ANALYSIS OF DOMINANT COLOR SEPARATION IN DIGITAL IMAGES USING RGB SEGMENTATION METHOD BASED ON OCTAVE

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Abstract: A digital color image consists of three main components, namely red, green, and blue, known as the RGB color model. This study aims to implement a color segmentation method on digital images to classify color dominance using Octave application. The segmentation process is carried out by comparing the intensity of each color channel and producing three output images: red-dominant, green-dominant, and blue-dominant regions. The image was used for testing the effectiveness of color separation through logical masking. The results show that this method accurately isolates objects based on dominant colors and can be applied to various image processing tasks such as object tracking, color classification, and visual analysis. This research provides a foundation for developing simple yet effective computer vision systems

Keywords*: Color segmentation, RGB, OCTAV, digital image processing*

INTRODUCTION

Image processing is a form of processing an image or image with a process that is processed into each pixel or point of the image (Gazali et al., n.d.) The development of digital image processing technology has made great contributions in various fields, including surveillance systems, manufacturing industry, precision agriculture, and military and security. One of the basic techniques in image processing is color segmentation, which is the process of separating image parts based on the dominant color characteristics. Color segmentation is important to support the process of object identification, pattern analysis, and visual-based decision-making. The technique to divide or separate images into several regions based on the similarity of their attributes is called segmentation(Orisa & Hidayat, 2019).

The study is conducted through an experimental approach, where a few methods for converting grayscale images are implemented and analyzed using the Phyton programming language.(Widya Saputri Nst et al., n.d.)

RGB color model is a color model consisting of 3 colors, namely red (red), green (green), blue (blue) which are added in various ways to produce a variety of colors this model is the most commonly used color model in digital systems (Muwardi & Fadlil, 2017). In this model, each pixel in the image consists of three intensity values that indicate how strong each component of red, green, and blue colors is. Using this model, segmentation can be done with a simple approach using the logic of comparison between color channels

In this study, RGB color segmentation was applied using Octave software. There are many ways to track an object, the most popular way of tracking using RGB colors as a detection benchmark (Prabowo & Abdullah, 2018). The approach used is to compare the intensity values of each channel to determine the dominant color of a pixel. It is hoped that in this study we can identify and isolate the parts of the image that are predominantly red, green, or blue, and display the segmentation results visually. This research also aims to provide a simple technical overview of how color segmentation is carried out logically and efficiently

This research can be the initial basis for the development of advanced image processing systems such as color object tracking, color mapping, or simple machine vision applications in the fields of defense, security, and civil industry. RGB color segmentation can also be used for image quality analysis, automatic object recognition, and real-time video processing.

RESEARCH METHODS

This study uses an development method,(Wibisono et al., 2024) where the "irfan.jpg" image is processed using an Octave-based script. The segmentation process is carried out in stages, starting from reading the image, making logic masks, to visualizing the results of color segmentation.

1. Image Reading Color images are read with the imread function, and are broken down into three color channels:

```
pkg load image;
img = imread("irfan.jpg");
R = img(:,:,1);
G = img(:,:,2);
B = img(:,:,3);
```

Picture. 1

(Source of Researcher)

2. For each pixel, a dominance value is checked using logical operations:

```
mask_red = R> G & R > B;
mask_green = G > R & G > B;
mask_blue = B > R & B > G;
```

Picture. 2

(Source of Researcher)

3. Color Segmentation The part of the image that meets the dominance condition is multiplied element-wise by the RGB channel:

```
seg_red = cat(3,R.*uint8(mask_red),G.*
seg_green = cat(3,R.*uint8(mask_green)
seg_blue=cat(3,R.*uint8(mask_blue),G.*
```

```
uint8(mask_red),B.* uint8(mask_red));
,G.*uint8(mask_green),B.*uint8(mask_green));
uint8(mask_blue),B.*uint8(mask_blue));
```

Picture. 3
(Source of Researcher)

4. The segmented image visualization is displayed in a single figure window:

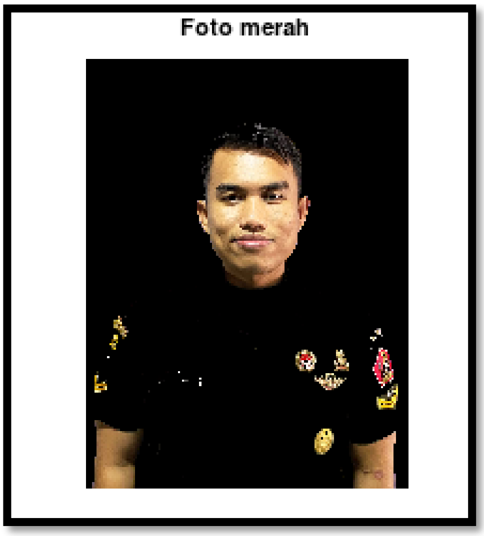
```
figure;
subplot(2,2,1); imshow(img); title('Foto Asli');
subplot(2,2,2); imshow(seg_red); title('Foto merah');
subplot(2,2,3); imshow(seg_green); title('Foto Warna hijau');
subplot(2,2,4); imshow(seg_blue); title('Foto Biru');
```

Picture. 4
(Source of Researcher)

RESEARCH RESULTS

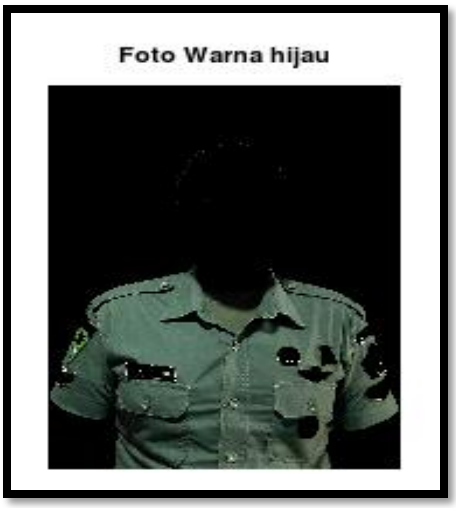
From the process of segmenting RGB colors against the "irfan.jpg" image, three segmentation images were obtained: red, green, and blue. The visual results show that parts of the image with a certain color dominance can be clearly separated.

1. Red Segmentation Parts with red intensity that are higher than green and blue are successfully displayed, such as clothing elements or backgrounds with warm colors



Picture. 5
(Source of Researcher)

2. Green Segmentation Green colors, such as plants or field attributes, are successfully isolated.



Picture. 6

(Source of the Researcher)

3. Blue segmentation Blue parts such as the sky, clothes, or blue plastic objects appear clearly without being mixed with other colors.

Picture. 7
(Source of Researcher)

Segmentation shows success in separating dominant colors without the need for complex methods such as edge detection or spatial transformation. This method is fast and does not require intensive calculations, suitable for real-time applications

DISCUSSION

This study successfully shows that the RGB color segmentation method based on color channel comparison logic is a simple but effective approach in separating objects based on color dominance. The visualization of the final image, which displays a distinct color contrast and the precision of the dominant item, demonstrates the success of segmentation. The main advantage of this method is its speed and ease of implementation, making it suitable for applications that don't require complex features. However, it does have some drawbacks, particularly when used in poor lighting conditions, shadows, or objects with mixed colors. Therefore, future development can be carried out by:

1. Integrate other color space-based segmentation algorithms such as HSV or Lab.
2. Added adaptive threshold logic to reduce sensitivity to lighting.
3. Combines segmentation methods with machine learning algorithms for automatic color classification.
4. Testing this method on more complex and diverse image datasets.

With these improvements, this segmentation system has great potential to be applied in the fields of automated visual monitoring, military robotics, security systems, and color recognition-based navigation aids.

The results show that the RGB channel logic-based segmentation method is quite effective for recognizing and displaying dominant colors. Although simple, this method is able to provide clear separation of the image with good lighting. Some of the things discussed further:

1. The accuracy of segmentation is greatly influenced by the lighting and contrast quality of the image (Kartowisatro, 2014). In low-contrast images, some dominant colors are not optimally detected.
2. This segmentation is suitable for use as part of a color-based object tracking system, especially for surveillance systems, robotics, or visual aids.
3. Compared to the transformation method to the HSV or LAB color space, this method is much faster but not as complex as human perception-based segmentation.
4. Further development can use adaptive thresholds or merging with machine learning for automatic color classification (Reza et al., n.d.).

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CONCLUSION

In Conclusion this study successfully applied RGB color segmentation using the color channel intensity comparison method. With a simple approach using mask logic, the parts of the image with the predominance of red, green, and blue colors were successfully identified and visualized. This method provides fast and accurate results on good quality images, and can be used as an initial foundation in the development of image processing systems for various applications.

Going forward, the development of segmentation can be directed at merging with object detection systems, video image processing, or integration with artificial intelligence algorithms for automatic classification of objects.

REFERENCES

Gazali, W., Soeparno, H., & Ohliati, ; Jenny. (n.d.). *Penerapan Metode Konvolusi …... (Wikaria Gazali; dkk) PENERAPAN METODE KONVOLUSI DALAM PENGOLAHAN CITRA DIGITAL*.

Kartowisatro, I. H. (2014). PENGARUH PENCAHAYAAN TERHADAP KINERJA SEGMENTASI. In *Juni* (Vol. 5, Issue 1).

Muwardi, F., & Fadlil, A. (2017). SISTEM PENGENALAN BUNGA BERBASIS PENGOLAHAN CITRA DAN PENGKLASIFIKASI JARAK. In *Jurnal Ilmu Teknik Elektro Komputer dan Informatika (JITEKI)* (Vol. 3, Issue 2).

Orisa, M., & Hidayat, T. (2019). ANALISIS TEKNIK SEGMENTASI PADA PENGOLAHAN CITRA. In *Jurnal MNEMONIC* (Vol. 2, Issue 2).

Prabowo, D. A., & Abdullah, D. (2018). Deteksi dan Perhitungan Objek Berdasarkan Warna Menggunakan Color Object Tracking. *Pseudocode*, *5*(2), 85–91. https://doi.org/10.33369/pseudocode.5.2.85-91

Wibisono et al., n. d. (2024). 2700-Article Text-1675-1-10-20240903. *Rancang Bangun Sistem Pengendali Lampu Jalan Otomatis Berbasis Sensor Cahaya Dan Mikrokontroler Arduino*.

Widya Saputri Nst, I., Sofinah Harahap, L., Baihaqi, A., Sains dan Teknologi, F., & Studi Ilmu Komputer, P. (n.d.). *Intan Widya Saputri Nst, dkk., Konversi Citra RGB … 845 Konversi Citra Rgb Ke Grayscale Menggunakan Python*.