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Communication Aid for Differently Abled

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ABSTRACT: For a disabled person, sign language is the only way of communication. With the help of sign language, these physically impaired people express their expressions and thoughts to another person. Since for the common person, it is difficult to understand this language therefore hence sign language recognition has become an empirical task. sign language consists of various movements and gesture of the hand, so the accuracy of sign language depends on the accurate recognition of hand gesture. This paper presents a novel approach for sign language recognition and proposed background subtraction model for hand segmentation, Histogram of Oriented Gradients (HOG) descriptor for feature extraction and random forest for hand sign recognition. This technology will help employers in recruiting the dumb and deaf person can present their thoughts in large seminars and conferences.

KEYWORDS: Communication aid, Gesture Recognition, Image Processing, Histogram of Oriented Gradients (HOG)

I. INTRODUCTION

Sign languages are languages that use the visual-manual method to convey meaning. Hand gestures are a part of body language and they have been one of the most natural and fundamental means of communication among humans. If these gestures can also be used to naturally interact with a computer interact, then it would set up a revolution. The emerging recenter searches in Hand Gesture Recognition has gained a lot of attention due to their varied applications such as virtual environments, interactive human and machine interface, assistance in surgeries, military and also game technology Language is expressed via the manual sign stream in combination with non-manual elements, people with disability need some translator to translate their thoughts and ideas to another person so they use sign language. Sign language is the combination of different gesture, shape, and movement of hand, body and facial expression. In a different part of the world, different sign languages have been used. but it is not understood by a normal person and also it is not possible to keep a translator with them for any time. To ignore this situation, In this paper we have been using image processing and machine learning techniques to communicate with a normal person by using the webcam which detects the different hand signs and that signs can be recognized or understood by normal person by displaying the text in the user system according to signs given by differently abled. so both the persons can be easily understood and communicate.

II. SIGN LANGUAGE

A sign language is a way of communicating by using their hands. Sign languages are an important way for deaf people to communicate. Deaf people often use them instead of spoken languages. Spoken languages use sounds from the mouth and are understood with the ears. Sign languages use hands and are understood with the eyes. Deaf people can use sign languages more easily than spoken languages. Deaf people sometimes learn a sign language from their family, especially if their parents are deaf. But, most deaf children have hearing parents, so they learn a sign language from other deaf people. They may meet other deaf people at school or in the streets. Hearing people may learn to sign directly from deaf people. Or, they may learn a sign language by going to signing classes or by studying a sign language work book, which can come with an interactive DVD.

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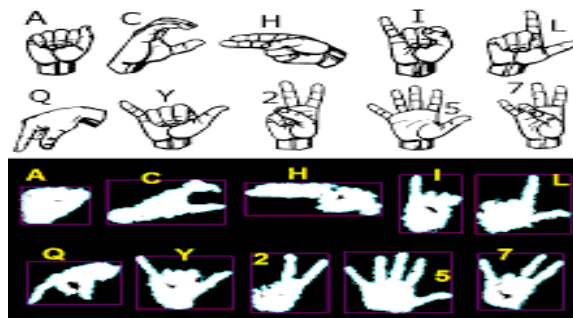


Fig.1: Some of the Sign Languages

Sometimes deaf people do use a spoken language, especially when talking with hearing people. Sometimes hearing people use a sign language with each other, rather than speaking. But, deaf people tend to use sign languages, and hearing people tend to use spoken languages. Some deaf people can also understand spoken words by looking at a speaker lips. This is known as lip-reading. It is hard to learn, and few people do it well. Sometimes signing and lip-reading are combined, especially when deaf and hearing people are talking to each other.

III. HAND GESTURE

The hand gesture is a high practical value body language that its specific meaning is established through our language centre by the palm and finger position and shape. Generally speaking, the gesture consists of static and dynamic hand gestures. As its name suggests, Static hand gestures refer to the individual shape of the hand, and the dynamic hand gestures are composed of a series of hand movements. Because the gesture has diversity and ambiguity, and it is affected by time and cultural backgrounds, different people have different definitions of gestures.



Fig.2: Examples of Data Glove.

In this paper, the hand gesture is defined as the combination of all kinds of gestures and movements produced by hand or hand and arm. It includes dynamic hand gestures, whose meanings are based on the track of the motion of hands, and static hand gestures in which the shape of hand gesture is used to express the meaning. The main difference between gesture and posture is that posture has more emphasis on the shape and state of the hand and the body, but gesture has more emphasis on the hand movement.

IV. LITERATURE SURVEY

1. In 2012 Deepika Tewari, Sanjay Kumar Srivastava in their paper, presented an algorithm for hand gesture recognition which is further used in Indian sign language recognition system. In their system, self organizing map (SOM) is used for classification purpose. In their approach, first of all the hand image is segmented by utilizing the pixel value for skin and background. Background is represented by the black color. Once the hand image is segmented then discrete cosine transform (DCT) is computed for hand region. 2-d DCT is used for this purpose. Computation of 2-D DCT involves two steps- (i) Computing 1-D DCT for each row of the image. (ii) Computing 1-D DCT for each column of the image[2].
2. Dhruva N. and Sudhir Rao Rupanagudi, suggested in hand gloves worn to recognize the sign language. They have used white color woollen hand gloves for better accuracy. Since in sign language each and every finger represent



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unique message therefore it is very important that each and every fingers must be segmented out clearly. In order to meet this requirement, they have modified the woollen hand gloves For this purpose each finger in the glove is sown with different colour. This makes it easy to segment out each and every fingers clearly with the help of color based segmentation techniques. RGB and other color based approach is used for segmentation purpose[4].

3. Hand gesture recognition systems have become increasingly interesting to researchers in the field of human-computer interfaces. Real-world systems for human dynamic hand gesture recognition is challenging as:
 - 1) the system must be robustness to various conditions.
 - 2) There is a rich diversity in how people perform hand gestures, making hand gesture recognition difficult.
 - 3) The system must detect and recognize hand gestures continuously using unsegmented input streams in order to avoid noticeable lag between performing a gesture and its classification. In this paper, to address these challenges, we present Latern, a novel system for dynamic continuous hand gesture recognition based on Frequency Modulated Continuous Wave (FMCW) radar sensor[13]
4. Vasiliki E. Kosmidou, and Leontios J. Hadjileontiadis, in their paper, suggested electromyogram and 3-D accelerometer based sign language recognition system. In their method, five-channel surface electromyogram and 3-D accelerometer are used to get the data from the dominant hand of signer's. These data is then analysed using intrinsic mode entropy(IMEn) for recognizing the sign language. They have used this method for Greek sign language. Isolated signs are used for recognizing the sign language[5]
5. Soukaina Chraa Mesbahi and Mohamed Adnane Mahraz ,In there paper presents a method for hand gesture recognition using convexity defect and background subtraction.First, the background subtraction is used to eliminate the uselesinformation. To find contour of segmented hand images we used images processing techniques. After that we calculate the convexhull and convexity defects for this contour. The feature extraction purposes to detect and extract features that can be used todetermine the significance of a given hand gesture[11]
6. Vandit Gajjar, Viraj Mavani and Ayesha Gurnani, In this paper developed universally incomputing, now a day's user interaction approaches with mouse,keyboard, touch-pens etc. are not sufficient. Directly using ofhands or hand gestures as an input device is a method to attract people with providing the applications, through Machine Learning and Computer Vision. Human-computer interaction application in which you can simply draw different shapes, fill the colors, moving the folder from one place to another place and rotating your image with rotating your hand gesture[10]
7. Chunying QUAN and Jianning LIANG, In this paper presented Hand gesture recognition is very important for HCI(human computer interaction). We introduce a simple methodto recognize hand gestures. After the hand region is segmentedfrom the background, the distance signature is constructed to describe the shapes of hand gestures. Then, the recognition of hand gestures is accomplished using the KNN classifier[1]
8. Lan Tiantian, Shen Jinyuan, Liu Runjie, and Guo Yingying, In this paper presented To reduce the influence of edge information in background, an improved feature extraction method for handgestures in which the histograms of oriented gradients is combined with the skin similarity is proposed. Weight computedon the skin similarity is introduced into the gradient of each image pixel. This new gradients can enhance the hand features. Histograms of oriented gradients with different size of cells are employed to classify the hand gestures because different sizes of cells depict different local features[2].

V. PROPOSED SYSTEM

The proposed system uses Open CV and SK learn as its core entity. By using background subtraction the movement of the hand is identified. Using Feature Extraction Techniques like LBPH (Local Binary Pattern Histogram) or HOG(Histogram of Oriented Gradients).To solve the background and lighting problems. Use an effective method for reducing the computation time and increase recognition accuracy. Recognize the hand gesture to identify the sign language. To increase the detection accuracy. the gestures captured is stored in the data set for finding the skin segmentation after the sign is recognized by the camera it then checks whether the hand is stored in the dataset if it is valid then it performs the skin segmentation of the hand and enters to perform the following methods

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A. Background Subtraction:

The Gaussian Mixture Model (GMM) based background subtraction process is applied for subtracting the background.

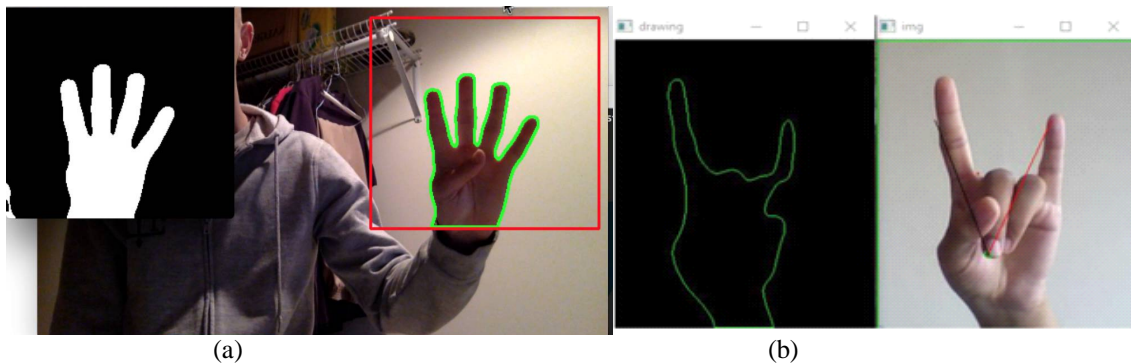


Fig.3: Background Subtraction (a) & (b) Process of separating out the foreground objects from the background .

B. Feature Extraction:

In that, HOG feature is extracted from the segmented hand gesture image.

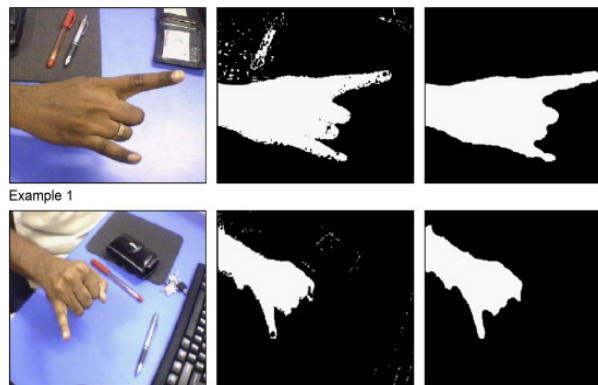


Fig.4: Feature Extraction is the process of collecting discriminative information from set of samples.

C. Recognition:

Finally, a random forest machine learning model is used to recognize the hand gesture to identify the sign language. After the completion of the process, the sign is converted as a text message for the normal user. and again the text message is translated to sign language for understanding by the normal person

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ARCHITECTURE DIAGRAM

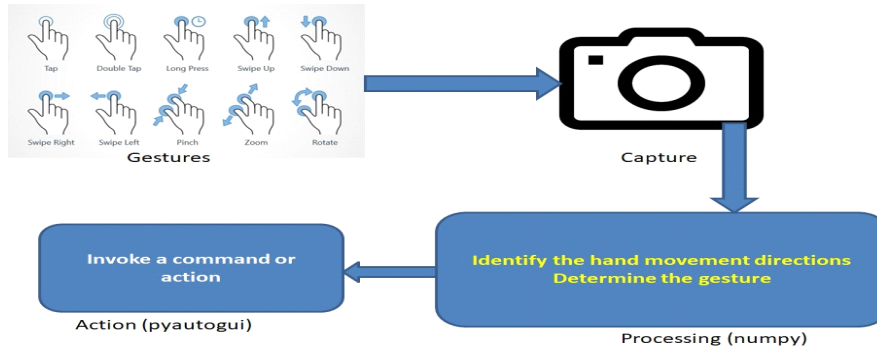


Fig.5: An Architecture Diagram is a set of concepts, that are the parts of an architecture including their principles, elements and components.

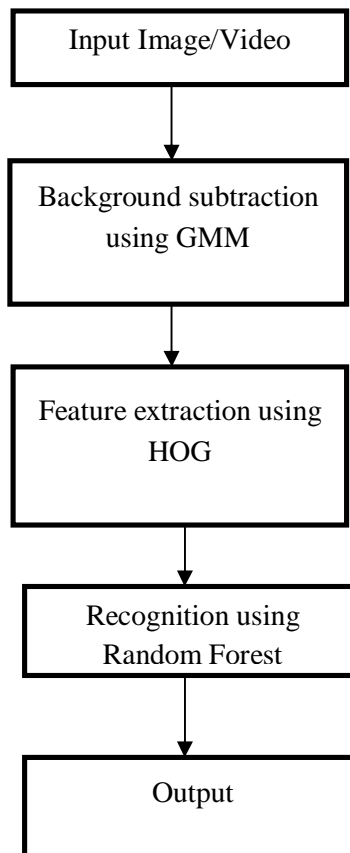


Fig.6: Block Diagram shows a schematic form of general arrangement of the parts or components of a complex system or process.

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VI. WORKING PROCEDURE OF HAND GESTURE

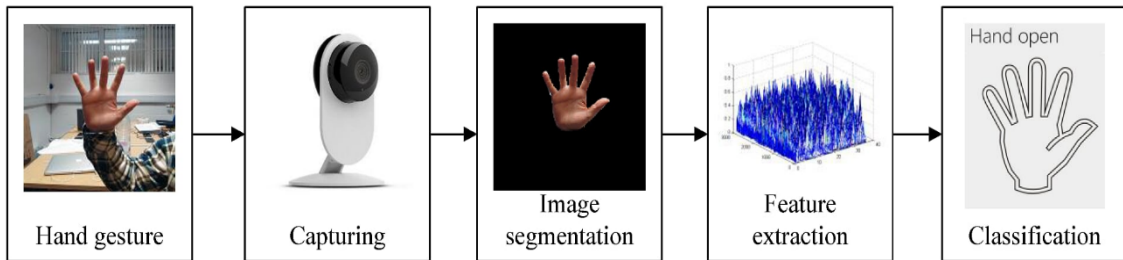


Fig 7: The working procedure of hand sign recognition is takes places under the following modules each modules can be considered to perform a specific function. Each function uses a sequence of methods to gives an exact output according to the given gesture

VII. RESULTS



Fig.8: Storing a hand gestures in a data set

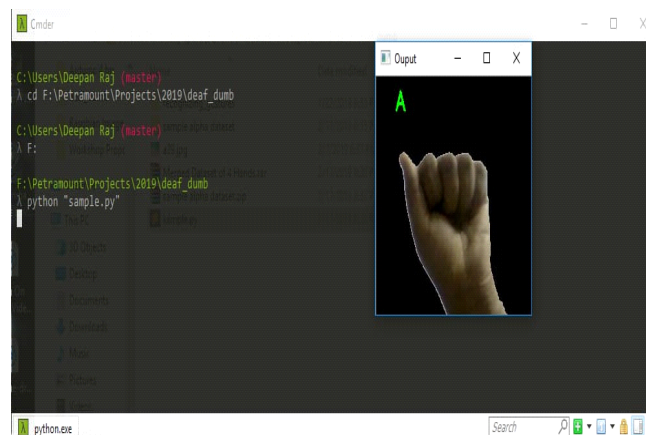


Fig.9: The input of the hand sign gives the output as "A"

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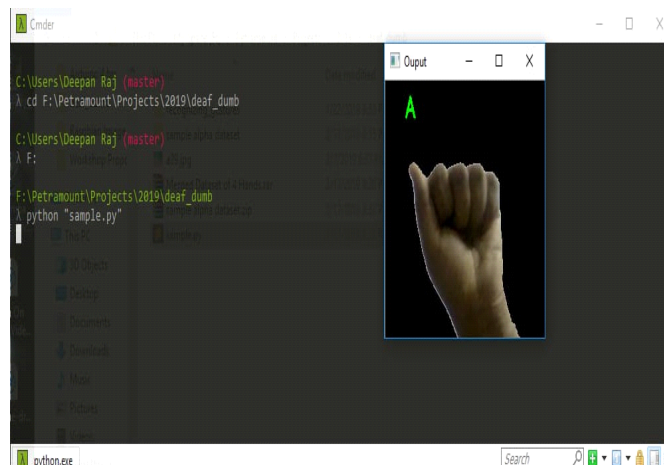


Fig.10: The input of the hand sign gives the output as "A"

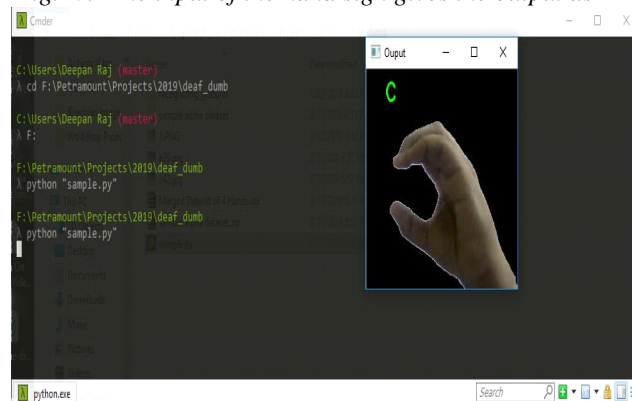


Fig.11: The input of the hand sign gives the output as "C"

VIII. CONCLUSION

Hand sign recognition algorithm is rather robust and accurate so it is easy for them to communicate with a normal person. Hand gesture recognition has achieved an important breakthrough in this technology will help Employers in recruiting the dumb and deaf person can present his thoughts in large seminars and conferences without any translator. Though the gesture recognition is not a new subject, with the emergence of the strong vitality and diversity application technology, Kinect, hand gesture recognition has achieved an important breakthrough. The user need not use the gloves and other equipment, he can directly show the sign and it will be recognized. The above cause will help in bridging the communication gap between the deaf and dumb and a normal person. The deaf and dumb person can make presentations and express his ideas in sign language in conferences. Writing on piece of paper will take time but sign language is quick And as the further mature and fully dig of the Kinect, its complete implementation in the natural conditions is no longer far away from us.

IX. FUTURE WORK

This paper is aimed by developing interaction between the normal person to differently abled person, both can communicate among themselves without any translators middle, because it is not possible to keep a translator always with them. to rupture this kind of situation we have introduced this paper. with the sign language In future the technology can be developed in a wide range so the developer can be able to develop a project which increases the



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accuracy and images of gesture and also it can be used for visually abled person also in order to provide the information through voice so that they can be able to understand and now the things or object they needs.

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