Sign Language Recognition Using Image Processing

Kamal Preet Kour, Dr. Lini Mathew
Electrical & Panjab University,
Punjab, India

Abstract- One of the major drawback of our society is the barrier that is created between disabled or handicapped persons and the normal person. Communication is the only medium by which we can share our thoughts or convey the message but for a person with disability (deaf and dumb) faces difficulty in communication with normal person. For many deaf and dumb people , sign language is the basic means of communication. Sign language recognition (SLR) aims to interpret sign languages automatically by a computer in order to help the deaf communicate with hearing society conveniently. Our aim is to design a system to help the person who trained the hearing impaired to communicate with the rest of the world using sign language or hand gesture recognition techniques. In this system, feature detection and feature extraction of hand gesture is done with the help of SURF algorithm using image processing. All this work is done using MATLAB software. With the help of this algorithm, a person can easily trained a deaf and dumb.

Index Terms- Sign language Recognition (SLR), Hand gesture recognition, Image processing, Feature detection, Feature extraction, SURF.

I. INTRODUCTION

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

1.1 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.

1.1.1 Sensor Based Approach: In this approach for 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. 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.

1.1.2 Vision Based Approach: In this approach camera takes the image of gesture, extract the main feature and recognizes it. Initally colour bands were used. 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.

II. LITERATURE SURVEY

The literature survey is considered as a part of the work**.** It interference the queries related the improvement of work already done and clearly outline the development of the research projects.

Sunitha K. A1 et al. 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 proposed

that are Wearable Communication Device and Online Learning System. Under Wearable communication method, Glove based system are used, Keypad method and Handicom Touch-screen. The Online Learning System has different methods like SLIM module, TESSA, Wi-See Technology, SWI_PELE System and Web-Sign Technology. [1].

Ahuja and Amardeep 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.Template based matching technique is developed using Principal Component Analysis (PCA) for recognition. [2].

Sagar P.More & Prof. Abdul Sattar have 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.[3].

Pratibha Pandey & Vinay Jain have presented various method of hand gesture and sign language recognition in the past by various researchers. With the help of sign language, these physical impaired people express their emotions and thoughts to other person. [4].

Nakul Nagpal et al 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. Authors design an algorithm to convert dynamic gesture to text at real time.[5].

Neelam K. Gilorkar & Manisha M. Ingle A proposed a real time vision based system for hand gesture recognition .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.[6] .

Ashish Sethi et al presented application system which 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 histogram matching, bounding box computation, skin colour segmentation and region growing. Techniques applicable for Gesture matching include feature point matching and correlation based matching.[7].

Priyanka Sharma proposed off-line signature recognition & verification system using neural network where the signature is captured and presented to the user in an image format.[8].

III. PROPOSED METHODOLOGY

In this section Hand Gesture Recognition using SURF Algorithm is given. Flowchart for the proposed system is shown in Fig.1
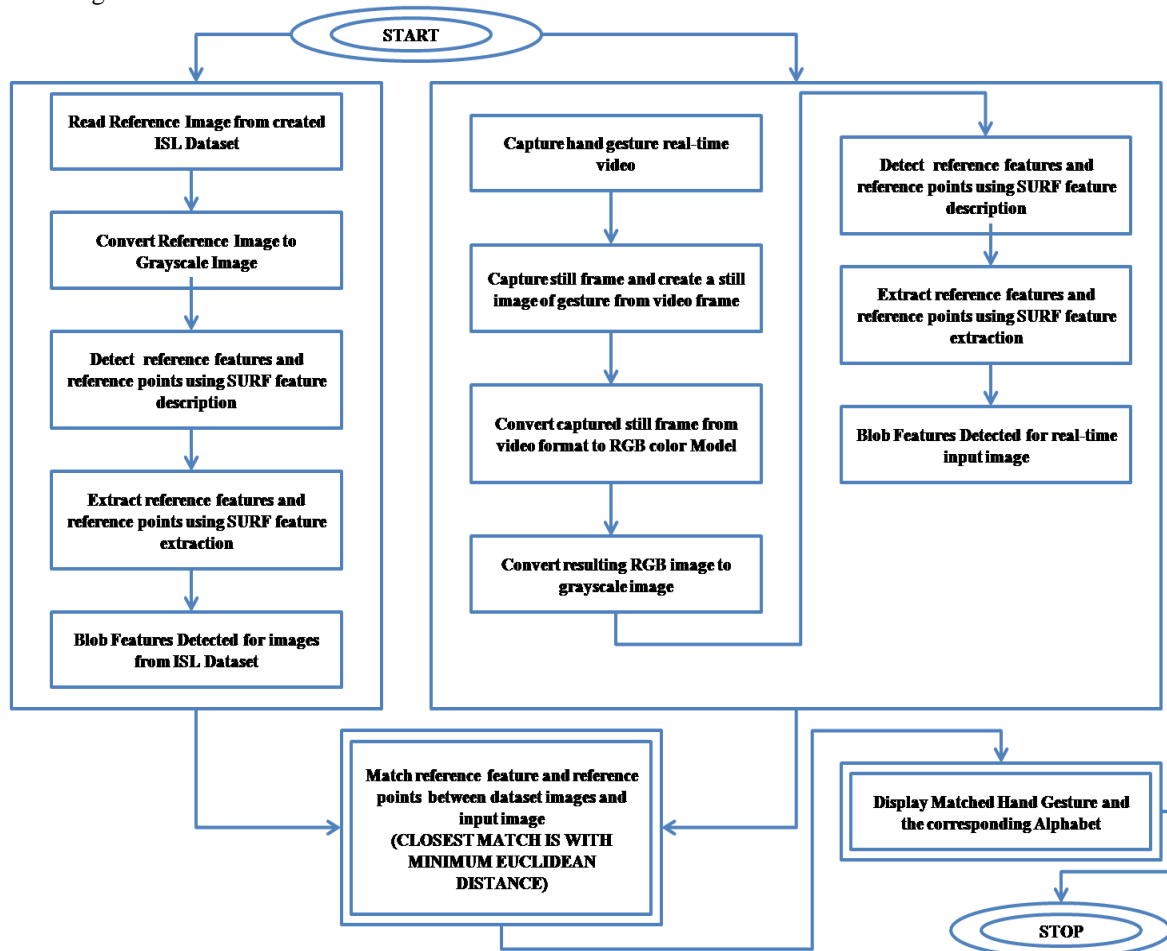

Fig.1 Hand Gesture Recognition System for ISLS.

Proposed flowchart has following steps:

Image Acquisition: In this step hand gesture made in front of the camera & frame capture function is used to create a still image from real-time video capture.

Preprocessing & Segmentation: This still image is converted from video frame format to RGB colour Model Format for further processing. After obtaining RGB image, it is converted into gray scale. From converted gray scale image interest points are detected using SURF. Interest points of captured image & reference image stored in database is detected.

Description & Feature selection: After feature detection, features are extracted from captured image as well as from reference image. Feature extraction is also refer as feature description. Extraction of features are done using SURF.

Matching: The final step is matching. Matching reference feature and reference points between reference images and input image ie captured image with closest match using Minimum Euclidean distance.

IV. RESULTS

The proposed work is implemented and tested with set of images. The database is created with 26 images of single person and their corresponding images of 26 alphabets. Results for Alphabet A is shown in Fig.2 and Results for Alphabet B is shown in Fig.3.
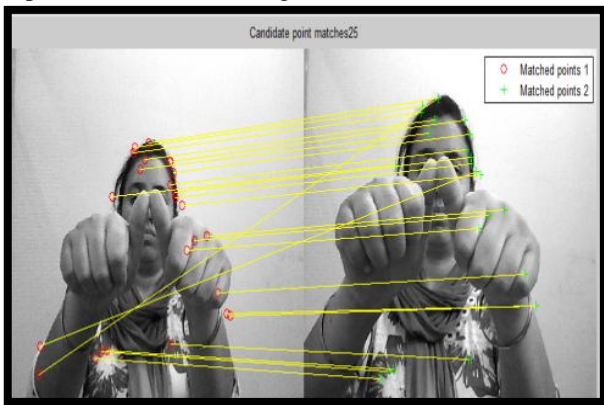

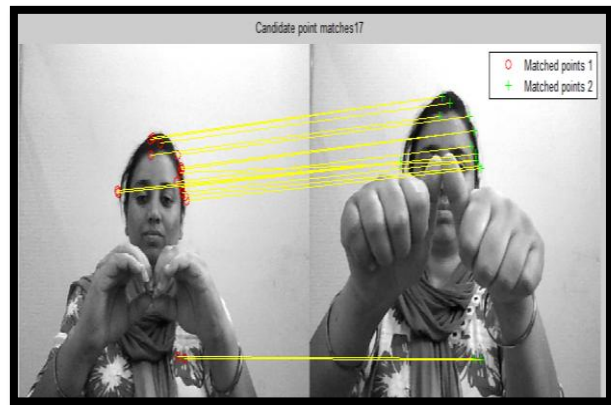Fig.2(a) Number of matched points = 25
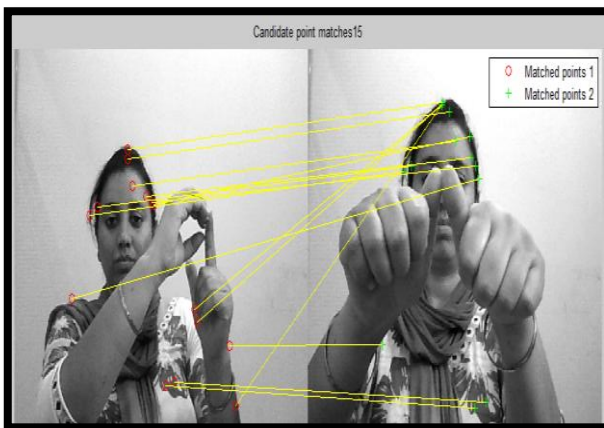

Fig.2(b) Number of matched points = 17

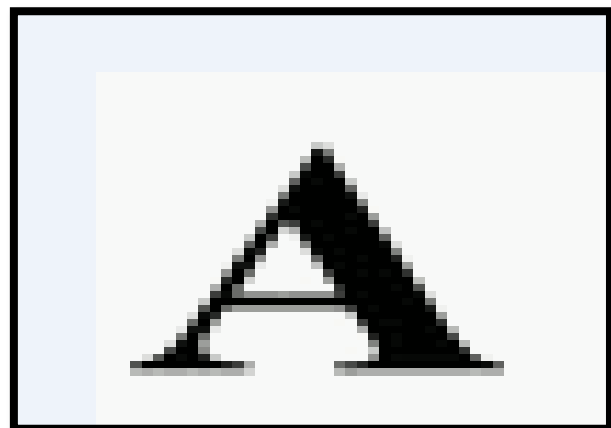Fig.2(c) Number of matched points = 15

Fig.2(d) Output

Fig. 2(a), (b), (c), (d) shows match points of reference image and captured image and output for alphabet A
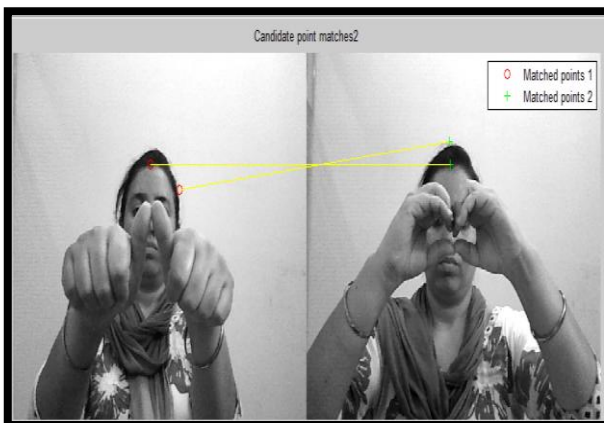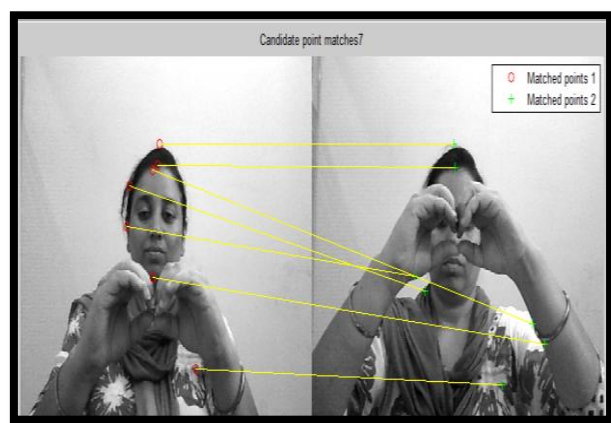

Fig.3(a) Number of matched points = 02

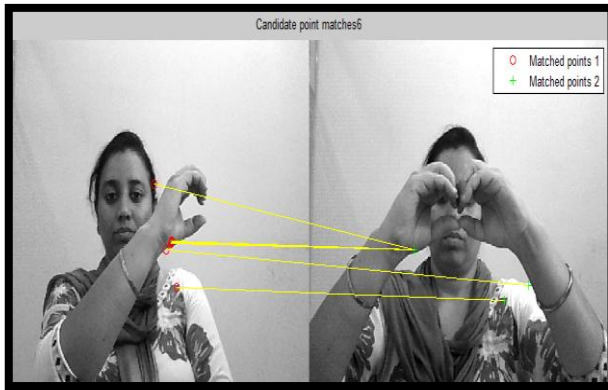Fig.3(b)Number of matched points = 07

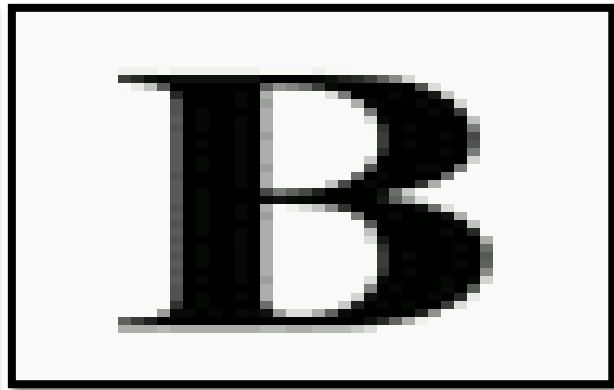Fig.3 (c) Number of matched points = 06   Fig.(d) Output
Fig. 3 (a), (b), (c), (d) shows match points of reference image and captured image and output for alphabet B

V. CONCLUSION

Vision based approach is used for sign language recognition in which a video camera used to record hand movements, and the input video is partitioned into frames, for each frame, a set of features are extracted. The system aims at recognizing 26 alphabets using Image processing technique in which feature detection and feature extraction of hand gesture is done with the help of SURF (Speed Up Robust Features) algorithm. Results for two alphabets ie. for A and B are given   The system is implemented in MATLAB. The system resolves the difficulties of disabled person to learn sign language and identify the characters. This system will improve the quality of teaching and learning in deaf and dumb institute. The main aim of this work is serving the mankind that is achieved by providing better teaching and better learning.

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