Color Based Image Classification

Using MATLAB

April 8

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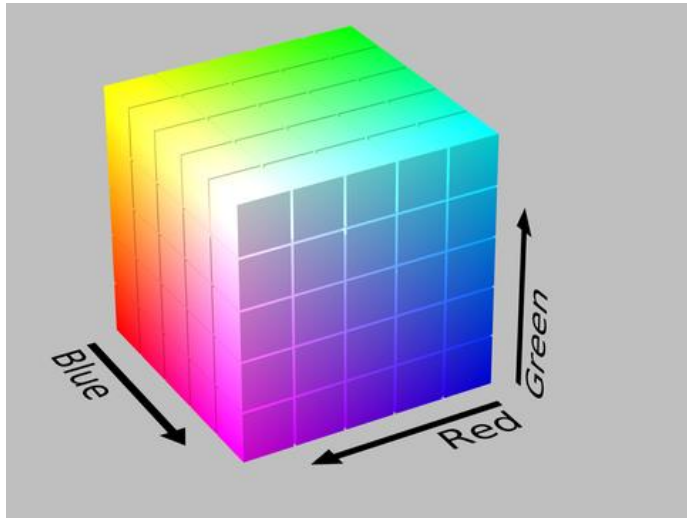|	
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❖ Overview

We applied the given algorithm once using the RGB color space and once using HSV color space.

❖ Comparison Between the RGB and HSV Color Spaces

The RGB color space is an additive color model. It means that different proportions of Red, Blue and Green light can be used to produce color.

The HSV space TRANSFORMS the RGB space into a more convenient representation.
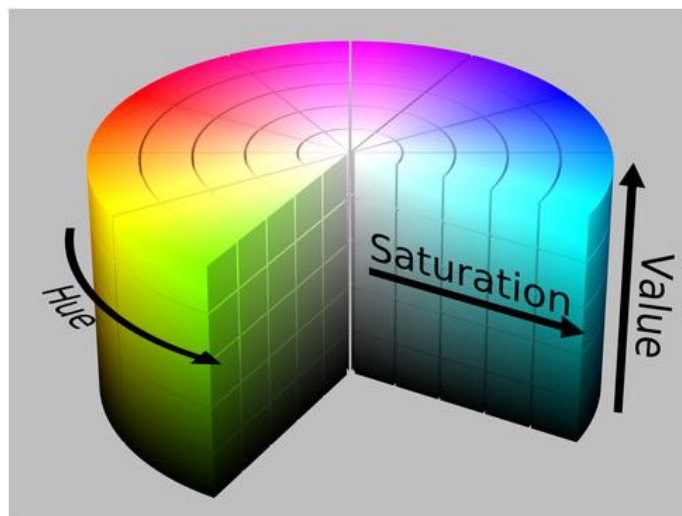
The "whiteness" or "lightness" is a function of R, G and B when we view it in the cube while it's a separate dimension in the HSV space known as value.

The saturation or "colorfulness" is given by the distance of your color from the 3D diagonal of the RGB cube. In the HSV model however, the saturation is directly given as another dimension.

❖ Confusion Matrix

- **RGB**

	Coast	City	Highway	Forest
Coast	19	11	3	51
City	7	5	0	54
Highway	18	8	16	22
Forest	4	2	2	72

- **HSV**

	Coast	City	Highway	Forest
Coast	44	17	2	21
City	14	42	0	10
Highway	6	14	38	6
Forest	3	6	3	68

❖ Most Ambiguous Results

- **RGB**

  The **city** class with 7.5 % of the test images being correctly classified as actual **cities**, while 81 % were incorrectly classified as **forests**. We believe that this is due to some cities having some percentage of trees.

- **HSV**

  The **coast** class with 52 % of the test images being correctly classified as actual **coasts**, while 25 % were incorrectly classified as **forests**. We believe that this is due to some of the coasts having some percentages of trees and, in some coasts, due to light exposure water colors can be very close to green.

❖ Most Discriminated Results

- **RGB**

  The **forest** class with 90 % of the test images being correctly classified as actual **forests**. We believe that the majority of the **forest** class's colors are concentrated in the **green**-**component** which is quite distinguishable from all the other classes.

- **HSV**

  The **forest** class with 85 % of the test images being correctly classified as actual forests. Same reason as RGB.

❖ <u>Suggestions to Improve the Results</u>

We can apply a 2-stage algorithm to classify images as follows:

- Test an image for its number of **vertical edges** if it is above or equal to a given threshold then it is belongs to the **city** class and stop.

- Else test the image for its number of **diagonal edges** if it is above or equal to a given threshold then belongs to the **highway** class and stop.

- Else compare the histograms of the remaining image classes using absolute differences through the **HSV** color space and classify based on the match having the **minimum** absolute difference.

❖ Conclusion

For color based image classification it is obvious that **HSV** color space produces more accurate results than **RGB** color space as it is a better representative model of color.