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VISION BASED SIGN LANGUAGE BY USING MATLAB

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Abstract - *Human Computer Interaction moves forward in the field of sign language interpretation. Indian Sign Language (ISL) Interpretation system is a good way to help the Indian hearing impaired people to interact with normal people with the help of computer. As compared to other sign languages, ISL interpretation has got less attention by the researcher. In this paper, some historical background, need, scope and concern of ISL are given. Vision based hand gesture recognition system have been discussed as hand plays vital communication mode. Considering earlier reported work, various techniques available for hand tracking, segmentation, feature extraction and classification are listed. Vision based system have challenges over traditional hardware based approach; by efficient use of computer vision and pattern recognition, it is possible to work on such system which will be natural and accepted, in general.*

Key Words: **Sign Language, Hearing impaired,Computer, Hand gestures, Hardware and Software based, communication mode.**

1. INTRODUCTION

This paper presents SIGN LANGUAGE TRANSLATION BY USING MATLAB software for automatic translation of Indian sign language into spoken English to assist the communication between speech and/or hearing impaired people and blind people. It could be used by deaf, dumb and blind community as a translator to people that do not understand sign language, avoiding by this way the intervention of an intermediate person for interpretation and allow communication using their natural way of speaking.

The proposed software is standalone executable interactive application program developed using MATLAB software that can be implemented in any standard windows to developed operating laptop, desktop to operate with the camera, processor and audio device. For sign to speech translation, the one handed Sign gestures of the user are captured using camera; vision analysis functions are performed in the operating system and provide corresponding speech output through audio device. For blind people special switches are incorporated so that the corresponding speech output through speaker. This system is trained to translate one handed sign representations of predefined sign gestures to voice. The software does not require the user to use any special hand gloves.

The results are found to be highly consistent, reproducible, with high precision and accuracy.

1.1 Related work

The authors Y.Madhuri , G.Anitha,M. Anburajan This report presents a mobile VISION-BASED SIGN LANGUAGE TRANSLATION DEVICE for automatic translation of Indian sign language into speech in English to assist the hearing and/or speech impaired people to communicate with hearing people. It could be used as a translator for people that do not understand sign language, avoiding by this way the intervention of an intermediate person and allow communication using their natural way of speaking. The proposed system is an interactive application program developed using LABVIEW software and incorporated into a mobile phone. The sign language gesture images are acquired using the inbuilt camera of the mobile phone; vision analysis functions are performed in the operating system and provide speech output through the inbuilt audio device thereby minimizing hardware requirements and expense[1].

The authors Dawod A.Y., Abdullah . and Alam MJ. Hand segmentation is often the first step in applications such as gesture recognition, hand tracking and recognition. We propose a new technique for hand segmentation of color images using adaptive skin color model. Our method captures pixel values of a person's hand and converts them into YCbCr color space. The technique will then map the CbCr color space to CbCr plane to construct a clustered region of skin color for the person. Edge detection is applied to the cluster in order to create an adaptive skin color boundaries for classification. Experimental results demonstrate successful detection over a variety of hand variations in color, position, scale, rotation and pose[2].

The authors Dhruva N., Rupanagudi S.R., Sachin S.K., Sthuthi 8., Pavithra R.and Raghavendra, Eigen values and Eigen vectors are a part of linear transformations. Eigen vectors are the directions along which the linear transformation acts by stretching, compressing or flipping and Eigen values gives the factor by which the compression or stretching occurs. For recognition of hand gestures, only hand portion till wrist is required, thus the unnecessary part is clipped off using this hand cropping technique. After the desired portion of the image is being cropped, feature extraction phase is carried out. Here, Eigen values and Eigen vectors are found out from the cropped image. Here is designed a new classification technique that is Eigen value weighted

Euclidean distance between Eigen vectors which involved two levels of classification[3].

The authors Bhame. V, Sreemathy. R, Dhumal. H. Hand gesture is one of the methods used in sign language which is most commonly used by deaf and dumb people to communicate with each other or with normal people. The proposed algorithm aims at developing real time image processing based system for hand gesture recognition on personal computer with an USB web cam. This paper proposes a method to detect and recognize the static image of Indian Sign Language numbering system from zero to nine. The method is based on counting the open fingers in the static images. The proposed algorithm for gesture recognition is based on boundary tracing and finger tip detection and also deals with images of bare hands, which allows the signer to interact with the system in a natural way. The proposed algorithm is first detect and segments the hand region from the real time captured images. Then using the proposed methodology, it locate the fingers and classifies the gesture. Further the system convert Indian signs into text and then speech using an audio file stored on PC. The algorithm is size invariant but it is orientation dependent. The proposed system is implemented using OpenCV[4].

The authors Zhou, Qiangqiang; Zhao, Zhenbing, Video surveillance system in the substation will enable operation and maintenance staffs to monitor on-site power equipments. But there's a variety of on-site equipments, it is necessary to add image recognition technology to the system. In this paper, a substation equipment image recognition method based on SIFT feature matching is proposed. To perform SIFT feature matching between the template image and the monitoring image of the substation equipment, mismatches are eliminated by means of RANSAC algorithm and the relative distance ratio being equal method. The edge of the template image is gotten through OTSU segmentation. At last, the location of the template image is marked in monitoring image. Comparison of experimental results show that the proposed method can more correct and effective than the original SIFT method, and it can accomplish well substation equipment image recognition[5].

The authors Archana S. Ghotkar, Dr. Gajanan K. Kharate, In this paper, we introduce a hand gesture recognition system to recognize the alphabets of Indian Sign Language. In our proposed system there are 4 modules: real time hand tracking, hand segmentation, feature extraction and gesture recognition. Camshift method and Hue, Saturation, Intensity (HSV) color model are used for hand tracking and segmentation. For gesture recognition, Genetic Algorithm is used. We propose an easy-to-use and inexpensive approach to recognize single handed as well as double handed gestures accurately. This system can definitely help millions of deaf people to communicate with other normal people[6].

The authors Dominikus Willy, Ary Noviyanto, Aniati Murni Arymurthy, The songket recognition is a challenging task. The SIFT and SURF, which are feature descriptors, are considered as potential features for pattern matching. The Songket is a special pattern originally from Indonesia The Songket Palembang is used in this research. One motif in the Songket Palembang may has several different basic patterns. The matching scores, i.e., distance measure and number of keypoint, are evaluated corresponding with the SIFT and SURF method. SIFT method has been better than SURF method, but SURF has been extremely faster than SIFT[7].

The authors Chenglong Yu, Member, IEEE, Xuan Wang, Member, IEEE, Hejiao Huang, Member, IEEE, Jianping Shen, Kun Wu,. This paper presents a feature extraction method or hand gesture based on multi layer perception. Median and smoothing filters are integrated to remove the noise. Combinational parameters of Hu invariant moment, hand gesture region, and Fourier descriptor are created to form a new feature vector which can recognize hand gesture [8].

The authors Penghui Jiang, Shengjie Zhao, Samuel Cheng, Speeded Up Robust Features (SURF) is one of the most robust and widely used image matching algorithms based on local features. However, the performance for rotation image is poor when one image is a rotated version of the other. To improve the matching accuracy of rotation image, we present an modified image matching algorithm combining Haar wavelet and the rotation invariant Local Binary Patterns (LBP). Firstly, keypoints are extracted from the images for matching by applying the Hessian matrix and integral images. Secondly, each keypoint is described by the Rotation Invariant LBP patterns and Haar wavelet, which are computed from the image patch centered at the keypoint. Finally, the matching pairs between the two sets of keypoints are determined by using the nearest neighbor distance based on matching strategy. The experimented results show that in comparison with prior works the proposed algorithm is efficient when tested on the images of scaling, rotation, blurring and brightening [9].

2. DESCRIPTION

In general, deaf people have difficulty in communicating with others who do not understand sign language. Even those who do speak aloud typically have a “deaf voice” of which they are self-conscious and that can make them reticent. The dumb people cannot speak and they will have difficulty in communicating with others. The blind people cannot communicate with others since they cannot see the world. To overcome this sign language should be interfaced with some other means for easy communication. So, we came up with a solution called “VISION BASED SIGN LANGUAGE TRANSLATOR BY USING MATLAB”.A coloured tape is fitted to the fingers which acts as a input. we have to show this fingers to pc with installed MATLAB.

The output from pc is converted to digital and processed by using microcontroller and then it responds as voice by using speaker. This voice output can be used for both blind and dumb. Here, we provide four buttons for blind with predefined voices and the last button for emergency call.GSM module supports for receiving the call.

In this project we have used a microcontroller, a speech IC and also speaker to produce the output. Hardware components used are power supply, and voice IC(aPR33a3).Software used is

MATLAB. It is used in medical applications and used as a speaking aid for dumb, deaf and blind patients who are in ICUs MATLAB helps in grasping the gestures and transmits the data pre-recorded accordingly, reliability in output etc

A video is captured at around 30 frames per second. This number of frames per second is enough for computation. More number of frames will lead to more time for computation as more data needs to be processed. The image acquisition process is subjected to many environmental factors like the exposure of light, the background and foreground objects. In order to make feature extraction easier later on, a plain background (white) is easier to work on. This part consists of hand segmentation followed by morphological operations. One method for this is proposed an adaptive skin color model for hand segmentation by mapping YCbCr color space into YCbCr color plane. Another method for hand segmentation and tracking is based on HSV histogram. These methods can segment the hand in simple as well as complex background. For simplicity purposes, the hand segmentation is performed by transforming the image acquired into black and white image, where the background will be white and the foreground i.e. the hand will be black. Another way to preprocess the images acquired is the color thresholding method. Using this method, the color region can be segmented and the position of the region of interest can be determined. Then, the color segmented images are analyzed to obtain the unique features of each sign in the sign language. But this method is suitable only for alphabets' (A – Z) and numbers' (0 – 9) recognition, because it uses the unique combination of fingertip position for feature extraction of each sign. The Gauss-Laplace edge detection method can also be used to get the hand edge. The experimental result shows the Gauss-Laplace algorithm is used to effectively implement the hand edge detection.

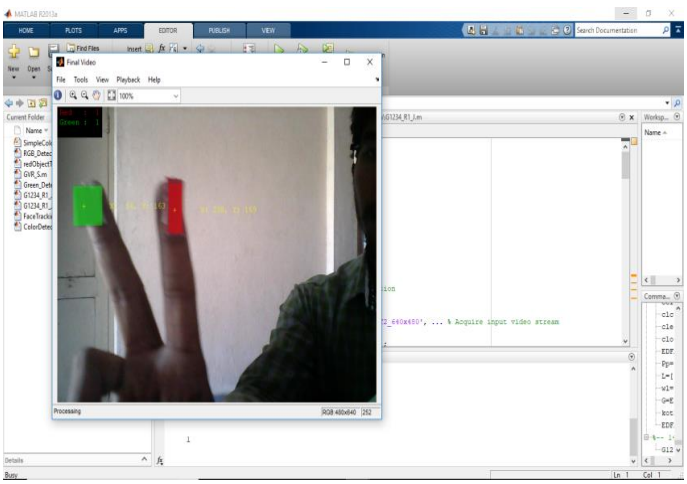

Figure -1: Gauss Laplace Translator used in template

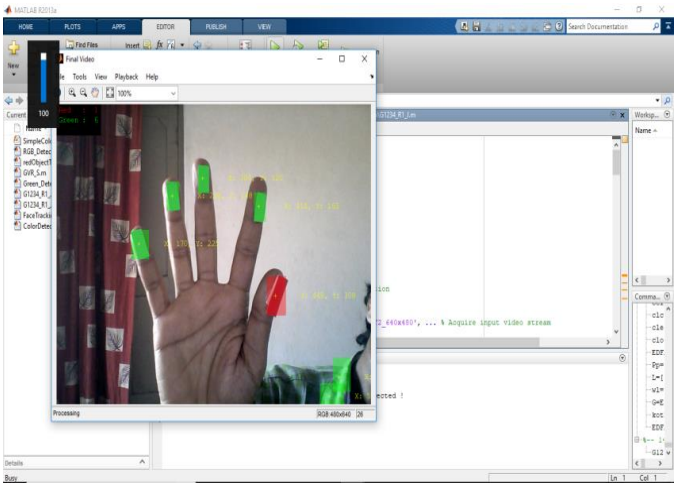

Figure-2: Gauss Laplace Algarithm

The technique to be chosen to recognize the sign depends on the method used for preprocessing the image. If color thresholding followed by fingertip position extraction is used, then the recognition will be based on the position of finger in the bounding box. A threshold value is set for the difference between the database image and the input image. If the difference obtained is above this threshold value, a match is said to have been found.

3. CONCLUSION

In this paper, various algorithms and methods by which the process of sign language translation can be performed are discussed. The advantages of some methods over others are also discussed. The vision of an efficient system to translate sign language to text is quite achievable, but the challenges lie in optimization.

4. RESULT

All input images were captured by webcam or an android device. The captured image is then read in MATLAB and converted in binary form of size defined so that it takes less time and memory space during pattern recognition. Now by using PCA it calculates the Eigen vectors and shows the equivalent image to the input gesture with minimum equivalent distance. At last it gives out the matched hand gesture and alphabet corresponding to the given input image from the database. It also produces an audio sound indicating the output sign gesture.

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