Device and Online Learning System. Under Wearable communication method, there are Glove based system, Keypad method and Handicom Touch-screen. All the above mentioned three sub-divided methods make use of various sensors, accelerometer, a suitable micro-controller, a text to speech conversion module, a keypad and a touch-screen. The need for an external device to interpret the message between a deaf –mute and non-deaf-mute people can be overcome by the second method i.e online learning system. The Online Learning System has different methods. The five sub-divided methods are- SLIM module, TESSA, Wi-See Technology, SWI_PELE System and Web-Sign Technology.

An Efficient Framework for Indian Sign Language Recognition Using Wavelet Transform [2]: The proposed ISLR system is considered as a pattern recognition technique that has two important modules: feature extraction and classification. The joint use of Discrete Wavelet Transform (DWT) based feature extraction and nearest neighbour classifier is used to recognize the sign language. The experimental results show that the proposed hand gesture recognition system achieves maximum 99.23% classification accuracy while using cosine distance classifier.

Hand Gesture Recognition Using PCA in [3]: In this paper authors presented a scheme using a database-driven hand gesture recognition based upon skin color model approach and thresholding approach along with an effective template matching with can be effectively used for human robotics applications and similar other applications.. Initially, hand region is segmented by applying skin color model in YCbCr color space. In the next stage thresholding is applied to separate foreground and background. Finally, template based matching technique is developed using Principal Component Analysis (PCA) for recognition.

Hand Gesture Recognition System For Dumb People [4]: Authors presented the static hand gesture recognition system using digital image processing. For hand gesture feature vector SIFT algorithm is used. The SIFT features have been computed at the edges which are invariant to scaling, rotation, addition of noise.

An Automated System for Indian Sign Language Recognition in [5]: In this paper a method for automatic recognition of signs on the basis of shape based features is presented. For segmentation of hand region from the images, Otsu's thresholding algorithm is used, that chooses an optimal threshold to minimize the within-class variance of thresholded black and white pixels. Features of segmented hand region are calculated using Hu's invariant moments that are fed to Artificial Neural Network for classification. Performance of the system is evaluated on the basis of Accuracy ,Sensitivity and Specificity.

Hand Gesture Recognition for Sign Language Recognition: A Review in [6]: Authors presented   various method of hand gesture and sign language recognition proposed in the past by various researchers. For deaf and dumb people, Sign language is the only way of communication. With the help of sign language, these physical impaired people express their emotions and thoughts to other person.

Design Issue and Proposed Implementation of Communication Aid for Deaf & Dumb People in [7]: In this paper author proposed a system to aid communication of deaf and dumb people communication using Indian sign language (ISL) with normal people where hand gestures will be converted into appropriate text message. Main objective is to design an algorithm to convert dynamic gesture to text at real time. Finally after testing is done the system will be implemented on android platform and will be available as an application for smart phone and tablet pc.

Real Time Detection And Recognition Of Indian And American Sign Language Using Sift In [8]: Author proposed a real time vision based system for hand gesture recognition for human computer interaction in many applications. The system can recognize 35 different hand gestures given by Indian and American Sign Language or ISL and ASL at faster rate with virtuous accuracy. RGB-to-GRAY segmentation technique was used to minimize the chances of false detection. Authors proposed a method of improvised Scale Invariant Feature Transform (SIFT) and same was used to extract features. The system is model using MATLAB. To design and efficient user friendly hand gesture recognition system, a GUI model has been implemented.

A Review on Feature Extraction for Indian and American Sign Language in [9]: Paper   presented the recent research and development of sign language based on manual communication and body language. Sign language recognition system typically elaborate three steps pre processing, feature extraction and classification.Classification methods used for recognition are Neural Network(NN), Support Vector Machine(SVM), Hidden Markov Models(HMM), Scale Invariant Feature Transform(SIFT),etc.

SignPro-An Application Suite for Deaf and Dumb . in [10]: Author presented application that helps the deaf and dumb person to communicate with the rest of the world using sign language. The key feature in this system is the real time gesture to text conversion. The processing steps include: gesture extraction, gesture matching and conversion to speech. Gesture extraction involves use of various image processing techniques such as

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histogram matching, bounding box computation, skin colour segmentation and region growing. Techniques applicable for Gesture matching include feature point matching and correlation based matching. The other features in the application include voicing out of text and text to gesture conversion.

Offline Signature Verification Using Surf Feature Extraction and Neural Networks Approach [11]: In this paper, off-line signature recognition & verification using neural network is proposed, where the signature is captured and presented to the user in an image format.

CONCLUSION

This paper deals with the different algorithm and techniques used for recognizing the hand gesture. Hand gesture recognition system is considered as a way for more intuitive and proficient human computer interaction tool. The range of applications includes virtual prototyping, sign language analysis and medical training. Sign language is one of the tool of communication for physically impaired, deaf and dumb people. From the above consideration it is clear that the vision based hand gesture recognition has made remarkable progress in the field of hand gesture recognition. Software tools which are used for implementing the gesture recognition system are C, C++, and Java language. To simplify the work especially when image processing operations are needed, MATLAB with image processing toolbox is used.

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