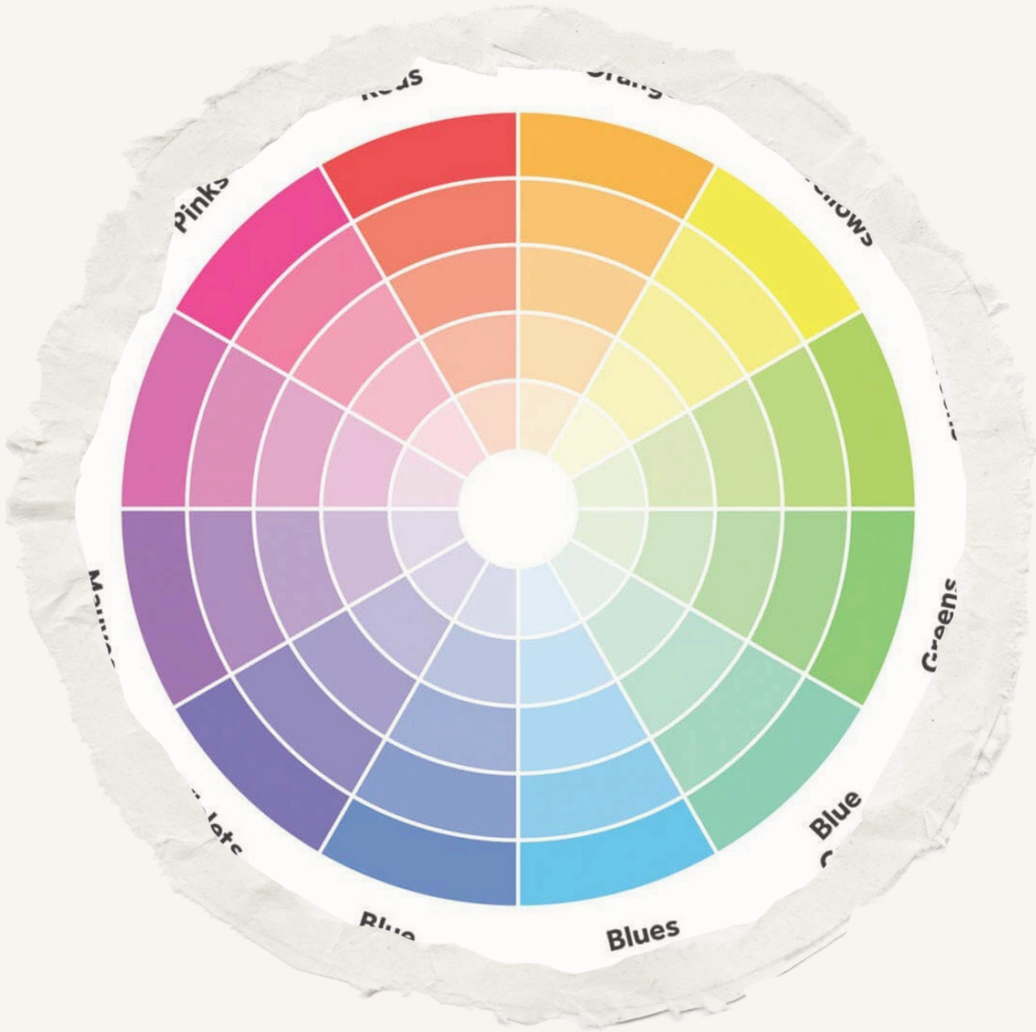
COLOR SPACE CONVERSION

INTRODUCTION TO THE PROJECT

The project aims to develop subroutines for converting RGB images to CMY, CMYK, and HSI color spaces, vital in image processing. This field encompasses techniques for analyzing, manipulating, and enhancing digital images, crucial across domains like medicine, satellites, and entertainment. Image processing involves acquiring, manipulating, and interpreting images for extracting information or enhancing features. Converting between color spaces is pivotal, aiding applications from printing to multimedia. RGB to CMY/CMYK conversion is crucial in printing for color mixing, while HSI transformation offers intuitive color manipulation. In the system model, RGB images are represented as pixel matrices, undergoing mathematical transformations to accurately map pixel values across color models.



PROBLEM STATEMENT

Designing subroutines to convert RGB images to CMY and CMYK, and transform to HSI is crucial for printing, digital imaging, and color analysis. Precise mathematical transformations are essential for faithful pixel mapping, maintaining image quality. Subroutines must be efficient and optimized for speed and memory usage for practical integration.

APPROACH

The methodology involves initial acquisition of an RGB image from the specified file path, followed by its display to provide visual insight. The RGB image is then normalized to the [0, 1] range to facilitate subsequent calculations. CMY conversion is performed by subtracting each RGB channel value from 1, forming the CMY image. This CMY image is displayed to visualize the color representation. Furthermore, the RGB image is converted to the HSI color space, where the hue, saturation, and intensity components are calculated based on specific formulas. The resulting HSI image is displayed to provide a different representation of the color distribution. This methodology provides a comprehensive understanding of the RGB image transformation into CMY and HSI color spaces, offering insights into different color representations for further analysis.

RGB TO HSI

1. Read a RGB image
2. Represent the RGB image in the range [0 1]
3. Find HSI components

$$\theta = \cos^{-1}\left\{\frac{\frac{1}{2}\left[(R-G)+(R-B)\right]}{\left[(R-G)^2+(R-B)(G-B)\right]^{1/2}}\right\}$$

4. H(Hue) = $\begin{cases}\theta & \text{If B<=G} \\ 360-\theta & \text{If B>G}\end{cases}$

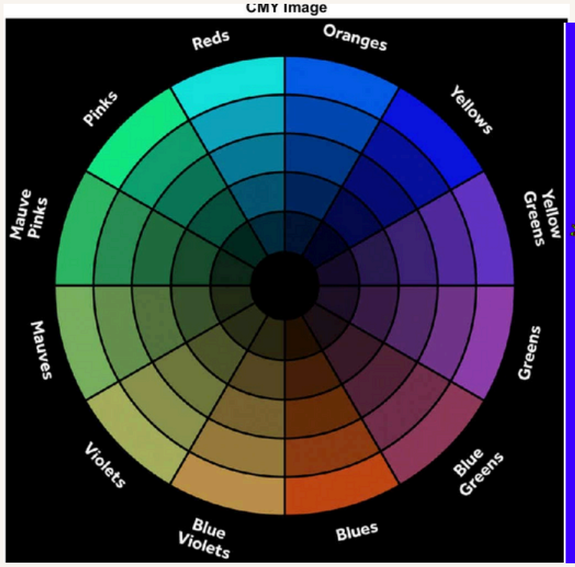
5. S(Saturation) = 1- $\frac{3}{(R+G+B)}\left[\min(R,G,B)\right]$

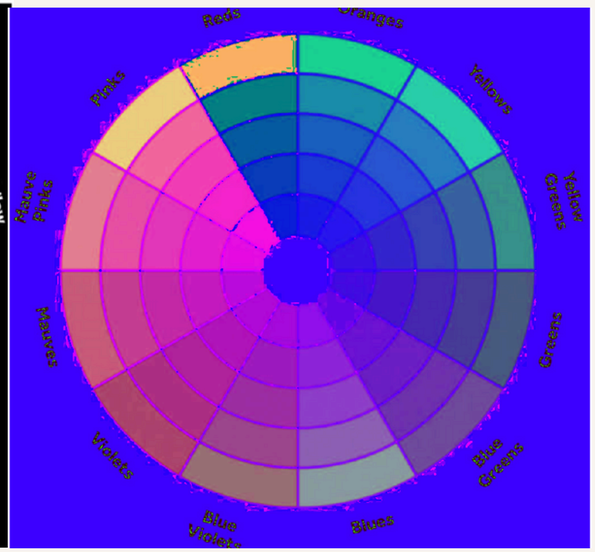
6. I(Intensity)= $\frac{1}{3}(R+G+B)$

RGB TO CMY

$$\begin{bmatrix} C \\ M \\ Y \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} - \begin{bmatrix} R \\ G \\ B \end{bmatrix}$$

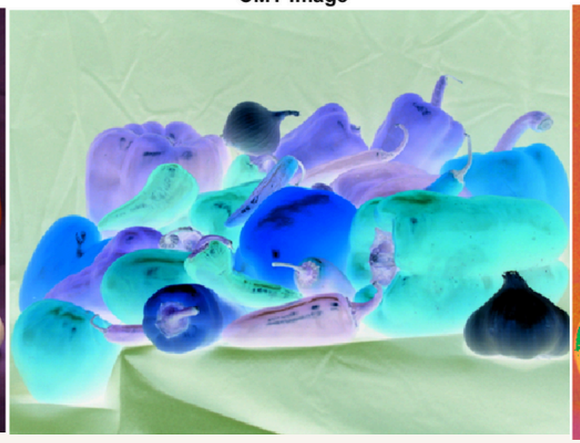
OUTPUT



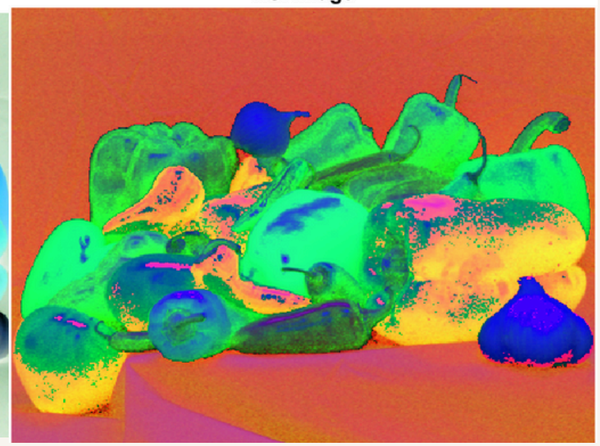


RGB Image

CMY Image



HSI Image



RESULTS

OUR PROJECT SUCCESSFULLY DELIVERS ROBUST SUBROUTINES FOR CONVERTING RGB IMAGES TO CMY, CMYK, AND HSI REPRESENTATIONS, CRUCIAL FOR IMAGE PROCESSING. IMPLEMENTED IN MATLAB, OUR METHODOLOGY ENSURES ACCURATE CONVERSION WHILE PRESERVING IMAGE QUALITY. THIS UNDERSCORES THE SIGNIFICANCE OF PRECISE COLOR SPACE CONVERSION FOR IMPROVED VISUAL REPRESENTATION AND ANALYSIS IN MODERN WORKFLOWS.

Thank you