# RGB COLOUR DETECTION ON IMAGES USING HUE, SATURATION AND VALUE (HSV) COLOUR SPACE

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# RGB COLOUR DETECTION ON IMAGES USING HUE, SATURATION AND VALUE (HSV) COLOUR SPACE

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Computer Engineering Technology (Computer System) with Honours.



by

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**BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA**

Tajuk: RGB Colour Detection on Images using Hue, Saturation and Value (HSV) Colour Space

Sesi Pengajian: 2020

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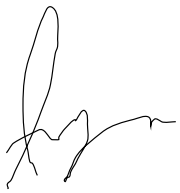
I hereby, declared this report entitled RGB Colour Detection on Images using Hue, Saturation and Value (HSV) Colour Space is the results of my own research except as cited in references.



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Date: 13/02/2021

## APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Computer Engineering Technology (Computer System) with Honours. The member of the supervisory is as follow:

Signature: .....

Supervisor: TS DR ROSTAM AFFENDI BIN HAMZAH

## ABSTRAK

*Pengesanan warna mempunyai pelbagai aplikasi dalam industri yang berlainan seperti tekstil, automasi, automotif, makanan, percetakan, farmasi, dan lain-lain. Pengesanan warna adalah proses mengesan nama warna apa pun tetapi secara khusus dalam kajian ini, Merah, Hijau dan Biru (RGB) saluran warna akan dikesan pada gambar. Teknik yang digunakan untuk mengesan warna dalam gambar adalah mengubah gambar asli menjadi gambar RGB. Dengan menilai nilai RGB untuk setiap piksel yang terdapat dalam gambar, warna piksel ini dikenal pasti. Kemudian, dengan menggunakan histogram rona, satah rona dan saturasi (HS) dan satah rona dan nilai (HV), teknik Hue, Ketepuan dan Nilai (HSV) diterapkan setelah menukar gambar RGB. Berdasarkan maklumat yang diperoleh dari dua pesawat, pangkalan data dapat dibina untuk mengurangkan masa berjalan dan meningkatkan kadar ketepatan pengiktirafan objek pengenal. Algoritma ini dirancang menggunakan kotak alat MATLAB untuk pemprosesan gambar. Prestasi pengesanan warna RGB juga dianalisis berdasarkan teknik HSV kerana sangat penting sehingga dapat diterapkan untuk jaminan kualiti, untuk menjaga produktivitas yang baik dan penjimatan kos.*

## ABSTRACT

Colour detection has a wide range of applications in different industries such as textiles, automation, automotive, food, printing, pharmaceutical, etc. Colour detection is the process of detecting the name of any color but specifically in this paper, Red, Green and Blue (RGB) colour channels will be detect on images. The techniques used to detect color in images are to transform original image to RGB image. By evaluating the RGB values for each pixel present in the image, this pixel color is identified. Then, using the hue histogram, the hue and saturation (HS) plane and the hue and value (HV) plane, Hue, Saturation and Value (HSV) technique is applied after converting the RGB image. Based on the information obtained from two planes, the databases can be constructed to decrease runtime and increase the recognition accuracy rate of the identifying object. The algorithm is designed using the MATLAB toolbox for the image processing. The performance of the RGB colour detection is also analysed based on the HSV technique as it is particularly important so it can be apply for quality assurance, to maintain good productivity and cost savings.

## DEDICATION

I devote this project to my maker, God the Almighty, my powerful foundation, my source of strength, wisdom and understanding. Throughout this program He has been the foundation of my power and I have only flown on His wings. My dissertation work is also dedicated to my family, and my lovely friends. A strong feeling of appreciation to my beloved parents, whose words of support echo through my ears and drive towards tenacity. Not to forget my supervisor, TS DR Rostam Affendi bin Hamzah and My several buddies who have been encouraging me all the way through. I would always acknowledge everything they have done.

## ACKNOWLEDGEMENTS

In the Name of Allah, the Most Gracious, the Most Merciful

All glory to Allah and His support that this thesis can be done. I thank God for all the opportunities, trials and strength that have been showered upon me to successfully complete the research paper. During this phase I witnessed too much not only from the academic perspective but also from the personality side.

First and foremost, I wish to express my deepest gratitude to my supervisor, TS DR Rostam Affendi bin Hamzah has received great motivation and a warm spirit to achieve this research for his assistance, most notably understanding and patience. Getting him as my supervisor has been a huge joy and privilege.

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# LIST OF SYMBOLS AND ABBREVIATIONS

| | | |
|---|---|---|
| **HSV** | - | Hue, Saturation and Value |
| **RGB** | - | Red, Green and Blue |
| **TV** | - | Television |
| **3-D** | - | Three Dimensional |
| **R** | - | Red |
| **G** | - | Green |
| **B** | - | Blue |
| **IRP** | - | Illumination Reflection Problem |
| **MMCrCb** | - | Mean of Medians of Cr Cb |
| **YCbCr** | - | Yellow (Y), Blue (Cb), Red (Cr) |
| **max** | - | Maximum |
| **min** | - | Minimum |
| **CHT** | - | Circular Hough Transform |
| **HSV** | - | Hue, Saturation, Value |
| **N.N** | - | Neural Network |
| **ARGB** | - | Addressable Red, Green and Blue |
| **YCgCr** | - | Yellow (Y), Green (Cg), Red (Cr) |

# CHAPTER 1

# INTRODUCTION

## 1.1 Background

The RGB colour combination is one of the most well-known colour schemes in the world, and perhaps the most common since the human eye only has red, green and blue colour-sensitive receptors, it is hypothetically possible to disintegrate each visible colour into variations of these three "primary colours." As an additive colour system, it blends red, green, and blue light to produce the colours that we see on our TV screens, computer monitors and smartphones. RGB is the primary colour model of an image (Red, Green, and Blue). As a 3-D coordinate plane, the possibilities for combining the three primary colours together can be illustrated with the R (red), G (green) and B (blue) values on each axis.

This plane of coordinates generates a cube called the colour space of the RGB. If all three colour channels have a value of zero, this means that there is no light emitted and black is the resulting colour. The resulting colour is white if all three colour channels are fixed to their maximum values (255 at a one-byte colour depth). It is known as "Additive colour mixing". If you construct a diagonal from the black (0, 0, 0) origin point of the colour cube to the white (255, 255, 255) point, you would get a line where the values of R, G and B are equal for each point on the line. The colour grey is the product of having the same value for all three colour channels. The colour of the shade of grey if you go from black to white is the only thing that varies when you pass down this diagonal. The RGB cube model can be referred in Figure 1.1.

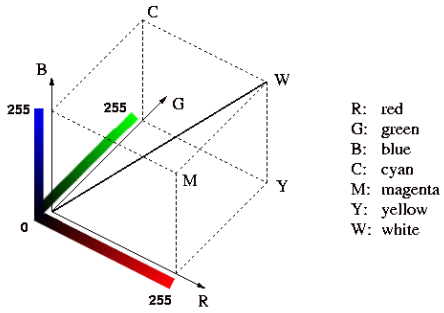


**Figure 1.1: RGB cube model**

Colour is often a characteristic that has been used to a considerable degree in the production of digital images, since it is an essential tool that also makes it easy to distinguish and recognize items that can be discriminated against depending on the vast number of appreciable colour tones. In an image, a colour detection algorithm recognizes pixels that match a given colour or set of colours. To distinguish them from the rest of the picture, the colour of the detected pixels may then be altered.

In the field of computer vision, it is normal to see problems in which it is important to use colour information to detect reference points that enable the monitoring and classification of the action of objects that have certain characteristics and that are detected in a controlled environment by sequences of images. On the other hand, there has been a need in other fields such as agriculture and biology to use colour-based image processing methods in order to implement them to situations such as the identification of weeds in crops, the identification and analysis of different types of fruits which, during the different stages of maturation or due to the presence of defects or associative, present significant changes in their colour.

## 1.2 Statement of the Purpose

The primary motive of this research study is to identify the colour red, green and blue on experimental images because to identify colour, one has to transform RGB colour space into the other colour spaces. Hence in this paper, Hue, Saturation and Value (HSV) colour spaces is adopted.

## 1.3 Problem Statement

Targeted colour on an item that is blurred due to the existence of another component in the colour recognition phase is one of the key problems encountered in the area of image processing. This is because the entity is not precisely visible in the picture, and is assumed and ignored by the system. Besides that, items that overlap each other have challenged the method of detecting and counting hidden objects and reduced colour detection accuracy. Lighting intensity can also affect the object's original colour to be deceptive when light is being processed. The intensity of light on each surface makes the object in the background almost the same colour as the object in question. A suitable procedure and technique for segmentation of the image must be considered in order to prevent all these problems from happening.