ISSN 2348-1218 (print)
International Journal of Interdisciplinary Research and Innovations ISSN 2348-1226 (online)
Vol. 7, Issue 1, pp: (479-486), Month: January - March 2019, Available at: www.researchpublish.com

Sign Language Based Hand Gesture Character Recognition Using Neural Network

[1]Sarita Yadav, [2]AP. Mr. Ankit Arora

[1]Vishwavidyalaya Engineering college, Lakhanpur
Dept. of Computer Science and Engineering,
Sarguja, Chhattisgarh, India
saritayadav787@gmail.com

[2]Vishwavidyalaya Engineering college, Lakhanpur
Dept. of Computer Science and Engineering,
Sarguja, Chhattisgarh, India
ankitarora1286@gmail.com

Abstract: **Communication is the exchanging of messages, thoughts or information, as by talk, visuals, signs, composing, or direct. In need of a hearing aide and unfit to talk people impart among themselves using gesture based communications, anyway they believe that it's difficult to open themselves to the outside world. This paper proposes a visual based system for Communication among in need of a hearing aide and unfit to talk people with the outside world using computers. This procedure utilizes Indian correspondence by means of gestures hand motions given by the customer as commitment through webcam and is changed over into a text. Not in any manner like the normal procedure for hand signal affirmation which makes usage of gloves or markers or some different devices, this technique does not require any additional hardware and makes the customer pleasant. Profitability is practiced by using a mix of different algorithm together to extract features as opposed to relying upon a single algorithm.**

Keywords: **Neural Network, Feature Extarction, Computer Vision, Sign Language.**

I. INTRODUCTION

The fundamental point of building hand gesture recognition system is to make an interaction between human and computer where the recognized gestures can be used for passing on important information [1]. Step by step instructions to frame the resultant hand gestures to be comprehended and well translated by the computer considered as the issue of gesture interaction [1]. Vision based interfaces are feasible and popular as of now because the computer can communicate with user utilizing webcam. This implies, user ready to offer command to the computer by simply demonstrating a few actions before the webcam without typing keyboard and clicking mouse button. Subsequently, users can perform Human-Computer Interaction (HCI) with these user friendlier features [2]. Today gesture can thoroughly supplant the mechanical devices like keyboard, Mouse, track ball and other input devices. There are two main attributes ought to be considered when designing a HCI system as said in [3]: functionality and usability. System functionality alluded to the arrangement of functions or services that the system prepares to the users [3], while system usability referred to the level and scope that the system can operate and perform specific user purposes proficiently [3]. In this paper, we concentrate to vision-based recognition of hand gestures [2]. Gestures can be static or dynamic [4]. A few gestures additionally have both static and dynamic elements, as in sign languages. A dynamic gesture is proposed to change over some stretch of time yet which are more complex be that as it may, suitable for real time environments though a static gesture which require less computational complexity [4].

ISSN 2348-1218 (print)
International Journal of Interdisciplinary Research and Innovations ISSN 2348-1226 (online)
Vol. 7, Issue 1, pp: (479-486), Month: January - March 2019, Available at: www.researchpublish.com

Various methods have been proposed for gaining information vital for gestures recognition system. A few methods used extra hardware devices, for example, data glove devices and color markers to effectively extract far reaching depiction of gesture features. Different methods based on the appearance of the hand utilizing the skin color to segment the hand and extract fundamental features [5], these methods thought about easy, natural and less cost contrasting and methods said previously. For digitizing hand and finger movements into multi-parametric data, Data-Glove based methods use sensors. The additional sensors make it easy to collect hand configuration and movement [6]. In any case, the additional devices are very cost costly. Conversely, the Vision Based methods require just a camera, in this manner realizing a natural interaction between humans and computers without the use of any additional devices [7].

II. HAND GESTURE RECOGNITION APPROACHES

For any system the initial step is to collect the data important to achieve a specific undertaking. For hand gesture recognition system diverse advances are used for getting input data. Present hand gesture recognition approaches can be arranged into different classifications.

A. Data glove based approaches:

Data Glove, based approach uses a glove-type device which could detect hand position, movement and finger bowing. In this approach user require to wear a glove like gadget, which uses sensors that can detect the movements of hand(s) and fingers, and pass the information to the computer, and perform the required gesture task. These approaches can without much of a stretch give correct coordinates of palm and finger's location and orientation, and hand configurations [6] [9].The main advantage of these approach are high accuracy and quick response speed however the confinement of this approach is to be very costly, because of additional prerequisite of hardware(Sensor).

Another disadvantages of glove based approach is user comfort and the hand size. Likewise it is wasteful for working in virtual reality. Fig. 1 represent the glove based approach.

Fig 1: Data Glove

B. Vision based approaches:

In this approach user not require to wear anything. Rather the system requires just camera, which are used to capture the pictures of hands for interaction amongst human and computers. Vision based approach is simple, natural and comfort [10]. A vision-based answer for collecting data for hand gesture recognition requires four similarly essential segments:

The first is the situation and number of cameras used. The second segment in a vision-based answer for hand gesture recognition is to make the hands more obvious to the camera for simple extraction of hand data. The third segment of a vision-based solution for hand gesture recognition is the extraction of features from the stream or streams of raw picture data, and the fourth segment is to recognition algorithm to these extracted features.

Be that as it may, there are as yet a few difficulties to be tended to, for example, enlightenment change, foundation noise, accuracy, partial or full obstacle and so forth. Fig 2 outline the vision based approach.

ISSN 2348-1218 (print)
International Journal of Interdisciplinary Research and Innovations ISSN 2348-1226 (online)
Vol. 7, Issue 1, pp: (479-486), Month: January - March 2019, Available at: www.researchpublish.com

Fig 2: Vision Based

C. Color glove based approaches:

Color glove based approaches speak to a compromise between data glove based approaches and vision based approaches. Marked gloves or color markers are gloves that well used by the human hand [8] with a few colors to coordinate the way toward tracking the hand and finding the palm and fingers, which give the capacity to extract geometric features important to frame hand shape [8]. The hindrances are similar data glove based approaches: they are unnatural and not reasonable for applications with multiple users because of hygiene issues. Fig 3 outline the color glove based approach.

Fig 3: Color Markers.

III. LITERATURE SURVEY

X. Jiang et al. [8], In recent years, the improvement of human-computer interaction (HCI) methods is quick and the common application is the gesture interaction innovation. This paper proposes a helpful and powerful unique gesture recognition technique. The initial step is to identify hand in each image frame acquired from a USB camera, through skin segmentation and hand feature extraction. Hand area is sectioned in light of YCrCb shading space and identified by recognizing the quantity of fingers. At that point, the algorithm in light of ellipse fitting and movement feature is used to track hand. We recognize the direction of hand got subsequent to following in light of a straightforward strategy. The experimental results demonstrate that the proposed technique is reliable and robust.

T. Zhang et al. [9], With the quick development of human-computer interaction technology, gesture recognition winds up one of the key advances of human-computer interaction. In this paper, we propose another technique for dynamic hand gestures recognition. The technique embraces the hierarchical identification demonstrate for dynamic hand gestures recognition. To start with, we consolidate frame combination with density distribution features for harsh gesture recognition, second, we utilize the hausdorff distance or fingertip location for exact gesture recognition. The principle development of this strategy lies in that author change the method for dynamic gestures recognition into the recognition of static image, enhances the productivity of gesture recognition successfully. Exploratory outcomes demonstrated that our recognition rate is over 90%.

S. Masood et al. [10], Sign language provides hearing and speech impaired people with an interface to speak with society. Unfortunately, most people do not comprehend sign language. For this, image preparing and desigpattern recognition can give a fundamental apparatus to identify and make an interpretation of sign language into vocal language. This work

exhibits a technique for identifying, understanding and making an interpretation of sign language gestures to vocal language. Microsoft Kinect is the essential tool used to capture video stream of the client. This is accomplished by getting skeleton frame from Kinect and afterward removing joints of interest. The information got are standardized and a connected rundown of skeleton frame is kept up. The proposed strategy is able to do effectively identifying all gestures that don't include finger developments. The proposed framework has an accuracy of 91%.

Nasri, S et al. [11], A novel approach is proposed for the recognition of moving hand gestures in view of the portrayal of hand movements as counter based similarity images (CBSIs). The CBSI was built by calculating the similarity between hand contours in various frames. The input CBSI was then coordinated with CBSIs in the database to perceive the hand gesture. The proposed continuous hand gesture recognition algorithm can at the same time partition the ceaseless gestures into incoherent gestures and recognize them. No prohibitive presumptions were considered for the movement of the hand between the incoherent gestures. The proposed algorithm was tested utilizing hand gestures from American Sign Language and the outcomes demonstrated a recognition rate of 91.3% for isolated gestures and 90.4% for continuous gestures. The test comes about represent the productivity of the calculation for noisy videos.

Li H et al. [12], Visual hand-gesture recognition is in effect progressively wanted for human-computer interaction interfaces. In many applications, hands just possess around 10% of the image, though its the vast majority contains foundation, human face, and human body. Spatial localization of the hands in such situations could be a testing assignment and ground truth bounding boxes should be accommodated preparing, which is typically not open. In any case, the area of the hand isn't a requirement when the criteria is only the recognition of a gesture to command a consumer electronics device, for example, mobiles phones and TVs. In this paper, a deep convolutional neural network is proposed to straightforwardly classify hand gestures in images with no segmentation or location arrange that could discard the unessential not-hand areas. The designed hand-gesture recognition network can classify seven sorts of hand gestures in a user independent and on real time, accomplishing an accuracy of 97.1% in the dataset with basic backgrounds and 85.3% in the dataset with complex backgrounds.

IV. METHODOLOGY

The letter sets in Indian Sign Language showed up in Fig. 4, utilizes both the hands which separate it from American Sign Language. Indian Sign Language characters are moderately similar to the characters themselves. In this manner the start of the undertaking will be with the commitment of gestures through a webcam and the yield will be the letters all together in the content configuration.

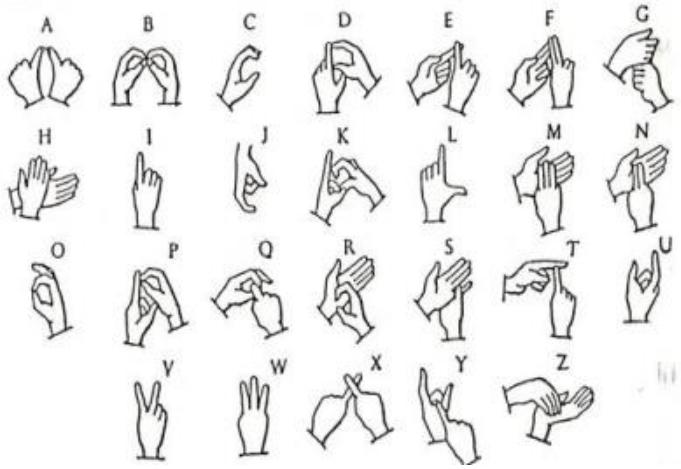

Fig 4: Hand Getsure Characters

The general stream of process is given through the going with piece outline (Fig 5) which illuminates clearly about the stages in the whole technique. Starting from the webcam, the data will be sent to the system. The information picture is distributed using the HSI shading based model. This isolated picture is then handled under separation change technique by which the parallel picture is found.

ISSN 2348-1218 (print)
International Journal of Interdisciplinary Research and Innovations ISSN 2348-1226 (online)
Vol. 7, Issue 1, pp: (479-486), Month: January - March 2019, Available at: www.researchpublish.com

The parallel picture is utilized for the method of widening and disintegration which gives the area extraction part. From these methodology, the extricated locale will be the finger area and the palm district in isolated variants. By then using the parallel picture, the fingertips are recognized and the length of each finger is figured. From that the finger is distinguished and their features like the closeness of the finger, point between the fingers are figured. From these features, the letters all together are seen since each letter set has its own features not equivalent to other people. By this the yield can be accomplished.

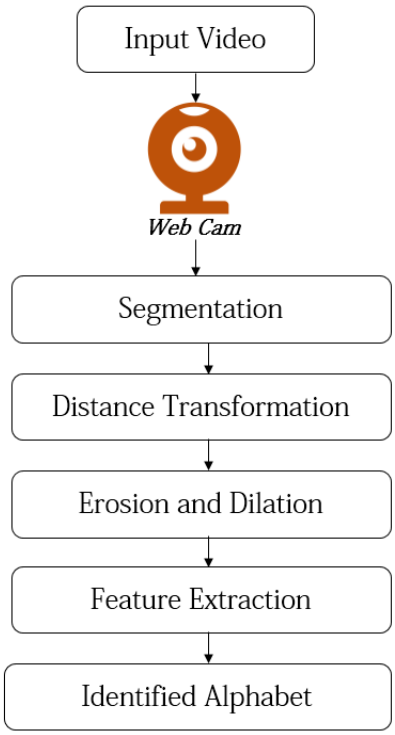

Fig 5: Propsoed system acrchitecture

D. Segmentation

This method does not utilize glove, so the skin shading must be seen for recognizing the hand motions. So the data that is taken through the webcam is first isolated into outlines for handling. The information pictures are in RGB shading model. In the RGB shading model change in iridescence impacts the image quality. So this image is first changed over to HSI illustrate (Hue Saturation Intensity). This transformation segregates the radiance segment (i.e. power) from the shading parts. One supposition made is that the hand is the greatest question in the data picture.

E. Fingertip detection

The quantity of dynamic fingers needs to know to recognize the movement. So the fingertip is figured. To figure this, the disconnected point between the two fingers is gotten. A graph is plotter with the limit number in the x-pivot and point in the y-hub. This graph is utilized to check the number if changes from white to dark district. The area where the twist tumbles down is recognized using differential channel as the fingertip. This number gives the quantity of dynamic fingers. In the wake of getting the quantity of dynamic fingers the movement can be settled using fingertips.

F. Distance Transform Method

Distance transform method is utilized to recognize the degree of the conclusion. In this method, the Euclidian distance between each white pixel and the centroid is figured. The pixels closest to the centroid are given a high power and as the distance extends the power reduced. Using a fitting organizing segment (a circle) of appropriate size the hand and palm areas are recognized and isolated using disintegration enlargement and subtraction process. Line portions are drawn substituting the fingers and the edge between the fingers is found. This edge gives fundamental information to perceive correspondence by means of gestures motions having a comparable number of open fingers. Advance totally close, totally open and half open states of each finger are procured using the lengths of the fingers.

ISSN 2348-1218 (print)
International Journal of Interdisciplinary Research and Innovations ISSN 2348-1226 (online)
Vol. 7, Issue 1, pp: (479-486), Month: January - March 2019, Available at: www.researchpublish.com

G. Finger Division

From the distance transform method we got the totally opened hand with the most distant distance from the palm. Regardless, the fingers need to twist for a couple of characters. In such a case, the opened fingers alone can't be utilized. So with an explicit true objective to consolidate those cases, the hand is isolated into three segments. As the distance between the tip of the finger and the crossing point of palm and finger locale of each finger is known, by then the two centers can be found as

x = 1/3*major hub 1ength

y = 2/3*major hub length

In the wake of figuring, the centers are plotted. Regardless, if the finger isn't open the finger isn't at all perceived.

H. Finger detection

In the midst of the basic getting ready stage which continues for 50 outlines, the length of each finger and the distance of each open finger to one another finger are found and an upper triangular matrix is gotten. Again in the midst of the exploratory stage, length of each finger and the distance between them is figured and differentiated and the characteristics got in the midst of getting ready stage. From this the fingers are perceived and can tell whether the finger is semi closed or half closed, etc. In perspective of these features the affirmation is done in the midst of the certifiable communication through signing acknowledgement stage.

V. EXPERIMENT RESULTS

The test results of the examination stage which comes after the training stage for the 50 frames of input video is given underneath. Fig 5 is the input picture given through the webcam. It speaks to one of the 50 edges of the information video.

Fig 6: Shows the input video

The distance transformation work is connected to the video files frames. The image is caught from the video document are changed over into binary as appeared in fig. 7.

Again to get palm region and to eleminate rest of the information from the video document we apply dillusion process. The outcome are displayed in fig. 8.

Fig 7: Binary Image

ISSN 2348-1218 (print)
International Journal of Interdisciplinary Research and Innovations ISSN 2348-1226 (online)
Vol. 7, Issue 1, pp: (479-486), Month: January - March 2019, Available at: www.researchpublish.com

Fig 8: Region of Finger

After this process the system is prepared to perceive the image from the database which are trained earlier. The yield will be of shape as appeared in fig. 9.

Fig 9: Recognized Letter "P"

VI. CONCLUSION

The utilization of distance transform for both the hands is proceeding, since most of the signals in Indian Sign Language incorporate two hands. Also there is degree for growing it to body motions as well. So far simply the features of the English characters have been gotten. We are so far tackling affirmation methods for perceiving the letters all together from the procured features of the hand and we are as now searching for different calculations to help recognize other potential features to additionally develop the detection capacity of the system.

The structure gives a powerful method to perceive the character from the input hand gestures.

REFERENCES

[1] **S**. Mitra, and T. Acharya, 2007. Gesture Recognition: A Survey. IEEE Transactions on systems, Man and Cybernetics, Part C: Applications and reviews, vol. 37 (3), pp. 311-324, doi: 10.1109/TSMCC.2007.893280.

[2] J. P. Wachs, M. Kolsch, H. Stern, and Y. Edan, "Vision-based hand gesture applications," Communications of the ACM, vol. 54, pp. 60–71, 2011.

[3] Sanjay Meena, 2011. A Study on Hand Gesture Recognition Technique, Master thesis, Department of Electronics and Communication Engineering, National Institute of Technology, India.

[4] Xingyan Li. (2003). "Gesture Recognition Based on Fuzzy C-Means Clustering Algorithm", Department of Computer Science. The University of Tennessee Knoxville.

[5] Simei G. Wysoski, Marcus V. Lamar, Susumu Kuroyanagi, Akira Iwata, (2002). "A Rotation Invariant Approach on Static-Gesture Recognition Using Boundary Histograms And Neural Networks," IEEE Proceedings of the 9th International Conference on Neural Information Processing, Singapore.

[6] J. Weissmann and R. Salomon, "Gesture Recognition for Virtual Reality Applications Using Data Gloves and Neural Networks," In Proceedings of the International Joint Conference on Neural Networks, vol.3, pp. 2043-2046, 1999.

[7] Y. Wu and T. S. Huang, "Vision-Based Gesture Recognition: A Review," In Proceedings of the International Gesture Workshop on Gesture-Based Communication in Human-Computer Interaction, pp.103-115, 1999.

[8] Rama B. Dan et al, (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 5 (2) , 2014, 2050-2052.

[9] Harshith.C, Karthik.R.Shastry, Manoj Ravindran, M.V.V.N.S Srikanth, Navee Lakshmikhanth "Survey on various Gesture Recognition Techniques for Interfacing Machines based on Ambient Intelligence" (IJCSES) Vol.1, No.2, November 2010.

[10] Pragati Garg, Naveen Aggarwal and SanjeevSofat, 2009. Vision Based Hand Gesture Recognition, World Academy of Science, Engineering and Technology 49, pp. 972-977.

[11] X. Jiang, X. Lu, L. Chen, L. Zhou and S. Shen, "A dynamic gesture recognition method based on computer vision," *2013 6th International Congress on Image and Signal Processing (CISP)*, Hangzhou, 2013, pp. 646-650.

[12] T. Zhang and Z. Feng, "Dynamic Gesture Recognition Based on Fusing Frame Images," *2013 Fourth International Conference on Intelligent Systems Design and Engineering Applications*, Zhangjiajie, 2013, pp. 280-283.

[13] S. Masood, M. P. Qureshi, M. B. Shah, S. Ashraf, Z. Halim and G. Abbas, "Dynamic time wrapping based gesture recognition," *2014 International Conference on Robotics and Emerging Allied Technologies in Engineering (iCREATE)*, Islamabad, 2014, pp. 205-210.

[14] Nasri, S., Behrad, A., and Razzazi, F. 2015. A novel approach for dynamic hand gesture recognition using contour-based similarity images. International Journal of Computer Mathematics, 92(4), 662-685.

[15] Peijun Bao, Ana I. Maqueda, Carlos R. del-Blanco, and Narciso García, "Tiny Hand Gesture Recognition without Localization via a Deep Convolutional Network", IEEE Transactions on Consumer Electronics (Volume: 63, Issue: 3, August 2017).