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A Beginner's Guide to the Artist's

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***Abstract*: Painting is a colourful art form that involves applying paints, pigments, and other fluids to a canvas or other surface to create images. Painting can be done with a variety of mediums, including oils, acrylics, watercolours, and so on. Beginners are unfamiliar with the distinctions between the various colour media. However, we have the internet to obtain all of those answers, but searching and learning take a long time. Aside from that, artists should be aware of the colours employed in a work of art. Beginner artists and people who paint as a hobby may find it challenging to grasp the concept of colour blending in art at first.In light of these circumstances, we've come up with a plan to create a beginners guide to the artists application in which they can extract the dominant colours from an image, learn and explore everything there is to know about colours, paintings, and other forms of art, and begin purchasing art materials in the same application while working on their dream art. We used the K-means clustering algorithm to extract the most dominant colours from an input image in this application.**

***Keywords*: color extraction, K-means clustering, color palette, paintings, guide to the artists.**

1. Introduction

Lights vibrate, and colours represent the vibrations of those lights. Colors can be found all around us and are a part of our daily lives. For years, psychologists have studied the connection between an object's colour and the feelings it generates. The human eye is used to sense colour. Color can sometimes reflect our personality and thinking. Colors do, in fact, impact our emotions and actions. Colors affect even the blind. If we think optimistically, our lives will be vibrant. They are a symbol of joy and self-assurance. Colors are also a source of inspiration for well-known painters who make a profession from painting with them. They have been able to use colour to depict life and the planet. They use colour to bring their works to life.

The first thing we notice about a painting or art work is its colour; we don't realise how much more we are taking in. The artists must then use colours for their inherent qualities in order to achieve a specific goal. There are some sketches that we make solely with a pencil. However, we use colours in paintings to give them meaning and to help an artist express his or her emotions and inspiration. Not only that, but paintings rely heavily on colour to create impact, mood, and depth. Even a small amount of bright colour on a monochromatic image can have a significant impact. Depending on the colours used, the effects of adding colour to a painting can vary. They can be purely optical and draw your attention. They can also be emotional, either calming (blue/green) or stimulating (red/yellow). Colors can also have an aesthetic effect, such as the beauty you feel when you juxtapose harmonious colours.

However, certain physical properties of an image or an art piece, such as image resolution, colour depth, noise, the influence of neighbouring pixels, and so on, limit the number of colours and influence their appearance. Furthermore, because of the limitations of the human visual system (HVS), particularly in peripheral vision with poorer colour discrimination and lower spatial acuity, we can only distinguish between a small number of them. Because of the mechanism of selective visual attention, an even more intriguing question arises: which colours are most prominent—that is, they stand out or are noticeable at first sight—and what are the main factors that influence their prominence?

This paper is about beginning artists who enjoy learning to paint and are familiar with colour mixing and blending. because many beginners do not understand how to see colours in an image or a piece of art Colors are the soul of art, and we must understand how they work and how to apply them to a canvas or art paper. As a result, we devised a plan to create a web application and a platform for all aspiring artists eager to learn and demonstrate their artistic abilities.This application includes a learn module for learning about paintings and other forms of art, a store module for purchasing all of the necessary art materials at very low prices, and a module for extracting the dominant colours from an image using the concept of k-means clustering.

2. Literature Review

A. Color Extraction Approaches

Several methods for extracting a set of image colours, also known as an image colour theme, have been proposed in the past. However, little attention has been paid to developing an algorithm for extracting the image's most prominent colours. Color-extracting methods are classified into four types based on their operating principles: histogram-based, clustering-based, segmentation-based, and data-driven methods. Our primary focus is clustering. Clustering algorithms include density-based clustering, hierarchical clustering, fuzzy clustering, K-means clustering, and partitioning clustering.

The performance of k means and hierarchical clustering

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calculations is determined using a variety of tools based on exactness and running time. According to the findings of this study, the exactness of k means is greater than that of the various clustering strategies. So, k means algorithm is great for large data point.

B. K-Means Clustering

The K-means clustering algorithm computes centroids and then repeats the process until the best centroid is found. It is assumed that the number of clusters is known. The flat clustering algorithm is another name for it. The letter 'K' in K-means denotes the number of clusters discovered from data by the method. This method assigns data points to clusters so that the sum of the squared distances between the data points and the centroid is as small as possible. It is critical to note that reduced diversity within clusters results in more data points that are identical within the same cluster.

3. Proposed System

As we've seen, there are a variety of algorithms for extracting the dominant colours from any image. Because of its high accuracy, K-means is often employed. The current technology is just capable of extracting colours. We used this colour extraction using K-means clustering as an idea for a web application or platform dedicated to all beginner artists with a deep interest in learning and knowing more about colours and other kinds of art in the suggested system.

The suggested system is split into two parts: front end and backend.

A. Frontend

To create the front-end website for this proposed system, we used HTML, CSS, Bootstrap, and JavaScript. Hyper Text Markup Language, commonly referred to as HTML, is the standard markup language used to create web pages. Web browsers can read HTML files and render them into visible or audible web pages. HTML describes the structure of a website semantically along with cues for presentation, making it a markup language, rather than a programming language.

CSS (Cascading Style Sheets) defines the styling of the markup document. For instance, colors, fonts, alignments, layout, etc. Every presentable HTML element has a set of style properties, modifiable with CSS.It is used to improve content accessibility, provide more flexibility and control in the specification of presentation characteristics, and allow multiple web pages to share formatting by specifying the relevant CSS in a separate.css file, which reduces complexity and repetition in the structural content while also allowing the.css file to be cached to improve page load speed between the pages that share the file and its formatting.

Bootstrap is a web development framework that is both free and open-source. It's intended to make the building of responsive, mobile-first websites easier by providing a set of template design syntax. To put it another way, Bootstrap makes it easier for web developers to create websites because they don't have to bother about basic commands and functions. It's made up of HTML, CSS, and JS-based scripts for a variety of web design functions and components. JavaScript is a well-known programming language that is used to do magic on websites in order to make them more interactive for users. It's utilised to improve a website's functionality and run exciting games and web-based software.

B. Backend

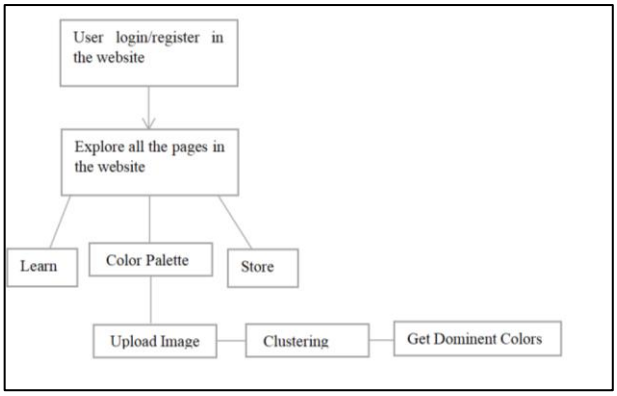

Fig. 1. Proposed system diagram

In backend we have used K-means clustering algorithm for obtaining the most dominant colors from an input image. K-Means clustering is a technique for unsupervised learning. Unlike supervised learning, this grouping does not require labelled data. K-Means divides things into clusters based on their similarities and differences with objects from other clusters. MongoDB is used to store all the user details getting registered and signing in the application. MongoDB is a NoSQL database management system that is available as open source software. Traditional relational databases are replaced by NoSQL. When working with massive amounts of scattered data, NoSQL databases come in handy. MongoDB is a database that allows you to organise, store, and retrieve document-oriented data. The frontend and backend are linked together using Flask. It's a compact and lightweight Python web framework that comes with a number of handy tools and features that make developing online apps in Python much easier. Because you can build a web application rapidly using only a single Python file, it allows developers more flexibility and is more accessible to new developers.

4. Algorithm

The Machine Learning Algorithm used in this Application is K-Means. It takes the un labelled dataset as input, divides the dataset into k-number of clusters, and repeats the process until it does find the best clusters. The value of k should be pre-determined.

The following steps describes the algorithm of the System:

Step 1: Choose an Image to upload

Step 2: Once u submitted an image.

- It sends that image file to Flask Server for Backend Interpretation.
- In the Backend, K-Means model makes Prediction
- Creates a new Image with most dominant colors of the uploaded image.
- Returns path of that newly created Image in html file.

A. Model Prediction using K-means

Clustering is a "unsupervised learning" strategy in general. We don't have a target variable; thus we can't use it. We're simply allowing the patterns in the data to emerge. K-means clustering assigns every data point to the nearest centroid, which are K separate randomly-initiated points in the data. The centroid is shifted to the average of all the points assigned to it once each point has been assigned. The process is then repeated: each point is allocated to the centroid closest to it, and centroids are shifted to the average of the points assigned to them. When no point's assigned centroid changes, the method is complete.

The algorithm appears to be similar to,

Step 1: Create K random centroids as a starting point.

- You could choose K randomly selected data points as your beginning points.
- Otherwise, for each variable, you choose K random values.

Step 2: Look at which centroid is closest to each data point.

- Using a measurement such as the Euclidean or Cosine distance.

Step 3: Assign the data point to the centroid that is closest to it.

Step 4: Move the centroid to the average of the positions allocated to it for each centroid.

Step 5: Repeat the last three procedures till the centroid assignment stays the same.

- When there are no further modifications, the algorithm is said to have "converged."

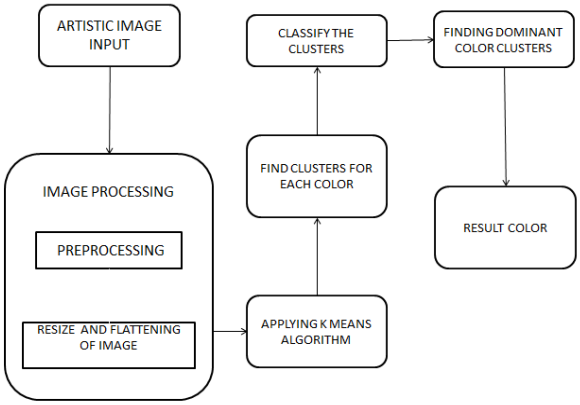

Fig. 2. Flow diagram

5. Working and Implementation

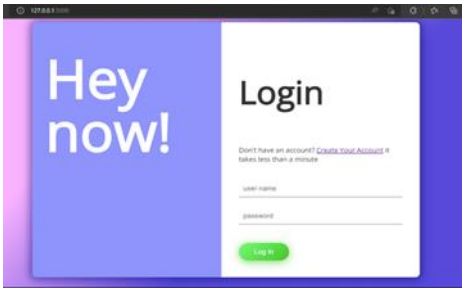

Fig. 3. Login page for users

First, we install all modules required for this project then we create an instance of Flask application running on a port. Whenever we run the server, it connects to MongoDB using a URL containing user name and password. We create methods and annotate it with @app.route so that it acts as a controller. Each method performs some action like rendering a template, returning an image etc. We map html pages with routes using url_for() method. Login and register route uses MongoDB to verify a user or create a user and login page is shown in fig. 3.

Once the user is logged in it generates a session for that user as shown in fig. 4 and then user will be able to access all the pages.

Fig. 4. Art amour home page

The colour palette is the initial module. We'll extract the most dominant colours from an image in this module. In addition, we offer a few colour palette suggestions. It gives the painters an idea of how to combine and use the colours. Upload route is the place where we perform K-Means clustering. First, we choose the number of cluster and then we extract image file which was sent from html page and flatten it then we fit to the K-Means function which is provided by scikit module and then we get centroids from the image using it we generate a new Image with most dominant color and render it on the color palette page as shown in fig. 5.

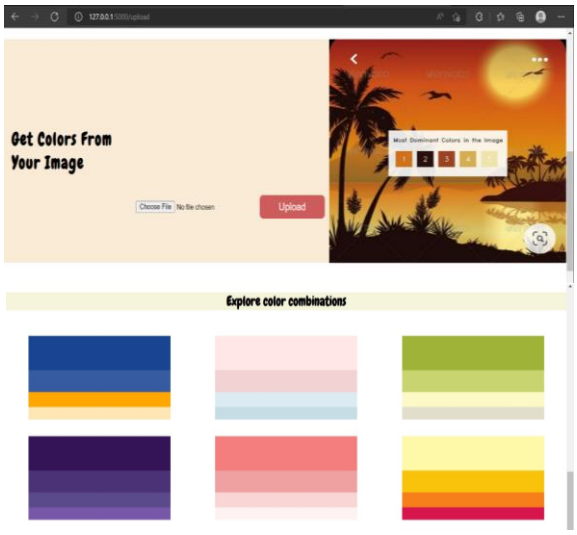

Fig. 5. Color extraction from images

Learn is the second module. It's a way for artists to become familiar with paintings and other types of artwork, such as doodles, mandalas, and zentangles. On this page, we've also

provided instructions on how to choose the right kind of paper to use and what size brush to use when and where.

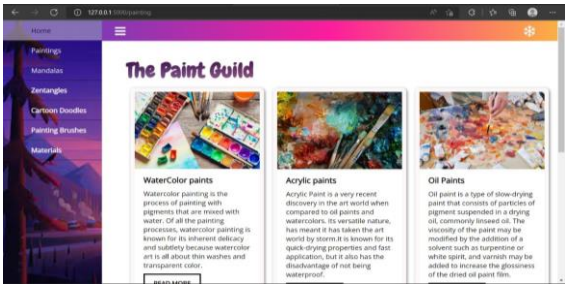

Fig. 6. Learn page

The final module is called store. Here, you can personalise your stationery. This module includes several affordable art supplies, including paints, brushes, pens, and paper. You will be taken to the shopping website where you can add the items to your cart and make a purchase when you click on the product card.

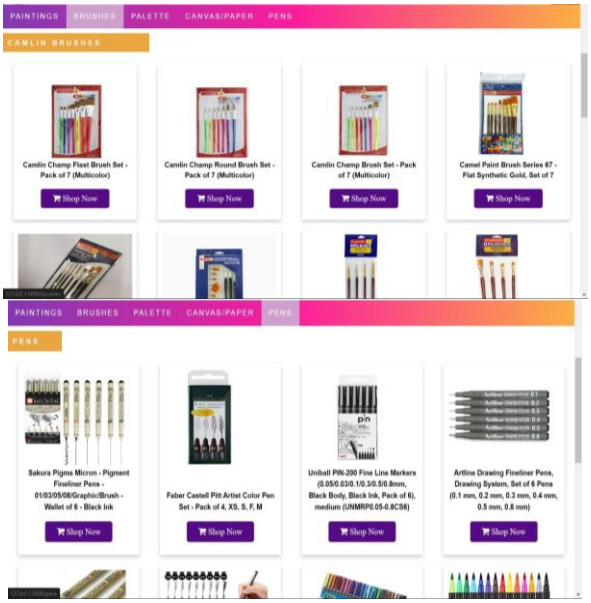

Fig. 7. Store page

6. Conclusion

We have created a successful application for all aspiring artists. The colour palettes or colour schemas that we derived using the clustering approach will now be easier to extract and comprehend with this application (K-means). This will save the user time by eliminating the need to search multiple sources when they already have everything they need to paint, such as 1. Using the colour palette module to choose which colours to use 2. Learning about many styles of art through the learn blog 3. Looking into the materials they'll need to paint, as well as links to the best products recommended by the store blog, all of which are accessible from a single platform.

The practical and analytical results show that the k means clustering techniques are also effective. When an image is uploaded by an user, the colour palette module has shown the accurate results by displaying the top five dominant colours in the image. It also offers painters a realistic answer for effectively supporting their painting's learning demands. It is important to study further on how to improve the system in light of future technology and advances.

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