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A Real Time Static & Dynamic Hand Gesture Recognition System

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ABSTRACT: Hand gesture recognition system plays a vital role in our day to day life. This hand gesture recognition system provides us natural, innovative, user friendly way of interaction with the computer which is more familiar to us. Gesture recognition has a wide area of application including human machine interaction, sign language, game technology robotics etc. There are different static hand gestures defined these are representing one, two, three, four, five. There are different dynamic hand gestures defined these are representing waving hand, fist hand, vertical hand, and horizontal hand. We developed a simple and fast motion image based algorithm. Gestures recognition deals with the goal of interpreting human gestures via mathematical algorithm In general, it is suitable to control home appliances using hand gestures**.**
Keywords: Normalization, Skin Color Detection, Skin Color Model, Hand Gesture Recognition.

I. INTRODUCTION

It is hard to settle on a specific useful definition of gestures due to its wide variety of applications and a statement can only specify a particular domain of gestures. Many researchers had tried to define gestures but their actual meaning is still arbitrary. Gesture and Gesture recognition terms are very important in human computer interaction. Gesture recognition is important for developing an attractive alternative to prevalent human–computer interaction modalities. In recent years computer vision based hand gestures recognition as input for man-machine interface is being developed. A gesture is a form of non verbal communication in which visible bodily actions communicate particular messages. Gesture is one of the most natural and expressive ways of communication between human and computer in a real time system. .Gesture includes physical movements of the fingers, hands, arms, head, face, or other parts of the body. Different hand gestures that are classified on the bases of orientation or finger positions, unique hand shapes pattern etc. With the development and realization of virtual environment, current user-machine interaction tools and methods are not sufficient. Hand gestures has the ability to represent ideas and actions very easily, thus using these different hand shapes, being identified by gesture recognition system and interpreted to generate corresponding event, has the potential to provide a more natural interface to the computer vision system.

Computer and computerized devices increasingly influence many aspects of our lives; for example, the way we communicate, the way we perform our actions, and the way we interact with our environment. The main objective of this paper is to develop a real time hand gesture recognition system based on skin color model. By skin color model, the effect from lighting, environment, and camera can be greatly reduced and robustness of hand gesture recognition could be greatly improved. Some systems have limitations that user sat in front of camera within a specified distance. Here we try to relax these limitations. Hand gestures recognition systems make people having high degree of freedom and intuitive feelings.

II. STATIC HAND GESTURE RECOGNITION

A static gesture is a particular hand configuration and pose, represented by a single image. Fig. 1 shows the flow chart of the proposed system in which skin color model is one of the key components. The system is divided into four major parts: normalization, skin color detection, skin color model, hand gesture recognition. Each part is described in the following subsections.

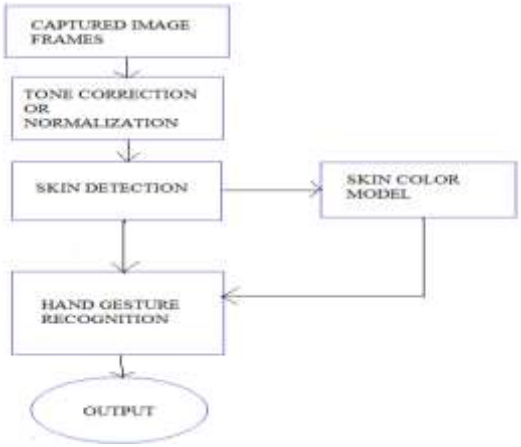

Fig. 1 Normalization

Normalization is a process that changes the range of pixel intensity values. Photographs with poor contrast due to glare, lack of dynamic range is normalized so sometimes called contrast stretching and histogram stretching. It is necessary to magnify the image area around the user for hand gesture recognition if user is distant from camera. This step is to normalize the image size to 320×240 pixels for the initially set camera resolutions may be different.

Skin Color Detection

In skin color detection image capturing using webcam then converting the captured images into frames. Skin color detection using hue and saturation values of various possible skin tones. Then detection of the fingertips. Identification of the gesture based the motion. General skin color scope[1] covers many skin- like colors false negative or false positive are sometimes unacceptable. Skin color provides an effective [2], and efficient [1][2] method for hand localization [2].

Skin color is not a physical property of an object, rather a perceptual phenomenon and therefore a subjective human concept. Color representation similar to the color sensitivity of human vision system. Complex transformation functions from and to RGB space, demanding far more computation than most other color spaces.

Skin Color Model

A generic color model can be specialized to describe particular classes of objects if labels are available for the training pixels. The color of skin in images depends primarily on the concentration of hemoglobin and melanin and on the conditions of illumination. It is well- known that the hue of skin is roughly invariant across different ethnic groups after the illuminant has been discounted. This is because differences in the concentration of pigments primarily affect the saturation of skin color, not the hue.

Skin color within one image occupies a compact cluster within NRGB but its position, size, and shape vary from image to image because of the person and context specific side conditions. In this paper we propose an Constructing an efficient hand gesture recognition system is an important aspect for easily interaction between human and machine. There were many gesture recognition techniques developed for tracking and recognizing various hand gestures. Each one of them has their pros and cons. The older one is wired technology, in which users need to tie up themselves with the help of wire in order to connect or interface with the computer system. In wired technology user can not freely move in the room as they connected with the computer system via wire and limited with the length of wire.

Human gesture recognition is a popular new way to input information in gaming, consumer and mobile devices, including smart phones and tablets. Users can naturally and intuitively interact with the device, leading to greater acceptance and approval of the products. In this paper we presented a real-time gesture recognition system capable of classifying gestures.

The static hand gesture recognition is used to find out the static hand movements like the number of fingers in the hand and performs application according to that. In recognition phase the input visual gesture images are recognized as a meaningful gesture depending on gesture modeling and analysis [4]. Recognition process affected with the proper selection of gesture parameters of features, and thus the accuracy of the classification [5]

III. EXPERIMENTAL RESULTS FOR STATIC HAND

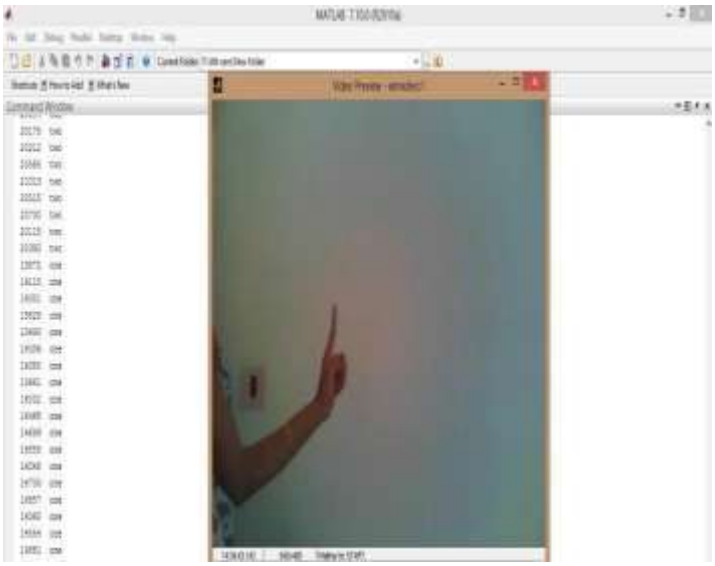

Fig.2 MATLAB Result1

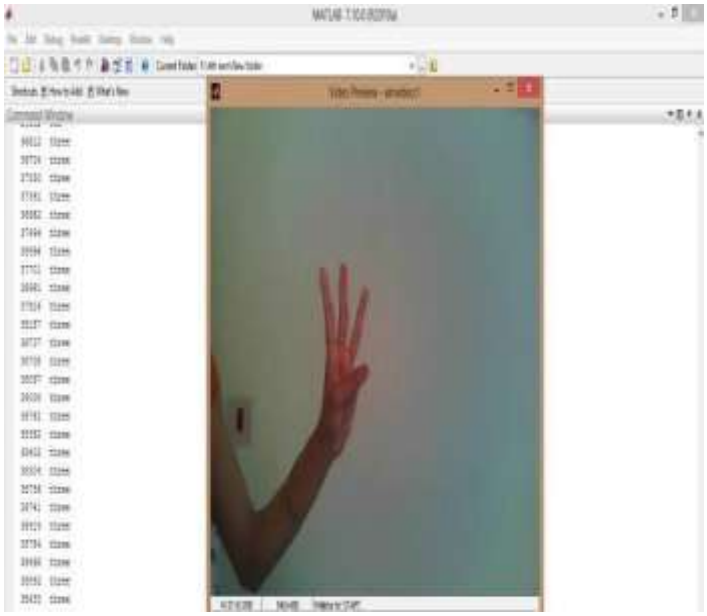

Fig.3 MATLAB Result2

IV.DYNAMIC HAND GESTURERECOGNITION

A dynamic gesture is a moving gesture, represented by a sequence of various images. Dynamic hand gesture means we have gesture recognition using dynamic hand. Here I have defined four types of hand gestures like five, fist horizontal and vertical. In that we have no need to use skin color model for matching skin color tone but dynamically taken skin color tone[11]. For dynamic hand gesture we have two stage.

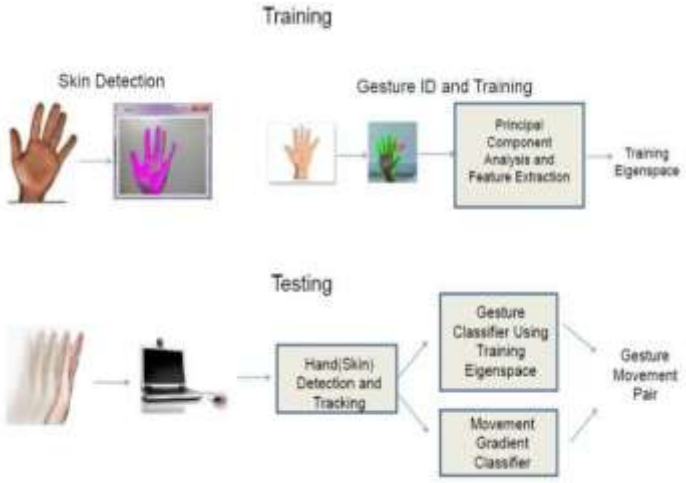

Fig.4 Simple Flow Char

Training Stage

Training stage Generate a transformation subspace for each hand-shape. In that training stage we have to take sample images for different hand gestures. Here we have defined four types of hand gestures for gesture recognition. Gesture ID is used for detection of hand shape. Principal Component Analysis is used for define component. For Example here hand, face etc.

Testing Stage

Testing stage project the test image into each of the subspaces to find the subspace with the nearest perpendicular distance. This subspace will be representative of one particular hand-shape**.**

In testing stage we have to implement real time dynamic hand gesture recognition. In testing stage we have dynamic hand gesture detection and tracking. After that gesture classifier using training eigen space and also movement gradient classifier for detecting movement. Combination of gesture classifier and movement gradient classifier will give gesture movement pair and this gesture movement pair will give output.

Fig. 5 shows the flow chart of the proposed system in which principal component analysis is one of the technique.

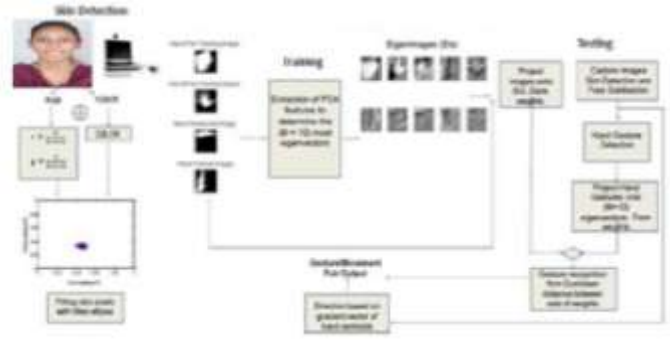

Fig.5

PCA TECHNIQUE

PCA is a rather general statistical technique that can be used to reduce the dimensionality of the feature space. PCA is performed on the set o f processed images for each hand-shape. Performing PCA provides M orthogonal eigenvectors {ul, ... ,uM} o f the covariance matrix, that correspond to the first M largest eigenvalues, in order to maintain a minimum energy o f the dataset.

In Dynamic hand gesture recognition we have here implemented real time dynamic hand gesture recognition. Here in dynamic hand gesture it also identify the direction and motion. So this dynamic hand gesture is better than static hand gesture and accuracy of dynamic hand gesture recognition is good.

V. EXPERIMENTAL RESULTS FORDYNAMIC HAND

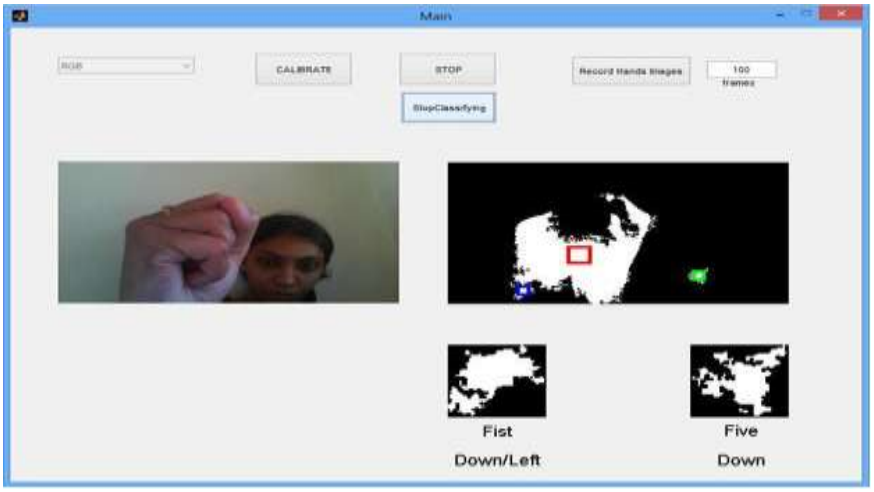

Fig.6 MATLAB Result1

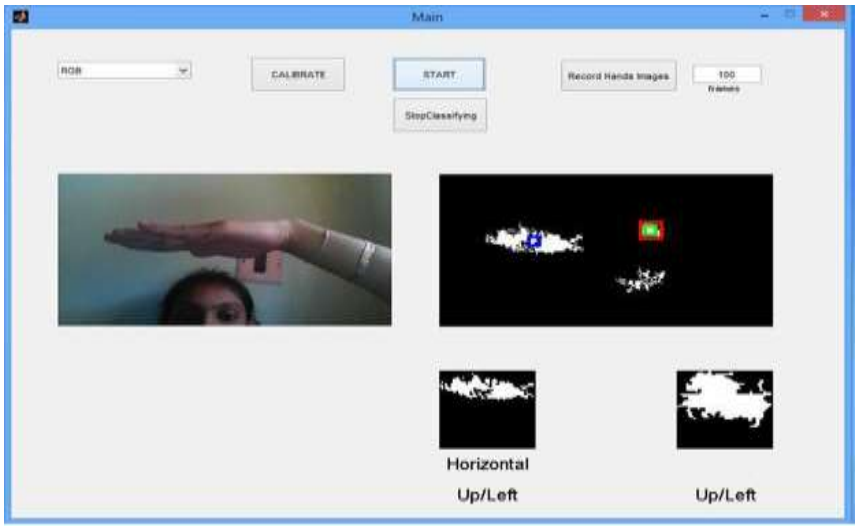

Fig.7 MATLAB Result2

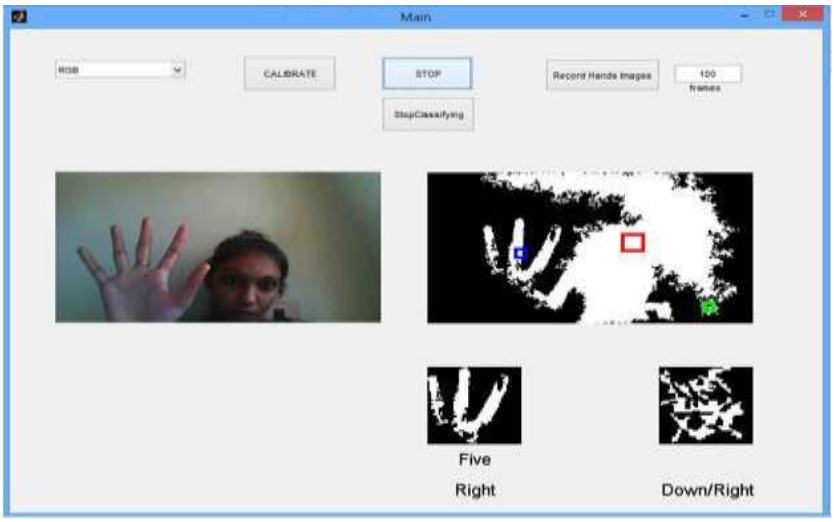

Fig.8 MATLAB Result3

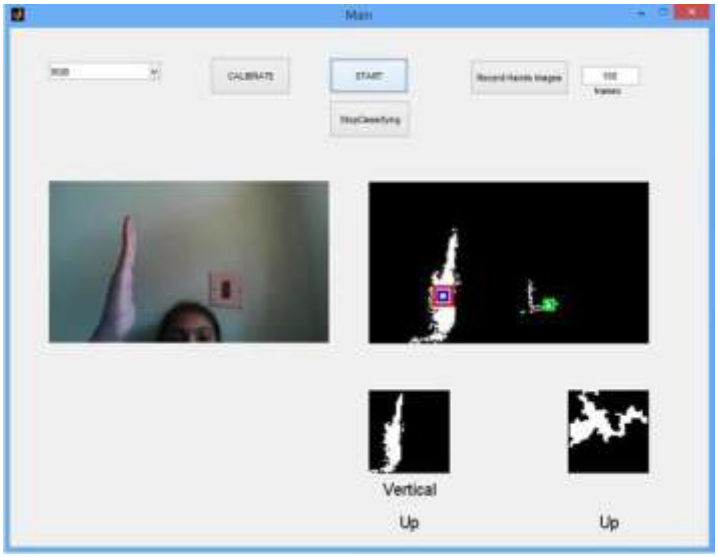

Fig.9 MATLAB Result4

VI. CONCLUSION AND FUTURE WORK

In this paper, the work is completely done by using MATLAB. Gesture recognition is an ideal example of multidisciplinary research. There are different tools for gesture recognition, based on the approaches. A novel static hand gesture recognition algorithm which overcomes the challenges (such as rotation, size and position variation of the images) for detection of hand gesture images, is developed in this work.It works well even in the presence of background clutter. The advantage of the system lies in the ease of its use. The user does not need to wear a glove, neither is there the need for a uniform background. The original contributions of this work are, a novel technique for combining shape and motion parameters, and system level techniques and optimizations for the achievement of real-time gesture recognition. The major extension to this work can be done to make the system able to work at much complex background and compatible. It can be made as an effective user interface with different applications like controlling VLC media player etc. By applying to some applications, the system proves to be user independent, fast and stable.

REFERENCES

[1]. Mokhtar M. Hasan, and Pramod K. Mishra, (2012) ―Hand Gesture Modeling and Recognition using Geometric Features: A Review‖, Canadian Journal on Image Processing and Computer Vision Vol. 3, No.1.

[2]. Ying Wu and Thomas S. Huang, (2001) ―Hand Modeling, analysis and Recognition‖, IEEE Signal Processing Magazine, Vol. 18, No. 3, pp 51-60. doi: http://dx.doi.org/10.1109/79.924889.

[3]. Rafiqul Zaman Khan and Noor Adnan Ibraheem

[4]. ―COMPARATIVE STUDYOF HAND GESTURE RECOGNITION SYSTEM ‖.

[5]. Pavlovic, V. I., Sharma, R. & Huang, T. S. (1997) ‖ Visual Interpretation of Hand Gestures for Human- Computer Interaction: A Review‖. IEEE Transactions on Pattern Analysis And Machine Intelligence, Vol. 19, No. 7, pp 677- 695, doi; 10.1109/34.598226.

[6]. Joseph J. LaViola Jr. (1999) ―A Survey of Hand Posture and Gesture Recognition Techniques and Technology‖, Master Thesis, NSF Science and Technology Center for Computer Graphics and Scientific Visualization, USA.

[7]. Sushmita Mitra, Senior Member, IEEE, and Tinku Acharya, Senior Member, IEEE‖ Gesture Recognition: A Survey‖, IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS—PART C: APPLICATIONS AND REVIEWS, VOL. 37, NO. 3, MAY 2007.

[8]. Angel, Neethu.P.S‖ Real-Time Static and Dynamic Hand Gesture Recognition‖, International Journal of Scientific & Engineering Research Volume 4, Issue3, March-2013 1 ISSN 2229-5518.

[9]. Gary R. Bradski and James Davis,‖ Motion Segmentation and Pose Recognition with Motion History Gradients‖.

[10]. Meenakshi Panwar, Pawan Singh Mehra,‖ Hand Gesture Recognition for Human Computer Interaction‖ 2011 International Conference on Image Information Processing (ICIIP 2011).
[11]. Meenakshi Panwar,‖ Hand Gesture Recognition
[12]. based on Shape Parameters ―.Coogan T., Awad G., Han J. and Sutherland A. (2006).
[13]. Real Time Hand Gesture Recognition Including Hand Segmentation and Tracking‖, demonstration at European Conference o f Computer Vision, ECCV, 2006.
[14]. G. Awad, J. Han, A. Sutherland, ―A Unified Method for Segmentation and Tracking o f Face and Hands in Sign Language Recognition‖, in Proc 18th International Conference on Pattern Recogntion, 2006