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Application Access for Chromatic Colour Detection

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Abstract*— Computer has become one of the growing technologies in today's world. Therefore, an efficient technique must be used in-order to have a good interaction with the computer. The Human-Computer Interaction is one of the growing technologies that enriches better interaction among the humans and computers. Human Computer Interaction is an efficient way to have an interaction between human being and computer. This paper deals with the better version of interacting with the computer through the object detection. The object detection is done with the RGB colours. Once when the colour of the object is detected, accordingly the functionalities are performed. All these detections are done within the desktop environment i.e., by using web-cam. In this method every human can have better communication with the computer in a better way. By this way it enhances the human computer interaction.

***Index Terms*— Human computer Interaction, Application access, Colour detection, Gesture identification**

I. INTRODUCTION

Typical interaction between the human and computer is through mouse. Therefore, some technique has to be applied in-order to have an efficient interaction. For this purpose, Human Computer Interaction(HCI) is used. This HCI is one of the finest technology that enhances the communication between human and computer. The study is mainly aimed at conducting experiments to detect an object using RGB color models. This study is based on the accurate detection of color from different objects. The histogram of grayscale is produced to extract object. The main goal of the research is the interaction between the human and computer using objects by detecting the colour. It captures the real time objects when shown in front of web cam using colour tracking algorithm. Object detection has advantages that any object can be shown, in order to detect the colour to have efficient interaction.

Earlier work seeks to define the most appropriate color combination for the detection of edges [21]. The selections of the individual, most significant components were analyzed with the color models. First, the performances of the conventional canny edge detector for this color area are compared. In addition to robust statistical error measures we are then tending to evaluate the precision of the detected edges using two quantitative methods, Fram and Deutsch. Based on this, the paper details on the colour detection via object. By showing the object in the desktop environment web-cam, the colour of the particular object is detected. This paper detects the single object single colour and also detects multiple objects with the same colour. Then this paper also uses multiple colour combination. By detecting the colours of an object, the particular functionality that is mentioned is performed.

The organization of the paper goes in this order. We have outlined on the basic idea in section 1. Related research study pertaining to the proposed topic of research is highlighted in section 2. The details about the proposed system in outlined in section 3. The model description and study results with illustrations is presented in section 4. Section 5 gives the details on the algorithm and analysis of the results. Finally the section 6 presents the results and conclusion & future work in section 7.

II. RELATED WORK

This section describes the previous works related to our project on detecting colours using object. Though there are several research survey, studies using spectral sensitivities of color detection mechanisms have focused on two questions. The first one is whether the detection approach with spectral sensitivities that lies between those of the three standard mechanisms using black–white, red– green and yellow–blue [1]. Results of psychophysical work with habituation [2], visual search [3,4] and noise masking [5] suggest strongly that such mechanisms exist and operate in everyday visual detection tasks. One another issue is that whether the detection mechanisms have broad or narrow spectral sensitivities for color detection.

Research with broader sensitivity are more consistent with the combination of cone photo and receptoral inputs in a spectrally linear fashion. The study also reveals that the narrow sensitivities can only be created through non-linear combination. The study with the electro physiological approaches have reported that the majority of color sensitive neurons combine cone signals linearly.

Study results with the possible exception of some form of rectification provided certain links to low levels which maintains discharge [6,7]. However, study has shown that cortical neurons with narrow band spectral tuning have been found [7,8].

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The study also inferred that color detection is served by mechanisms that have been tuned to a variety of directions in color space and that these mechanisms have broad and linear spectral sensitivities [9]. Preliminary reports of the existing work [10,11] using color images were sensed which were reproduced based upon tri-stimulus values which have amplitude values proportional to radiance having spectral composition carefully chosen according to the principles of color science.

CIE systems [12, 13] have hue attributes of a visual sensation which resembles presentations which looks similar to one of the perceived colors, red, yellow, green and blue or using combinational schemes. The saturation is defined as the color fullness of an area judged in proportion to its brightness component. The definitions composed the first popularly known color space models namely RGB and HSV. One another subsequent variant scheme is the YIQ color space which uses a luma-chrominance encoding system. Here the luma component represents the original monochrome signal along with and chrominance and provides color information.

A robust solution for automatic selection of edge detector parameters [14] based on a hybridization algorithm [15] is aims at presenting results with adequate statistical theory. Similar other system [16] was presented which monitors non-cooperative and camouflaged targets. The system suggests visual surveillance domain which aims at developing a controlled outdoor environment like parking lots in a specific area. The system also aims at presenting a targets which are moving in changing environments with high occlusion and lower contrasts.

Similar other work employs projection histogram (W4) to locate human body part (i.e. head, hands, feet and torso) and distinguished single person and group [17]. Here it noted that each person in a group is tracked by tracking mechanism. The extension of the similar other work (Hydra) [18] without using colour cues for tracking is analyzed which have promising study results.

Nevatia [19] have implemented a scheme which adopts first color edge detection by extending Hueckel operator. All of these proposed schemes analyzed for the study have practical adaptations of grayscale edge techniques which deals with color images. Generally, three classes of color extensions in the literature with output fusion methods, multi-dimensional gradient methods and vector methods exist. Apparently, the output fusion is found to be the most popular one with low cost, since the goal is to fuse the results obtained by applying the detector to each component of the considered color space. Also, there are no other consistent work to compare highly correlated color space components and perceptual color space ones [20].

III. PROPOSED WORK

The proposed system deals with the efficient way of human computer interaction in the desktop environment i.e. using web-camera. The HCI is done using the colour that is done via object detection. The colours that are used in our project are red, blue and yellow. Initially all the colours are set to zero since there is no colour is detected. Then by showing an object with the colour, corresponding colour count is increased. Depending on the colour code the corresponding functionalities are performed.

Fig 1 depicts the flow diagram of our proposed work. The condition that is used is whether the colour is detected or not. Once when the colour gets detected the corresponding functionality gets performed and once if not detected it does not perform any functionality.

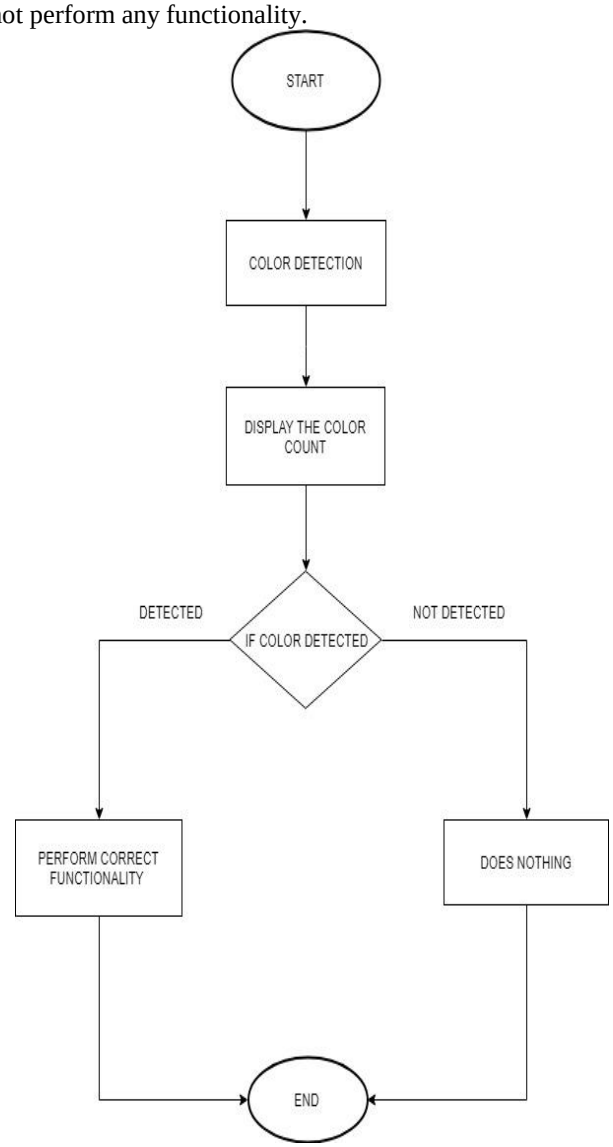

Fig. 1. Magnetization as a function of applied field

IV. MODEL DESCRIPTION

Generally, the colour can be predicted by using object that is coloured. Our proposed work deals with the interaction with the computer using the colour of the object. Our software environment was built on Windows. We used Spyder in the Anaconda Navigator for python programming language with the necessary packages that are required to perform the functionality mentioned in our proposed approach. The packages that are included are NumPy, cv2, web browser, selenium, play sound, urllib, time and date time. The package NumPy is used to mark the points around the object of the colours that are mentioned in our proposed work. The cv2 is the package that is mainly used for computer vision. The web browser is the package that is used display the web-based document.

The selenium is the most commonly used package that is used for testing the functionality in the web site. The urllib package is used to access the web sites. The play sound package is used to play an audio. The date time package is used to display date and time of particular action that is performed. Table 1 presented below describes the colour count and their corresponding functionality.

TABLE I
COLOUR COUNTS AND ITS TASK

Count of the Colour	Performing functionality
Blue - 1 no	Produces the List of Background tasks
Blue - 2 no	Opens Web site
Blue – 1 no Red - 2 no	Takes a screen shot and are stored in the folder along with date and time
Red – 2 no	Opens Gmail
Yellow – 2 no	Opens the Google Calendar

Initially the colours are displayed along with the count 00. This indicates that no colour has been detected from any object. Fig 2 depicts that no colour has been detected and therefore the count is 00. If any of the object colour is detected then the count gets increased accordingly.

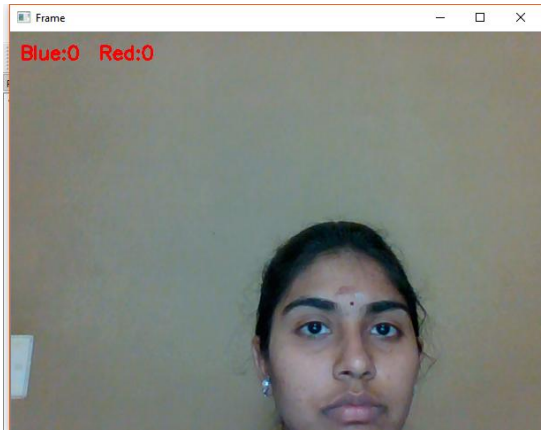

Fig 2. Initial Count Of Colours

When the object with one blue colour is shown the count in the blue colour gets raised and the corresponding functionality is performed.

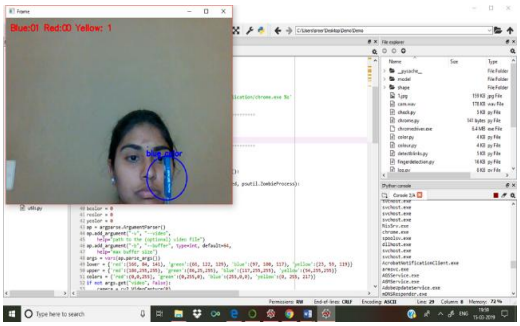

Fig 3 Detection Of Blue Colour

Fig 3 depicts the fact that blue is detected and the count of the blue colour is increased by 1. Once when the blue count gets increased at side inside the Spyder log console all the run command is listed. Then, the object that has two blue colours is taken. The blue count is raised to count two. By increased count by 2 the corresponding functionality is done. Fig 4 depicts the fact that when the objects that has two clue colour is shown then those blue colour are counted and their corresponding count is raised. For the above colour detection for the object the corresponding functionality is performed

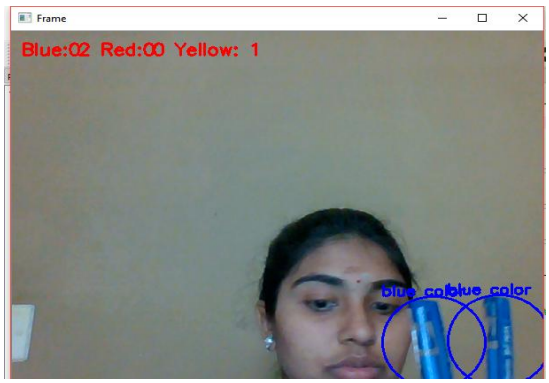

Fig 4 Detection Of Multiple Blue Colour

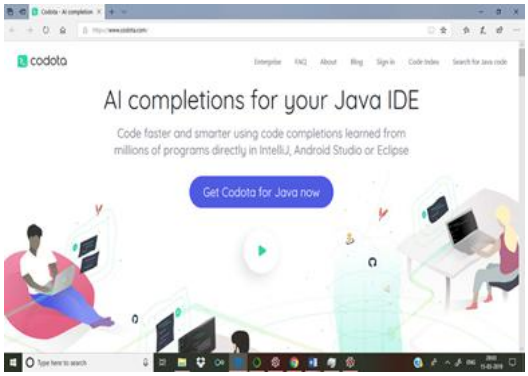

Fig 5 Performing Functionality

Fig 5 depicts the opening of a web site for instance Codota when blue color count is two.When an object with the two red colours are taken the count of the red colour gets raised. By this count the corresponding functionalities are performed.

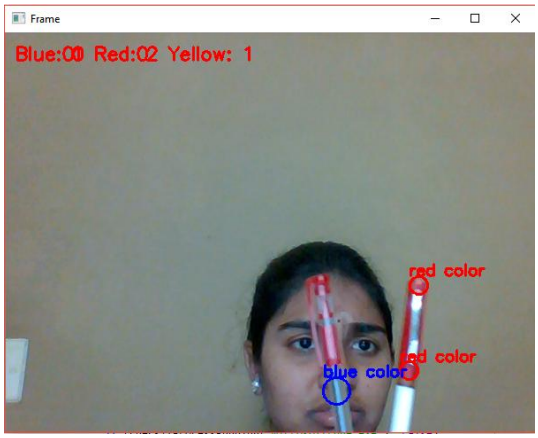

Fig 6 Detection Of Multiple Red Colour

Fig 6 presented above depicts the fact that multiple objects with the red colour is shown and the count gets raised to two. When the corresponding two red colors are taken then the corresponding functionality is performed accordingly.

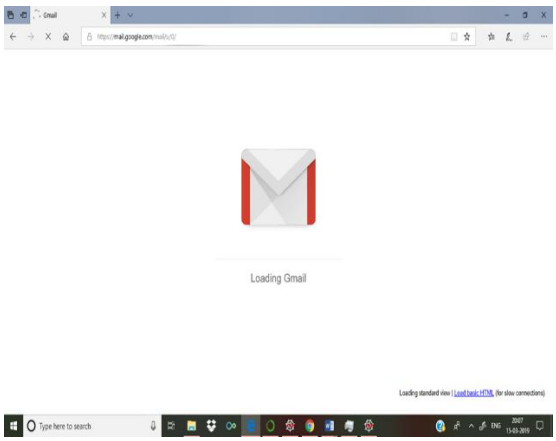

Fig 7 Performing Functionality

Fig 7 depicts corresponding functionality i.e. the Gmail gets opened up when the count of the red colour is two. Now the combination of two colours are used. The combination is that one blue and one red. As soon the object with the colours are detected and the corresponding count gets raised.

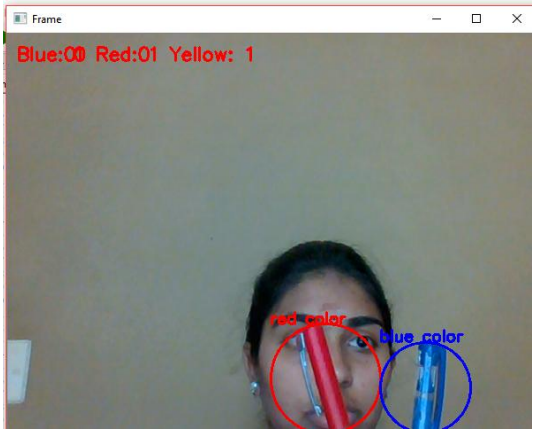

Fig 8 Detection of multiple Colours

Fig 8 depicts the fact that when the multiple objects are shown then the corresponding colours are detected an dtheir count is raised.When the multiple colours are detected the functionalities are performed accordingly.

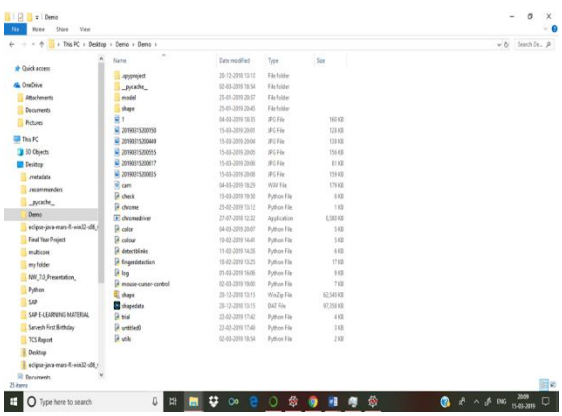

Fig 9 Performing Functionality

Fig 9 depicts the fact that once the combination of the colours is detected then the screen shot is taken and are stored in the folder. The screenshot is taken with an audio. The picture is stored in the '.jpeg 'format along with the date and time.
Now the yellow colour is detected. Once when the colour is detected the corresponding count for the colour gets raised and corresponding functionality is performed.

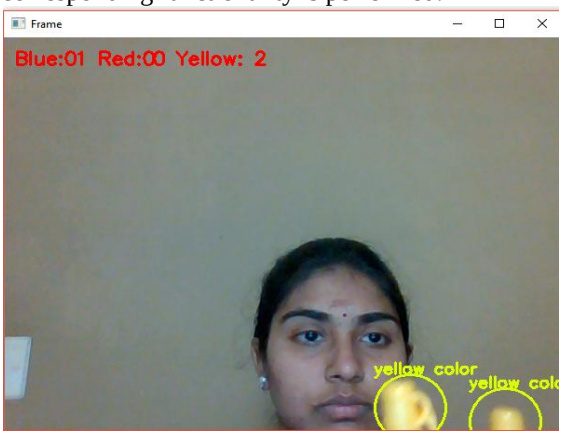

Fig 10 Detection Of Multiple colours

Fig 10 depicts the fact that when the multiple objects are shown then the corresponding colours are detected an dtheir count is raised.When the same colour of multiple objects are detected the functionalities are performed accordingly. Fig 11 depicts the fact that when the yellow count is raised to 2 the corresponding functionality i.e. to open the Google Calendar is opened. Likewise, we can perform for many colours and combination of colours. By using these colours, we can have a better interaction between computers and human.

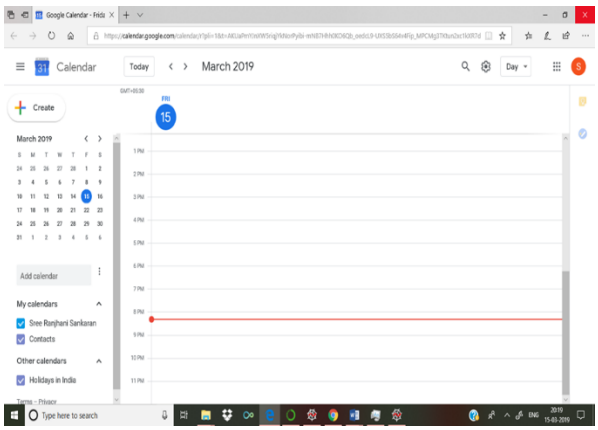

Fig 11 Performing Functionality

V. ALGORITHM FOR COLOUR TRACKING

This section describes the algorithm that is used for detecting the colour using the various objects. The algorithm we are using here is Colour Tracking Algorithm and presented in Table 2.

TABLE II
PSEUDO CODE OF COLOR TRACKING ALGORITHM

```
IF object with the colour is detected
    THEN
        increased colour count
IF(colour count == number)
        performing functionality
        ELSE
            No functionality
IF(multiple colour count == number)
            performing functionality
        ELSE
            No functionality
        ELSE
No operation and count remain zero
```

VI. EXPERIMENTAL ANALYSIS AND DISCUSSION

Research papers based on Colour detection via Object are mentioned in the related work session. This paper discuss about the interaction through colour detection. The colour detection is performed in the desktop environment using web-cam. The colour detection is possible using the packages NumPy, urllib, cv2, selenium, web browser, play sound, time and date time. Using these modules, we can have an efficient communication with the computer. Initially the blue, red and yellow count are taken as zero. When the object is placed in-front of the web cam the respective colour count is increased. Depending on the count of the colour respective functionality are performed. For instance, when the count of the blue colour then all the run command is shown as the output. Similar to these cases, the color is detected and functionalities are performed. In the above mentioned way we can better interaction with computer.

The metrics chosen for evaluating the performance of various sections that are important for the pursuing the proposed scheme. The program is programmed to identify the colour of the object. The colour of the object is detected once it is shown. Once when the colour of the object gets detected it performs the corresponding functionality. The colours that are used are red, blue and yellow. Once when the colour gets detected the functionalities are performed accordingly. A single colour or combination of colours are used so that an efficient communication can be made between human and computer.

VII. CONCLUSION AND FUTURE WORK

In this growing world, computer plays a major role in every human being life. Since they are part of every human life therefore some interaction techniques must be used so that it becomes more user friendly. This paper deals with the improved version of human and computer interaction. This paper shows the interaction with computer using the colours that are detected from the object. Using these colours, we can have an efficient way of communication. This paper has built only for single colour, combination of two colours and their respective colour counts. For future enhancements it can be done using hand gestures that support efficient communication between the human and computer.

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