

**HAND GESTURE RECOGNITION USING COMPUTER VISION**  
**DIGITAL IMAGE PROCESSING**  
**PROJECT PHASE 1**

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## **ABSTRACT**

In today 's world, the computers have become an important aspect of life and are used in various fields. However, the systems and methods that we use to interact with computers are outdated and have various issues. Hence, a very new field trying to overcome these issues has emerged namely HUMAN COMPUTER INTERACTIONS (HCI). Although, computers have made numerous advancement in both fields of Software and Hardware, still the basic way in which Humans interact with computers remains the same, using basic pointing device (mouse) and Keyboard or advanced Voice Recognition System, or maybe Natural Language processing in really advanced cases to make this communication more human and easy for us.

Our proposed project is the Hand gestures recognition system to replace the basic pointing devices used in computer systems to reduce the limitations that stay due to the legacy systems such as mouse and Touchpad. The proposed system uses hand gesture, mostly no of fingers raised within the region of Interest to perform various operations such as Play, Pause, seek forward, seek back word in video player (for instance VLC media player).

## **COLOUR SEGMENTATION**

Colour in an image is apparent by human eyes as a combination of R(red), G(green) and B(blue), these three colours i.e. Red, Green and Blue are known as three primary colours. Other kinds of colour components can be derived from R, G, B colour represented by either linear or nonlinear transformations. The RGB colour components represent the incoming light, that is the brightness values of the image that can be obtained through (Red, Green and Blue filters).

It has been highly praised that human eye can only distinguish two-dozens of colours out of thousands of colour shades and intensities. It is quite often difficult to extract an object or recognize a pattern from image using grayscale, the object can only be extracted using colour information. Since colour information provides additional information to the intensity as compared to grayscale, therefore, the colour information is extremely necessary for pattern recognition.

The main purpose of colour segmentation is to find particular objects for example lines, curves, etc in images. In this process every pixel is assigned in an image in such a way that pixels with the same label share certain visual characteristics. The goal of colour segmentation in this work is to simplify and increase the ability of separation between skin and non-skin, and also decrease the ability of separation among skin tone.

## **SKIN DETECTION**

There are several techniques used for colour space transformation for skin detection. Some potential colour spaces that are considerable for skin detection process are:

- ✓ CIEXYZ
- ✓ YCbCr
- ✓ YIQ
- ✓ YUV

The YCbCr, colorspace performs very well in 3 out of 4 performance metrics used. Thus, it was decided to use YCbCr colorspace in skin detection algorithm. In YCbCr colorspace, the single component “Y” represents luminance information, and Cb and Cr represent colour information to store two colour-difference components, Component Cb is the difference between the blue component and a reference value, whereas component Cr is the difference between the red component and a reference value. Thus, a pixel is considered a human skin, if a set of pixels is falling into that particular category with a certain value of Cr and Cb having certain threshold. n skin pixels marked in blue colour, so that the gesture can easily be identified.

The skin detection algorithm implements the following steps:

- ✓ Read the image (RGB colour image), and capture the dimensions (height and width)
- ✓ Initialize the output images
- ✓ Apply Grayworld Algorithm for illumination compensation
- ✓ Convert the image from RGB to YCbCr
- ✓ Detect Skin
- ✓ Mark Skin Pixels with Blue 10.