

## Hand Detection using HSV Model

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### Abstract

Natural Human Computer Interaction (HCI) is the demand of today's technology oriented world. Detecting and tracking of face and hands are important for gesture recognition. Skin detection is a very popular and useful technique for detecting and tracking human-body parts. It has been much attention mainly because of its vast range of applications such as, face detection and tracking, naked people detection, hand detection and tracking, people retrieval in databases and Internet, etc. Many models and algorithms are being used for detection of face, hand and its gesture. Hand detection using model or classification is to build a decision rule that will discriminate between skin and non-skin pixels. Identifying skin color pixels involves finding the range of values for which most skin pixels would fall in a given color space. All external factors will be eliminated to detect the hand and its color in the image in complex background.

**Keywords:** image segmentation, hand detection, hci, computer vision, RGB, HSV

### INTRODUCTION

In last few decades, there are many advancement have been made in the field of computer science. More and more machines and robots are made to serve human and these machines had changed the human life in many ways like laptops, smart phones, tablet Pcs, iphones. With the innovation of these things many changes are taken in the human computer interface to make it user friendly, diversified and widespread. The use of traditional input devices are being minimized and replaced. Human computer interaction has changed the way of utilizing of computer.

Computer vision is a branch of computer science which deals with the ways of image extraction, object and information detection in the images. Today lots of work is being done to understand image and extract information from them and use them as input to computer and other devices. Vision based algorithms and techniques are being used to make natural interface for devices. Human computer interaction and computer vision are being used together to design into a system that is close to human behavior. That's why images are being used as hot topic in the field of research and technology.

The computer technology associated with computer vision and image processing which works with the job of detecting and identifying examples of semantic entities belonging to a certain category of objects in video and images. Face detection, pedestrian, detection, vehicle tracking etc. are the well researched spheres of object detection. Object detection is extensively used in computer vision together with areas like image retrieval and surveillance of video.

Hand detection is associated with the location of the presence of a hand in a still image or series of images i.e. moving images. In case of moving series it can be performed by tracking of the hand in the picture but this is more correlated to the applications such as sign language. The core concept of hand detection is with the intention of human eyes can perceive objects which machines cannot with that much accurateness as that of a human. From a machine judgment it is just similar to a man move around with his senses to find an object.

### RELATED WORK

(Rautaray and Agrawal, 2011) explained that color data plays very vital role for locating hand in vision based system. Visions based techniques offer interaction system in dynamic environment by using cameras for capturing gesture and convert it in to meaningful command. Techniques used in hand tracking are divided into two parametric and non parametric group. Parametric techniques focuses on color concentration and non parametric technique focuses on using statistical probability models for calculating color dispersion in training dataset. In this paper randomized lists are used for hand color classification for two stages of work: training of data and tracking of hand. In this paper, they actualize and test a continuous hand following method in view of hand shading division and conveyance utilizing randomized records. The method is easy to keep moving so as to run the client's hand openly for intuitive applications.

(Chaudhary *et al.*, 2011) discussed that Hand signals acknowledgment is the normal method for connection of human and machine. There are different types of methods used to locate hand in the obtained image after preprocessing. Morphology based method where image of hand is rebuilt using the image properties and extraction. Model supported method in which various models are utilized to characterize image using different models to represent in Computers. Soft computing approaches include the use of fuzzy logic, genetic algorithm and neural network for hand gesture recognition. Diverse uses of hand signal acknowledgment have been executed in distinctive spaces from essentially amusement inputs to discriminating applications.

(Hasan and Misra, 2011) discussed the vision based hand gesture represents critical information that needs to be used in a correct way. Two techniques are used for gesture system edge based information and segments information. Gesture recognition system is divided into three phases, the image preprocessing, feature extraction, and recognition algorithm. Preprocessing is done to remove all unnecessary information mostly done through segmentation. Feature extraction is the process of converting image into such format to perform processing and to understand the shape of hand. Recognition algorithm is used for finding the correct gesture among the stored database gestures. Block scaling normalization is implemented to produce database features.

(Trigueiros *et al.*, 2012) elaborated the objective of gesture recognition research is to make a framework, which can distinguish particular human motions and pass them to pass on data for gadget control. Hand motions are an intense human specialized apparatus with loads of potential applications. Two diverse datasets with an alternate arrangement of hand elements were utilized to test the algorithm for machine learning. Machine learning is a process which has two entities teacher and learner. Teacher has required knowledge and learner has to be trained the knowledge to carry out the task. Orientation with the help of image moments is done using image segmentation. Introduction histograms depict how quite a bit of every shape is arranged in every conceivable course regardless of position of the hand inside the camera outline. The outcomes demonstrated that the component determination and information planning stage are vital, with low determination pictures.

(Tayal *et al.*, 2012) presented the automatic face detection algorithm was connected on a mixture of images taken under diverse lighting conditions and with distinctive foundations. An improved color based segmentation technique was applied to segment the skin areas in a picture and use of skin based segmentation in face recognition. Skin colour pixels assumed an essential part in identifying appearances in colored images and skin chromaticity estimations of distinctive colour spaces could be productively utilized for the information picture or image. Images taken from camera are RGB that are converted in to HSV values and then other operations are performed. Segmentation of the color image was done into skin and non skin areas are the first stage of face detection.

(Ibraheem *et al.*, 2013) stated that segmentation of images is to get area of interest. The use of proper color space to symbolize color information of image is a fundamental decision in segmentation. CIE Lab HSV, RGB, and YCbCr are commonly used four color spaces. They divided image segmentation in to four kinds: pixel, edge, region and model based on specific application and working environment. The diversity of color spaces provides the ability to select the proper color space that can be utilized well under different environment conditions. GM and GMM are statistical methods used recently for modeling skin color distribution in different applications. GMM is used for dynamic face tracking and estimating the face position and the bounding box used to focus for the processing on the selected area. Skin color based segmentation method needs the careful selection of color space and the model applied to the skin color image for efficient and accurate segmentation.

(Singh and Lodhi, 2014) elaborated that in recent times, the hand localization and tracking has been a dynamic field for specialists because of its improvement in human computer interaction methods. There are such a large number of points of view of recognition of gesture which is based on vision methodologies that give the most common and natural interfaces. Such a large number of sorts of motion come surprisingly close to recognition of gesture, for example, head, hand, eyes, fingertips, mouth, example and so forth. In this paper they focused just on Head motion and Hand recognition. So much work has been done in the vision based frameworks. These frameworks have clarified the significance of motion recognition framework for Human Computer interaction (HCI). To build up a framework that precisely and viably track the head and hand development, there are still a few difficulties. The precision of the framework minimized because of a few elements, for example, commotion in feature or picture, jumbled scene, separation and other lighting conditions and so on.

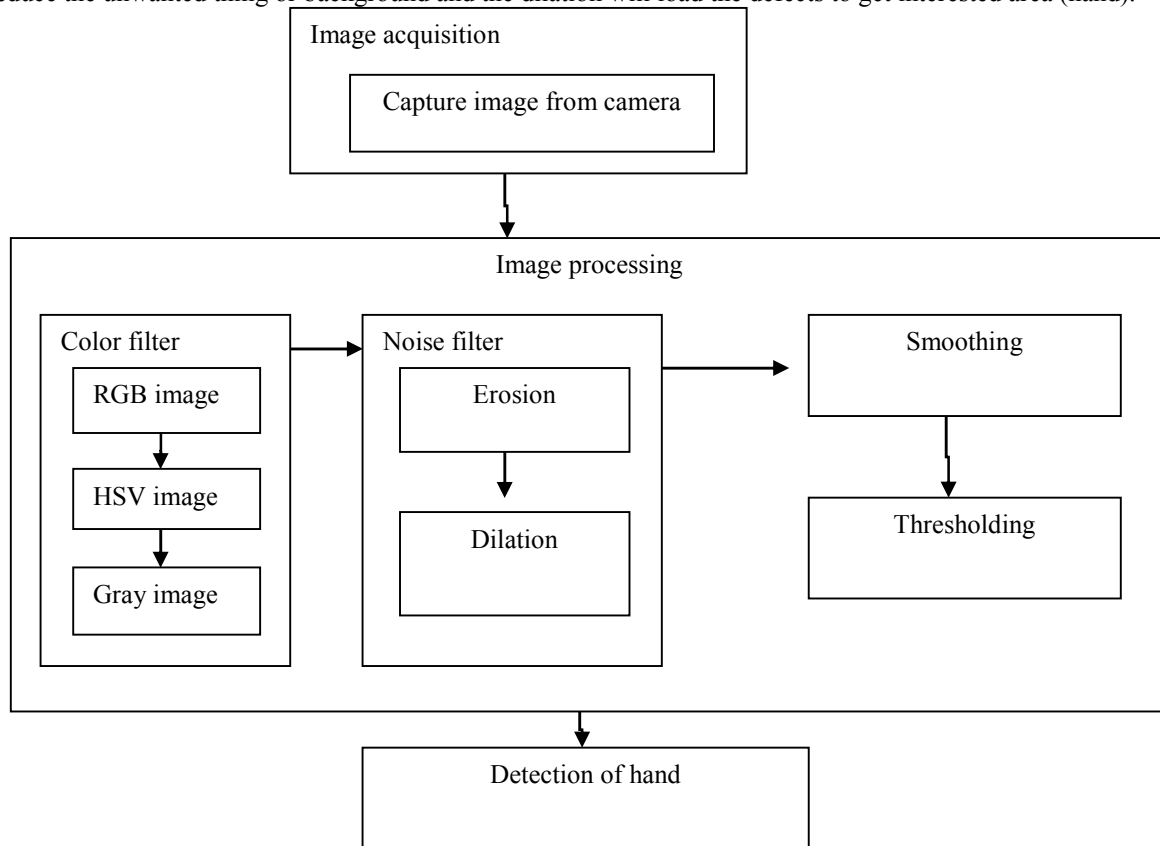
(Singhai and Satsangi, 2014) elaborated Hand motions are influential human communication channel between human, those made a main element of information convey in our daily days. Hand motions are natural and an easy to use mode of communication. Skin color detection is a challenge for natural interface between user and the machine. The three color spaces (RGB, HSV, CIE) have been chosen which are commonly used in computer vision applications. Hand Segmentation system using color model is a major problems in any color image analysis. Pre-processing is a step to get the required output form of an image. Human hand's skin modeling is done by implementation of Design and Development of hand Segmentation techniques using mix model approach. Segmentation by means of blend model technique, hand is enhanced fragmented by means of HSV and RGB for changing background and for defaulting background YCbCr and HSV color model or space is performed sound.

(Pradhan *et al.*, 2014) described that Gesture extraction is one of the most important functions in hand gesture recognition and revolutionary technology for man machine interaction. A variety of methods have been suggested to track and locate body parts (e.g., hands and arms) including colors, markers, and gloves. Hand Gesture Recognition Systems consists of three basic steps: detection, tracking and recognition. A low cost, robust hand gesture extraction technique which extracts gesture based on the basis of skin colour segmentation after the depth segmentation was proposed in the paper. In a best situation when human interacts with the computer by using

gesture, the depth of the gesture information and the other body parts varies and this information could be used to split gesture from other complex background

## MATERIALS AND METHODS

In this section, we will introduce how to extract the region of interest from color image. Using a single web camera to capture a series of images we captured the image. After transforming the image into HSV color space, we might be able to extract the skin pixel and non skin pixel regions by thresholding the value of hue, saturation and value. A binary image will be constructed and development will be done using frame difference method. Erosion will reduce the unwanted thing or background and the dilation will load the defects to get interested area (hand).



**Fig 1: system architecture**

### System description

Our system consist of two parts :

- i. A web camera
- ii. And matlab

Camera used is of 2MP and has resolution of 680x480. Video frame rate is 50fps. Matlab 2012a.

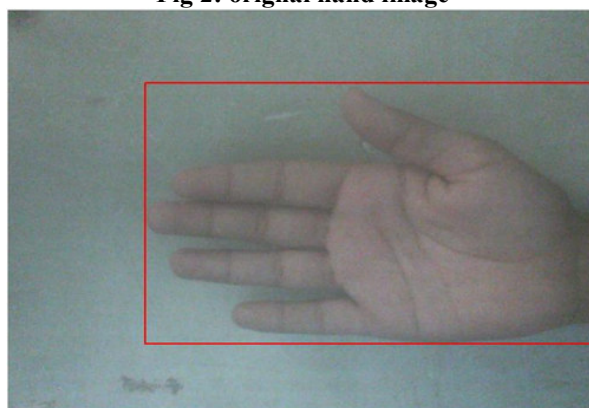
## RESULTS AND DISCUSSION

We have done following steps:

- a) The first step is to get input image from camera.
- b) Second step RGB image that was taken from camera is converted in to HSV image using matlab function.
- c) HSV image is converted in to binary image.
- d) Threshold is applied to get the hand segment only.
- e) Then image is eroded to get image free of noise.
- f) Image is then dilated to get the original hand image.
- g) Then we draw reactangle around the hand to get the hand image.



**Fig 2: original hand image**



**Fig 3: hand detection**

## CONCLUSION

In this research work my aim was to develop a system that detects hand in complex background. We obtained the color image from single web camera, and transform the color space into HSV color space. Our skin color region is defined under HSV color space. A binary image of hand can be obtained according to the skin color definition. Two morphological operations include erosion and dilation is performed. Erosion eliminates the noises while dilation smoothes the boundary. The limitation of our is that I have not worked at the motion of the hand.

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