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Color Detection of Image

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ABSTRACTThe color detection system is a computer program developed using OpenCV and Python. The system is designed to allow the user to select a color from an input image by double-clicking on it with the mouse. The system then calculates the minimum distance between the selected color and all colors in a CSV file that contains color names and their corresponding RGB values. Based on this calculation, the system determines the color name that best matches the selected color and displays it on the input image along with its RGB values. The system is capable of handling user input through mouse double-click events and terminates when the user presses the "esc" key. The color detection system provides a useful tool for identifying colors in digital images and can be applied in a variety of fields such as graphic design, computer vision, and image processing.

KEYWORDS: color detection system.

I. INTRODUCTION

Colour detection is important to recognise objects. It is also used as a tool in various image editing and drawing applications. Color detection is the process of detecting the name of any color. Well, for humans this is an extremely easy task but for computers, it is not straightforward. Human eyes and brains work together to translate light into color. Light receptors that are present in our eyes transmit the signal to the brain. Our brain then recognizes the color.

Human eyes and brain work in co-ordination in order to translate light into color. Light receptors that are present in eyes transmit the signal to the brain which in turn recognizes the color. There is no exaggeration in saying that humans have mapped certain lights with their color names since childhood. The same strategy is useful in detecting color names in this project.

Three different colors Red, Green and Blue are being tracked by utilizing the fundamentals of computer vision. After successful compilation when we execute the code a window redirects to the image displayed on it whose path is given as an argument.

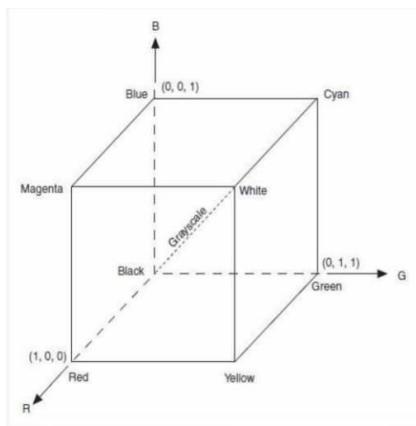
Additionally, we obtain the color name of the pixel along with the composition of three different colors red, blue and green values. It is helpful in recognizing colors and in robotics. One of the applications of color detection by computer vision is in driver less cars. This system is useful in detecting traffic and vehicle backlights and takes decision to stop, start and continue driving. This also have much application in industry to pick and place different colored object by the robotic arm. Color detection is also used as a tool in various image editing and drawing apps.

II. RELATED WORK

RGB refers to red, green and blue color model. This color model was first portrayed by Thomas Young and Herman Helmholtz in the Theory of Trichromatic Color vision and by using James Maxwell's color triangle in early 19 centuries. In RGB color model, every color shows up in its primary spectral segments of red, green and blue. The model is taking into account Cartesian coordinate system. It is an additive color model, on the grounds that red, green and blue lights



are included in different blend to recreate a wide range of color. While representing this color model, a cube is defined on the axes of R, G and B. White color is delivered when each of the primary colors are present at M, where M shows the maximum intensity of the light, let $M = 255$. The primary diagonal axis uniting the black and white corners defines the intensity. $I(R,G,B) = R + G + B$ All points in a plane perpendicular to the grey axis of the color cube have the same intensity. The plane through the color cube at points $R = G = B = M$ is one such plane. This plane forms an equilateral triangle which is the standard RGB chromaticity triangle. In that cube primary colors (Red, Green and Blue) are at three corners i.e., red in x axis, green in y axis, and blue in z axis, Secondary colors Cyan, Magenta and Yellow are in other three corner i.e., cyan is at diagonally opposite corner of red, magenta is at diagonally opposite corner of green, yellow is at diagonally opposite corner of blue. Black is at origin and White is at corner most remote from origin. Distinctive colors in this model are focuses on or inside the shape, and characterize by vectors stretching out from the origin. The principal motivation behind the RGB color model is detection, representation, as well as presentation of images in electronic devices, for example, TVs, PCs, etc. However, it is additionally being utilized as a part of traditional photography. Previously, in the electronic era, this color model as of now had a strong hypothesis behind it, situated in human view of colors.



Color detection is a technique of detecting any color in a given range of HSV (hue saturation value) color space. Image segmentation is the process of partitioning digital image and labeling every pixel, where each pixel having the same label shares certain characteristics.

III. METHODOLOGY

Image Capture: The first step is to fetch a high-quality image with resolution. To load an image from a file we use `Cv2.imread()`. Image should be in working directory or full path of the image should be given.

`Img=cv2.imread(img path)`

Extraction of RGB Colors: In this phase, the 3 layered colors are extracted from the input image. All the color images on screens such as televisions, computer, monitors, laptops and mobile screens are produced by the combination of red, green, and blue light.

Each primary color takes an intensive value 0 (lowest) to 255 (highest). When mixing 3 primary colors at different intensity levels a variety of colors are produced. For Example: If the intensity value of the primary colors is 0, this linear combination corresponds to black. If the intensity value of the primary colors is 1, this linear combination corresponds to white.

`Index=["color", "color_name", "hex", "R", "G", "B"]`

Calculate minimum distance from coordinates:

The minimum distance is calculated by considering moving towards the origin point from all colors to get the most matching color.



The pandas library serves as an important utility to perform various operations on comma-separated values like `pd.read_csv()` reads the csv file and loads it into the pandas data frame.

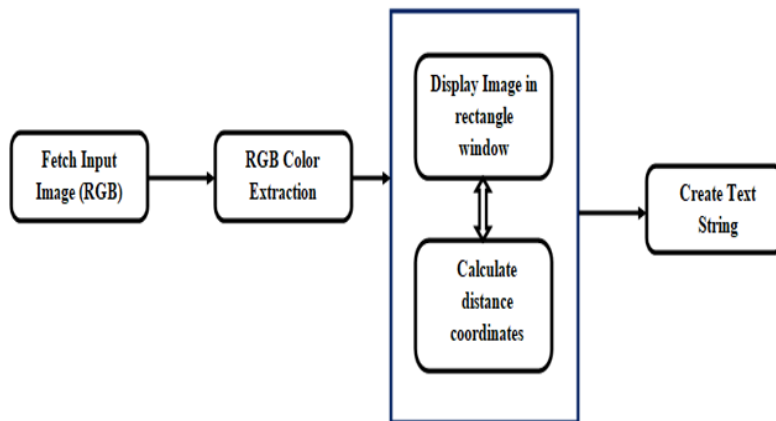
$$D = \text{abs}(R - \text{int}(\text{csv.loc}[i, "R"])) + \text{abs}(G - \text{int}(\text{csv.loc}[i, "G"])) + \text{abs}(B - \text{int}(\text{csv.loc}[i, "B"]))$$

Image Display with Shades of Color:

The rectangle window is used to display the image with shades of color. After the double-click is triggered, the RGB values and color name is updated. To display an image `Cv2.imshow()` method is used. By using `cv2.rectangle()` and `cv2.putText()` functions, the color name and its intensity level can be obtained.

`text=getColorName(r,g,b) + 'R='+str(r) + 'G='+str(g) + 'B=' +str(b).`

Systems design is the process of defining elements of a system like modules, architecture, components and their interfaces and data for a system based on the specified requirements. It is the process of defining, developing, and designing systems which satisfies the specific needs and requirements of a business or organization.



The above architecture shows the capability for the project. It consists of a well-defined sequence diagram that is abstracted from the source code. It leverages the rich capabilities of the technology such as OpenCV library in python.

The above architecture makes the process more efficient based on principles and properties related to each other. As we know that Red, Green, and Blue are the primary colors that can be mixed to produce different colors. The present color detection project takes the path of an image as an input and looks for the composition of three different colors red, green, and blue in the given image.

IV. EXPERIMENTAL RESULTS

The input image description typically refers to the process of describing the characteristics of the image that will be used for color analysis. Here's a possible input image description for a color detection project:

Image Size and Format: Specify the size and format of the input image, such as width, height, and file type (e.g., JPEG, PNG).

Color Space: Specify the color space used in the image, such as RGB (Red, Green, Blue) or HSV (Hue, Saturation, Value).

Image Content: Describe the content of the image, including objects, scenes, or specific regions of interest that contain the colors to be detected.

Lighting Conditions: Mention any relevant information about the lighting conditions under which the image was captured, as lighting can affect color perception.



Background Information: Provide any additional information about the image, such as whether the background is uniform or complex, or if there are any color variations or patterns present.

Image Quality: Mention any potential issues with image quality, such as blurriness, noise, or compression artifacts, which might impact color detection accuracy. Still, some small non-text objects are detected.

Here's an example input image description:

"The input image is a JPEG file with a resolution of 800x600 pixels. It is in the RGB color space and depicts a garden scene with flowers, trees, and a blue sky in the background. The image was captured in daylight with natural lighting conditions. The flowers exhibit various colors, including red, yellow, and purple. The background is mostly uniform, with some slight color variations due to shading. The image quality is clear with minimal noise."



(a)



(b)



(c)

Fig.1. Image detection process (a) Input image (b) Output image with Rectangle box, Dark color name and RGB values (c) Output image with Rectangle box, Light color name and RGB value

V. CONCLUSION

We have implemented The color detection project using OpenCV in Python provides a simple and efficient way to detect colors in an image. The program can accurately detect and identify the closest match of any color present in the image by comparing the RGB values of the selected pixel with the RGB values of colors present in a dataset of named colors.



The program has a user-friendly interface that allows users to easily click on any point in the image to obtain the color name and RGB values of the corresponding pixel. Additionally, the program displays the color name and RGB values on the image for easy visualization.

This project can have several real-world applications, such as in image editing, web design, or in art, where the detection of colors is important for effective visualization and communication of information.

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