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Finger Spelling Identification by Employing Picture Processing

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ABSTRACT

Human hands are delicate instruments. Hand gestures and finger gestures are excellent ways of emphasizing what we say, but on the other hand they can also reveal our true intentions. In this paper introduced a continuous Indian sign language recognition system, wherever each the hands are used for playacting any gesture. Recognizing a sign language gestures from continuous gestures could be a terribly difficult analysis issue. In this paper, a new skeleton-based approach is proposed for 3D hand gesture recognition. Specifically, we exploit the geometric shape of the hand to extract an effective descriptor from hand skeleton connected joints returned by the Intel RealSense depth camera. This paper solve the problem using gradient based key frame extraction technique. These key frames are useful for splitting continuous language gestures into sequence of signs further as for removing uninformative frames. After splitting of gestures every sign has been treated as associate degree isolated gesture. Then features of pre-processed gestures are extracted using orientation histogram (OH) with principal component analysis (PCA) is applied for reducing dimension of features obtained after OH.

Keywords: *Gesture Recognition, Orientation histogram (OH); Correlation; Indian sign language (ISL).*

1. INTRODUCTION

Sign languages (also known as **signed languages**) are languages that use manual communication to convey meaning. This can include simultaneously employing hand gestures, movement, orientation of the fingers, arms or body, and facial expressions to convey a speaker's ideas. Sign languages often share significant similarities with their respective spoken language, such as American Sign Language (ASL) with American English. Grammar and sentence structure, however, may vary to encourage efficiency and fluidity in speaking.[1][2] It is important to note that just because a spoken language is intelligible transnationally, such as English in the United States and the United Kingdom, does not mean that the sign languages from those regions are as well; ASL and British Sign Language (BSL) were formed independently and are therefore unintelligible.[3]

Humans know each other by conveying their ideas, thoughts, and experiences to the people around them. There are numerous ways to achieve this and the best one among the rest is the gift of Speech. Through speech everyone can very convincingly transfer their thoughts and understand each other. It will be injustice if we ignore those who are deprived of this invaluable gift. The only means of communication available to the vocally disabled is the use of sign language. Using sign language they are limited to their own world. This limitation prevents them from interacting with the outer world to share their feelings, creative ideas and potentials. Very few people who are not themselves deaf ever learn to sign language. These limitation increases the isolation of deaf and dumb people from the common society. Technology is one way to remove this hindrance and benefit these people. Several researchers have explored these possibilities and have successfully an achieved finger spelling recognition with high levels of accuracy. But progress in the recognition of sign language, as a whole has various limitations in today s applications. The problem of automated sign language recognition can be put across as, given a video of a sign language sentence, can We identify the signs in the sentence and reconstruct the sentence? The solution to the problem of sign language recognition has many practical implications. Firstly, advances in automated sign language recognition are necessary to improve the quality of life of deaf persons by facilitating their interaction with hearing populace in public situations.

The script of Kannada language is syllabic. The language uses forty nine phonemic letters which are segregated into three groups- Swaragalu, the vowels, the Vyanjanagalu, the consonants and Yogavaahakagalu, the two characters which are not vowel or consonant. The Character set is very similar to that of other Indian languages. The script is fairly complex as like other complex scripts it has also been derived from Brahmi script. As far as Kannada Grammar is concerned, it is a highly inflected language with three genders- the masculine, feminine and the neutral, there are two numbers-singular and plural. Kannada is inflecting for gender, number and tense, among other things. A primary objective of this work is to recognize sign and generate equivalent text description in Kannada language. The significant contribution made in this paper helps in translation of sign language to text I Kannada language for single signer. The present work attempts to recognize the sign based on shape and features. The extracted features are input to ANN Classifier independently. The study leves scope for further research on translating different signer of sign language into text information in Kannada language with grammatically correct meaning. The literature on related woks is reviewed to know the state of the art and survey is organized.

Shows a kannada sign symbol basic letter (16)

2 A Review of Previous Research

Sign language continues to be the preferred method of communication among the deaf and the hearing-impaired. Advances in information technology have prompted the development of systems that can facilitate automatic translation between sign language and spoken language. More recently, systems translating between Arabic sign and spoken language have become popular. This paper reviews systems and methods for the automatic recognition of Arabic sign language. Additionally, this paper highlights the main challenges characterizing Arabic sign language as well as potential future research directions [1]. In this paper a Sign Language Recognition system has been proposed. The first step of this system is to create a database of Indian Sign Language. This is done by acquiring the videos from the signers while they are performing the hand gestures. Next step is Hand tracking and Segmentation. This is performed in order to extract features from a particular gesture. A three step algorithm has been used in the proposed system to get better quality hand tracking and segmentation. This algorithm works on motion tracking, edge detection and skin colour detection. The system is implemented successfully and results are presented in this paper. The results demonstrate working of motion tracking, edge detection and skin colour detection individually as well as their combined effect [2].

It is difficult for most of us to imagine, but many who are Deaf-mute rely on sign language as their primary means of communication. They, in essence, hear and talk through their hands. Sign languages are visual languages. They are natural languages which are used by many deaf mute people all over the world. In sign language the hands convey most of the information. Hence, vision -based automatic sign language recognition systems have to extract relevant hand features from real life image sequences to allow correct and stable gesture classification. In our proposed system, we intend to recognize some very basic elements of sign language and to translate them to text. Firstly, the video shall be captured frame by frame, the captured video will be processed and the appropriate image will be extracted, this retrieved image will be further processed using BLOB analysis and will be sent to the statistical database; here the captured image shall compared with the one saved in the database and the matched image will be used to determine the performed alphabet sign in the language. Here, we will be implementing only American Sign Language Finger spellings, and we will construct words and sentences with them [3]. In the recent years many approaches have been made that uses computer vision algorithms to interpret sign language. This endeavour is yet another approach to accomplish interpretation of human hand gestures. The first step of this work is background subtraction which achieved by the Euclidean distance threshold method. Thinning algorithm is then applied to obtain a thinned image of the human hand for further analysis. The different feature points which include terminating points and curved edges are extracted for the recognition of the different signs. The input for the project is taken from video data of a human hand gesturing all the signs of the American Sign Language [4].

In recent years, enormous research is progressing in the field of computer vision and human computer interaction where hand gestures play a vital role. Hand gestures are more powerful means of communication for hearing impaired when they communicate to the normal people everywhere in day to day life. As the normal people find little difficulty in recognizing and interpreting the meaning of sign language expressed by the hearing impaired, it is inevitable to have an interpreter for translation of sign language. To overcome this difficulty, an automatic hand gesture recognition system which translates the sign language into text needs to be developed. In this paper, a static hand gesture recognition system for American Sign Language using Edge Oriented Histogram (EOH) features and multiclass SVM is proposed. The edge histogram count of input sign language alphabets is extracted as the features and applied to a multiclass SVM for classification. The average accuracy of the system is compared with different number of features and the experimental findings demonstrate that the proposed method gives a success rate of 93.75% [5]. Visual Interpretation of gestures can be useful in accomplishing natural Human Computer Interactions (HCI). In this paper we proposed a method for recognizing hand gestures. We have designed a system which can identify specific hand gestures and use them to convey information. At any time, a user can exhibit his/her hand doing a specific gesture in front of a web camera linked to a computer. Firstly, we captured the hand gesture of a user and stored it on disk. Then we read those videos captured one by one, converted them to binary images and created 3D Euclidian Space of binary values. We have used supervised feed forward neural net based training and back propagation algorithm for classifying hand gestures into ten categories: hand pointing up, pointing down, pointing left, pointing right and pointing front and number of fingers user was showing. We could achieve up to 89% correct results on a typical test set [6].

This paper presents an automatic translation system of gestures of the manual alphabets in the Arabic sign language. The proposed Arabic Sign Language Alphabets Translator (ArSLAT) system does not rely on using any gloves or visual markings to accomplish the recognition job. As an alternative, it deals with images of bare hands, which allows the user to interact with the system in a natural way. The proposed system consists of five main phases; preprocessing, best-frame detection, category detection, feature extraction and classification. The extracted features used are translation, scale, and rotation invariant, which make the system more flexible. Experiments revealed that the system was able to recognize the 30 Arabic alphabets with an accuracy of 91.3% [7]. This paper presents a novel technique for hand gesture recognition through human computer interaction based on shape analysis. The main objective of this effort is to explore the utility of a neural network-based approach to the recognition of the hand gestures. A unique multi-layer perception of neural network is built for classification by using back-propagation learning algorithm. The goal of static hand gesture recognition is to classify the given hand gesture data represented by some features into some predefined finite number of gesture classes. The proposed system presents a recognition algorithm to recognize a set of six specific static hand gestures, namely: Open, Close, Cut, Paste, Maximize, and Minimize. The hand gesture image is passed through three stages, pre-processing, feature extraction, and classification. In pre-processing stage some operations are applied to extract the hand gesture from its background and prepare the hand gesture image for the feature extraction stage. In the first method, the hand contour is used as a feature which treats scaling and translation of problems (in some cases). The complex moment algorithm is, however, used to describe the hand gesture and treat the rotation problem in addition to the scaling and translation. The algorithm used in a multi-layer neural network classifier which uses back-propagation learning algorithm. The results show that the first method has a performance of 70.83% recognition, while the second method, proposed in this article, has a better performance of 86.38% recognition rate [8].

3-PROPOSED SYSTEM

3.1 Dynamic Hand Gesture dataset (DHG- 14/28

Skeleton-based action recognition approaches have become popular as Shotton et al. [12] proposed a real-time method to accurately predict the 3-D positions of body joints from depth images. Hence, several descriptors in the literature proved how the position, motion, and orientation of joints could be excellent descriptors for human actions. Collected datasets for action recognition purpose like [17, 9] provide usually the depth data in addition to the 3D body skeleton of the person performing the action. However, in the context of hand gesture recognition, there are no publicly released dataset of dynamic hand gestures providing sequences of labelled hand gestures with the depth and hand skeleton. We present below a Dynamic Hand Gesture 14-28 (DHG) dataset, which provides sequences of hand skeleton in addition to the depth image. Such a dataset will facilitate the analysis of hand gestures and open new scientific axes to consider1 .

A Overview and protocol The DHG-14/28 dataset contains 14 gestures performed in two ways: using one finger and the whole hand.Each gesture is performed 5 times by 20 participants in 2 ways, resulting in 2800 sequences. Sequences are labelled following their gesture, the number of fingers used, the performer and the trial. Each frame contains a depth image, the coordinates of 22 joints both in the 2D depth image space and in the 3D world space forming a full hand skeleton. The Intel Real Sense short range depth camera is used to collect our dataset. The depth images and hand skeletons were captured at 30 frames per second, with a 640x480 resolution of the depth image. The length of sample gestures ranges goes from 20 to 50 frames.

Figure 1. Shows sentence in English My father is in higher post and equivalent text in Kannada form is
"ನನ್ನ ತಂದೆ ಹೆಚ್ಚಿನ ಪೋಸ್ಟ್ ಆಗಿದೆ".

3.2 Feature extraction from 3D skeleton

In order to represent a hand gesture entirely, we propose to mainly capture the hand shape variation based on skeleton joints, but also the movement and the rotation of the hand in space are also computed. The temporal nature of gestures is encoded using a temporal pyramid and the classification process is performed by a linear Support Vector Machines (SVM) classifier. Figure 2 shows a general overview of the proposed approach.

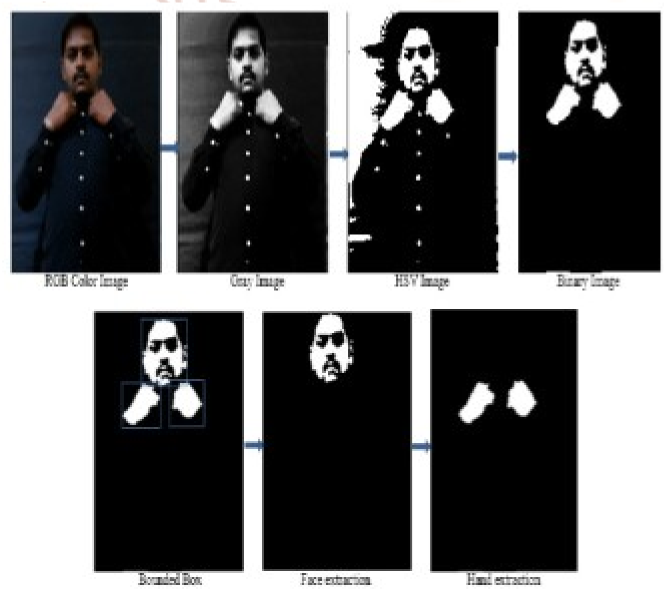

Figure 2.Shows pre-processing steps of each RGB frames from continuous gesture for the sentence My father is in higher post.

"ನನ್ನ ತಂದೆ ಹೆಚ್ಚಿನ ಪೋಸ್ಟ್ ಆಗಿದೆ".

4- CONCLUSION

This work suggests the advantage of using 3D hand skeleton data to describe hand gestures, and points out a promising direction of performing gesture recognition tasks using skeleton-like information. We present an approach to recognize dynamic hand gesture as time series of 3D hand skeleton returned by the Intel RealSense depth camera. We take as input a several set of relevant joints inferred from 3D hand skeleton. We propose a compact representation using

Fisher Vector kernel and on multi-level encoding the temporal nature of gestures.

As future work, skeleton-based features can be combined with the depth-based features to provide more informative description and produce algorithms with better recognition robustness.

REFERENCES

1) M. Mohandes, M. Deriche, and J. Liu, Image-Based and Sensor-Based Approaches to Arabic Sign Language Recognition , In Proc. IEEE Transaction on Human Machine System, ,pp.2168-2291, 2014.
2) P. Nanivadekar and V. Kulkarni, Indian Sign Language Recognition: Database creation, Hand Tracking and Segmentation , in IEEE Conference On Circuit System, Communication And Information Technology Applications, 2014,
3) K.Modi and A More, Translation of Sign Language FingerSpelling to Text using Image Processing , In conference (IJCA), Volume 77, No.11, September, 2013.
4) S .N . Omkar and M. Monisha, Sign Language Recognition Using Thinning Algorithm , ICTACT Journal On Image And Video Processing, Volume 02, Issue: 01¸ August 2011.
5) S. Nagarajan and T. S. Subashini, Static Hand Gesture Recognition for Sign Language Alphabets using Edge Oriented Histogram and Multi Class SVM , International Journal of Computer Applications (0975 8887),Volume 82, No4, November 2013.
6) G. R. S. Murthy and R. S. Jadon , Hand gesture recognition using neural networks , Advance Computing Conference (IACC), IEEE 2nd International Conference, Patiala, pp 134 138, Feb2010.
7) Nashwa El-Bendary , Hossam M. Zawbaa , Mahmoud S. Daoud and Aboul Ella Hassanien, ArSLAT: Arabic Sign Language Alphabets Translator , Computer Information Systems and Industrial Management Applications (CISIM), 2010 International Conference on Date of Conference:8-10 Oct. 2010 Page(s):590-595 Conference Location:Krackow Publisher:IEEE.
8) Haitham Hasan and S. Abdul-Kareem, Static hand gesture recognition using neural networks , Spinger link: Artificial Intelligence Review February 2014, Volume 41, Issue 2, pp 147 181
9) Stokoe, William C.; Dorothy C. Casterline; Carl G. Croneberg. 1965. *A dictionary of American sign language on linguistic principles*. Washington, D.C.: Gallaudet College Press
10) Stokoe, William C. 1960. Sign Language Structure: An Outline of the Visual Communication Systems of the American Deaf, *Studies in linguistics: Occasional papers (No. 8)*. Buffalo: Dept. of Anthropology and Linguistics, University at Buffalo.
11) "What is Sign Language?". Retrieved 10 March 2018.
12) J. Shotton, A. Fitzgibbon, M. Cook, T. Sharp, M. Finocchio,R. Moore, A. Kipman, and A. Blake. Real-time human pose recognition in parts from a single depth image. In Computer Vision on Pattern Recognition (CVPR), June 2011.
13) R. Slama, H. Wannous, M. Daoudi, and A. Srivastava. Accurate 3d action recognition using learning on the grassmann manifold. Pattern Recognition, 48(2):556 567, 2015.
14) H.-I. Suk, B.-K. Sin, and S.-W. Lee. Hand gesture recognition based on dynamic bayesian network framework. Pattern Recognition, 43(9):3059 3072, 2010.
15) D. Tang, H. J. Chang, A. Tejani, and T. K. Kim. Latent regression forest: Structured estimation of 3d articulated hand posture. In Computer Vision and Pattern Recognition (CVPR), pages 3786 3793, June 2014
16) H. Wang, Q. Wang, and X. Chen. Hand posture recognition from disparity cost map. In ACCV (2), volume 7725 of Lecture Notes in Computer Science, pages 722 733. Springer,2012.
17) J.Wang, Z. Liu, Y.Wu, and J. Yuan. Mining actionlet ensemble for action recognition with depth cameras. In Computer Vision and Pattern Recognition (CVPR), pages 1290 1297,June 2012
18) C. Zhang, X. Yang, and Y. Tian. Histogram of 3d facets: A characteristic descriptor for hand gesture recognition. In IEEE Int. Conference and Workshops on Automatic Face and Gesture Recognition (FG),, pages 1 8, April 2013.