ITE 351 - Artificial Intelligence - Assignment 3

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Proposal: Color Blind Aid: Make Color-Blinded Life Easier

In this project, we will create a software that can be used for color blind people so they can detect and classify the color. The color space that will be used in this project is RGB (Red, Green, Blue). This feature allows the user to upload an image and the application will find the color that the user desires and also tell the user the main colors in the image.

We have 2 features, which are:

1. Find A Color

   First, we need to define the upper and lower limits for pixel values based on the color that we want to find. Then we look into a data set and specifying which pixels fall into a specified upper and lower range. Then it will show an image with only one color that was intended to be found.

2. Specify This Color

   The method that will be used is K-Means Clustering. K-Means clustering is a type of unsupervised learning, which is used when you have unlabeled data (i.e., data without defined categories or groups). The goal of this algorithm is to find groups in the data, with the number of groups represented by the variable K. First, we convert the image to points that our clustering algorithm can use. Next, the color distance is calculated using the Euclidean distance formula, which is:

$$d(p,q) = \sqrt{\sum_{i=1}^{n}(q_i - p_i)^2}$$

   After that, we find the center for a set of points by adding the values for each dimension and divide by the number of points. Then, the clusters are sorted and the value will be converted into hexadecimal form.

Related Work: Color palette extraction with K-means clustering

(https://www.curiousily.com/posts/color-palette-extraction-with-k-means-clustering/)

This research project will explain how to extract dominant colors from images using the K-Means clustering algorithm and unsupervised learning. Besides extracting the color palette, we will show how to filter images from a collection of images based on the RGB values of colors.

The image is resized to a smaller format to reduce processing costs since it does not affect the amount of color information significantly. We convert the pixels which are the raw data of the image into points that the cluster algorithm can use.

The KMeans algorithm creates clusters based on a supplied count of clusters. In our case, it will form clusters of colors and these clusters will be our top colors. To compare colors we use the Euclidean distance of the RGB values of each color.

We use k-means clustering as a vector quantization method because the dominant color of an image is often so a single specific color, e.g. a specific RGB value. Instead, it's often shades of the same color that are dominant, for instance, the blues in a picture of the sky and the greens in a forest landscape pictures. With k-means, we can group similar colors together as part of the same cluster and extract and representative as an RGB or hexadecimal values. In our case, we want to apply this technique to more than one color for each image.

Most of the related papers have ended up using k-means clustering as a way to extract dominant colors from images because of the complexity of the human perception of colors as shade. As explained earlier, clusters are the best fit to represent them.

Planning

Plan	Date
Proposal Submission	November 1
Document Specification	November 15
Implementation (source code, testing)	November 29
Project Demo	December 8