

Fusion of Local & Global Descriptors for Effective Hand Gesture Recognition

¹Sneha Sharadkumar Jariwala, ²Prof. Neha Parmar

¹M.Tech. Student, Dept. of CSE, Parul University, Vadodara, Gujarat, India

²Assistant Professor, Dept. of CSE, Parul University, Vadodara, Gujarat, India

Abstract: Now a day, Hand Gesture Recognition System can be used for Interfacing between Computer and Human using Hand Gesture. Hand Gesture is defined as static movement e.g. making a fist and holding it in certain position is considered as gesture. Complex gesture, fingers can be bent at angles other than zero or ninety degree. It include various forms of pinching, the “okay” sign and many of the gestures used in finger spelling. Dynamic movement such as waving goodbye. Simple gestures are made in 2 ways. First way involves simple or complex gesture and change in position or orientation of the hand such as making a pinching gesture and changing hand position. Second way moving the fingers in some way with no change in position and orientation of hand. e.g.: moving the index and middle finger back and forth to urge someone to move closer. Complex gesture includes finger movement, wrist movement and changes in hand position and orientation. Many signs in American Sign Language are example of gesture. Number of gesture that given recognition system or algorithmic techniques can accurately recognized. 1 to 15 postures and gestures is considered small set, 15 to 25 medium sized and anything over 25 are considered large. Technique for a Human Computer Interface through Hand Gesture is able to recognize 25 Static Gestures from American Sign Language Hand Alphabet.

Keywords: Hand Gesture Recognition, American Sign Language, Gesture Recognition, Kinect Depth.

I. INTRODUCTION

Now days, Sign Language is a form of hand gestures involving visual motions and signs, which are used as system of communication notably by the deaf .Hand Gesture Recognition is very useful in real time applications. It is necessary to make computer knows the meaning of human computer interactions. Gesture means a non verbal communications in which visible part communicate particular message. Motions of body contain information. Gesture provides a way for computers to understand human body language. Deals with the goal of interpreting human gestures via mathematical algorithm. Enables human to interface with the machine and interact naturally without any input device like Mouse, Keyboard.

Integration of Data Mining techniques with health systems would help to improve the efficiency and effectiveness of healthcare organizations. Healthcare industries can reduce cost by using computer based data and decision support system. Various types of gesture recognitions are i.e. iris recognition, face recognition etc.

The main aim of this paper is to design of intelligent human – computer interface by recognizing meaningful expressions.

In these various techniques are like how edged detection techniques, wavelet energy signature is used and various techniques are present. In these American sign database will be used and then we will have testing database to be used in the system. When the image will be captured from webcam at that time system will capture the image and from that meaningful information will be known easily.

This paper is organized as follows: The proposed model architecture will be shown in section 2. Section 3 consists of different methods or different techniques which can be used in the system. Conclusion of this study is presented in section 4.

II. RELATED WORK

In [1], Chong Wang propose in these paper there is comparison between Finger Earth Mover Distance Shaped context distance and path similarity, super pixel earth movers distance achieves better performance, it is efficient for the real time applications.

In [2], Jayshree Panare suggested Hand Gesture Recognition System (HGRS) for detection of American Sign Language (ASL) alphabets has become essential tool for specific end users (i.e. hearing and speech impaired) to interact with general users via computer system. ASL has been proved to be a powerful and conventional augmentative communication tool especially for specific users. ASL consists of 26 primary letters, of which 5 are vowels and 21 are consonants. Proposed Real-time static Alphabet American Sign Language Recognizer- (A-ASLR) is designed for the recognition of ASL alphabets into their translated version in text (i.e. A to Z). The architecture of A-ASLR system is fragmented into six consequent phases namely; image capturing, image pre-processing, region extraction, feature extraction, feature matching and pattern recognition. We have used Edge Orientation Histogram (EOH) in A-ASLR system. The system is developed for detection of ASL alphabets based on Vision-based approach. It works without using colored gloves or expensive sensory gloves on hand. Our A-ASLR system achieves the recognition rate of 88.26% within recognition time of 0.5 second in complex background with mixed lightning condition.

In [3], Vi N.T. Truong, suggest, Viola and Jones's study is a milestone in developing an algorithm capable of detecting human faces in real time. The original technique was only used for the face detection, but many researchers have applied it for the detection of many other objects such as eyes, mouths, car's number plates and traffic signs. Amongst them, the hand signs are also detected successfully. This paper proposed a system that can automatically detect static hand signs of alphabets in American Sign Language (ASL). To do that, we adopted the two combined concepts AdaBoost and Haar-like classifiers. In this work, to increase the accuracy of the system, we use a huge database for training process, and it generates impressive results. The translator was implemented and trained using a data set of 28000 samples of hand sign images, 1000 images for each hand sign of Positive training images in different scales, illumination, and the data set of 11100 samples of Negative images. All the Positive images were taken by the Logitech Webcam and the frames size were set on the VGA standard 640×480 resolution. Experiments show that our system can recognize all signs with a precision of 98.7%. Input of this system is live video and output is the text and speech.

In [4], Cheok Ming Jin, Due to the relative lack of pervasive sign language usage within our society, deaf and other verbally-challenged people tend to face difficulty in communicating on a daily basis. Our study thus aims to provide research into a sign language translator applied on the smartphone platform, due to its portability and ease of use. In this paper, a novel framework comprising established image processing techniques is proposed to recognise images of several sign language gestures. More specifically, we initially implement Canny edge detection and seeded region growing to segment the hand gesture from its background. Feature points are then extracted with Speeded Up Robust Features (SURF) algorithm, whose features are derived through Bag of Features (BoF). Support Vector Machine (SVM) is subsequently applied to classify our gesture image dataset; where the trained dataset is used to recognize future sign language gesture inputs. The proposed framework has been successfully implemented on smartphone platforms, and experimental results show that it is able to recognize and translate 16 different American Sign Language gestures with an overall accuracy of 97.13%.

In [5], Celal Savar, Sign Language Recognition (SLR) system is a method which allow deaf people to communicate with society. In this study, Real-Time Sign Language recognition system was proposed by using the surface Electromyography (sEMG). To this purpose, sEMG data acquired from subject right forearm for all twenty six American Sign Language gestures. Raw sEMG data was filtered, feature extracted and fed into classification. Support Vector Machine (SVM) with one vs. all approach was used for multi class classification. The experiment result of offline system is reaching a recognition rate of 91.% accuracy and real-time system has a recognition rate of 82.3% accuracy. The results of the proposed system shows that sEMG signal can be used for Real-Time SLR systems.

III. PROPOSED MODEL

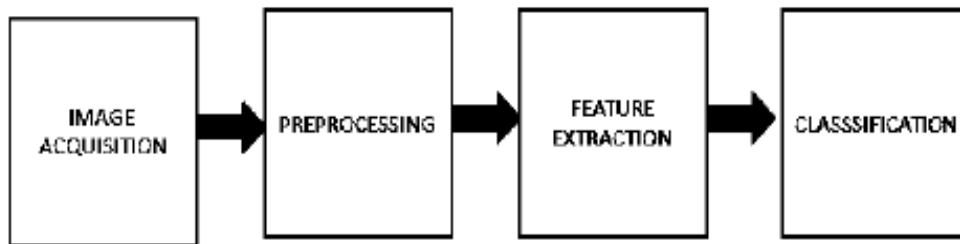


Figure 1: Proposed Model

The steps which will be processed are shown in figure 1 are presented as follows-

a) Image Acquisition

In these it is used to set image frame that will be captured by cheaper camera.

b) Data Preprocessing:

Pre-processing consists of image acquisition, segmentation and morphological filtering methods. It is used for segmentation purpose and gray scale images are converted into binary images consisting of hand or background. Morphological filtering techniques are used to remove noises from images so that we can get a smooth contour.

c) Feature Extraction

The third step consists of data in which the image will be processed and noise will be removed. In these texture based, shaped based, Geometric based

d) Matching:

A contour tracking is applied to find the contour and pixel in contour is numbered sequentially. Local contour sequence for any arbitrary pixel is calculated as perpendicular distance from the chord connecting end points of window size w .

e) Database

In these there will be 2 databases used. One will be American Sign Database and another will be Testing Database is used.

IV. DIFFERENT TECHNIQUES USED IN HAND GESTURE RECOGNITION

The proposed work is to implement the following steps in Matlab:

1. Pre-Processing

- a) Class Generation
- b) Segmentation
- c) Noise Removal and Morphological Filtering

Pre-processing consists of image acquisition, segmentation and morphological filtering methods. It is used for segmentation purpose and gray scale images are converted into binary images consisting of hand or background. Morphological filtering techniques are used to remove noises from images so that we can get a smooth contour.

2. Feature Extraction

- a) Texture Based Feature
 - 1) Wavelet Energy Signatures
 - 2) Runlength Matrices
 - 3) Local Gabor Binary Pattern Histogram Sequence

- b) Shape Based Features
 - 1) Edge Detection
 - 2) Boundary Estimation
- c) Geometric Features
 - 1) Estimation Of Palm Centre
 - 2) Fingertip Positions
 - 3) Mean Brightness
 - 4) Moment Invariant Features (Rotational and Scale Invariant)

It is used Local contour sequence as our prime feature. Canny edge detection technique is used to detect the border of hand in image.

3. Matching

A contour tracking is applied to find the contour and pixel in contour is numbered sequentially. Local contour sequence for any arbitrary pixel is calculated as perpendicular distance from the chord connecting end points of window size w .

4. Performance Evaluation

Computation of Accuracy

5. Database

- a) American Sign Language
- b) Self Generated Database

V. CONCLUSION AND FUTURE WORK

This paper presents various algorithms for Hand Gesture Recognition. To get efficient result, comparison is needed between these algorithms and we can decide best algorithm among all of them. As paper presents , two classification methods ,support vector classifier , conclusion of paper after referring methods and existing research paper is that . According to this survey, we can conclude that the most efficient method for Hand Gesture Recognition needs Support Vector machine and edge Detection method. In future work, different data mining technique can be used with decision tree classification algorithm to improve performance and high accuracy. In recent years a lot of research has been conducted in gesture recognition. The aim of this project was to develop an offline Gesture recognition system, so work can be done for real time purpose.

REFERENCES

- [1] Chong Wang,Zhong Liu,Shing-Chow Chan,“Superpixel-Based Hand Gesture Recognition with Kinect Depth Camera” ,IEEE-2015
- [2] Jayshree Panare, Maya Ingle, “Vision Based Approach for American Sign Language Recognition using Edge Histogram”, IEEE Vision and Computing,2016
- [3] Vi N.T.Truong, Chuan Kai Yang, Quoc Viet Tran, ” A Translate for American Sign Language to Text and Speech”, IEEE Transactions on Electronics,2016
- [4] Cheok Ming Jin, Zaid Omar, Mohamed Hisham Jawad, ”A Mobile Application of American Sign Language Translation via Image Processing Algorithm,”IEEE Region Symposium,2016.
- [5] Celal Savar, Ferat Sahin, ”Real Time American Sign Language Recognition System by using surface EMG signal,”IEEE International Conference on Machine Learning and Application,2015.
- [6] Narendra V Jagtap, Prof R.K.Somani, Prof Pankaj Singh Parihar, “Hand Gesture Recognition System for Human-Computer Interaction with Webcam”,IJSRD-2013

- [7] Ankit Saxena , Deepak Kumar, Jai Ananya,“Hand Gesture Recognition using Android Device ”, IEEE
- [8] B Mathivanan, Dr V.Palanisamy, Dr S.Selvarajan,“An Efficient Hand Image Segmentation Algorithm for Hand Geometry based Biometrics Recognition System”,IJCA-2013
- [9] Anup ,Karun Thankachan, Mevin Dominic,“Sign Language Recognition” IEEE
- [10] Sushmita Mitra, Tinku Acharya “Gesture Recognition”,IEEE-2007

BIOGRAPHY

Sneha Sharadkumar Jariwala is an M.Tech. Student in the Computer Science and Engineering Department, Parul University, Vadodara,Gujarat, India and Pursuing Master of Technology (M.Tech) degree from Parul University, Vadodara, Gujarat, India. She received Bachelor of Engineering (B.E.) degree in Computer Science and Engineering in year 2015 from Laxmi Institute of Technology, Sarigam, Gujarat, India. Research interests are Image Processing, Data Mining, Machine Learning, Artificial Intelligence, etc.