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# AUTOMATIC COLOR IMAGE SEGMENTATION BY FUSION REGION GROWING ALGORITHM

D. Jeyakumari*

Dr. D. Somasundareswari**

**Abstract:** *Color image segmentation is a prehistoric operation in many image processing and computer vision application such as medical images, robotics and data compression. In this paper we propose a new hybrid color image segmentation algorithm to extract various features of the image which can be merged in order to build objects of interest on which analysis and interpretation can be performed. This paper introduces a two-level approach for the color image segmentation based on the edge and region correlation. First original color image is transformed in either CIE L*a*b or YCbCr color space. Second the edges are detected by color gradient detection technique. Edge information is used to choose a seed inside the region to start growth and edge information is included in the definition of the resolution principle which controls the growth of the region and seeds are selected, after calculating the gradient value of pixel in the color space and relative Euclidean distance and then followed by region growing algorithm using canny edge detection to enhance the border of the region. Our proposed hybrid method is to achieve better segmentation results.*

***Keywords:*** *color space models, canny edge detection, region growing.*

*Associate Professor, R.V.S.College of Engineering and Technology, ECE Department, Coimbatore.

**Dean, Electrical sciences, Adithya Institute of Technology, Coimbatore.

## I. INTRODUCTION

The principal goal of the segmentation process to partition an image in to region [also called classes or subset] that is homogeneous with respect to one (or) more characteristics (or) features. Color image segmentation is basically more complicated and time consuming algorithms controlled by a large set of parameters. Segmentation is an important tool in color image, medical image processing and it is used for many applications. In medical imaging segmentation, it is essential for feature extraction, image measurements and image display. It subdivides an image in to its constituent regions or objects or number of independent components.

A wide variety of segmentation techniques has been proposed. However, there is no one standard segmentation technique that can produce a satisfactory result for all the imaging applications. Segmentation techniques can be divided in to various classes in many ways depending on the classification scheme such as

1. Manual, semi-automatic and automatic
2. Pixel-based and Region based methods
3. Low-level segmentation and model based segmentation
4. Classical, statistical, fuzzy and neural network. [14]

The problem of segmentation still is an important research field, and many segmentation methods has been proposed in the literature surveys [3, 4, and 15]. Seed are selected automatically depending on calculating the intensity difference of pixel in the color space and relative Euclidean distances [1, 2].But these algorithms have some drawbacks, using the fixed threshold value which can produce reasonably good results in images. The mean value may not represent the property of this region well.

This paper is ordered as follows. In section II, an overview of color space models. Section III explains the algorithm of canny edge detection. In section IV an outline of region. Section V describes a proposed algorithm of correlation of edge detection and region growing. Section VI provides the experimental results and discussions. Conclusions are made in section VII.

## II. COLOR IMAGE MODELS

A color image is specified in RGB components. The RGB model is suitable for color display, but it is not good for color analysis because of its high correlation among R, G and B components. The distance in RGB color space does not represent the perceptual difference in a uniform scale in Image

processing and analysis, so we transform the color components in to other color spaces, Compared to grey-scale images, processing a color image is a difficult process. Color image provides complete information about an image and this provides a meaningful information.

*A.CIE L*a*b* color space:*

In the color image segmentation, a proper choice of color space is also very important. In the selection of color space, we choose the CIE L*a*b* color space to work on due to its three major properties 1.Separation of achromatic information from chromatic information 2.Uniform color space and 3.Similar to human visual perception. Here L* represents the luminance component, while a* and b* represent color components. [11]

*B.$YC_bC_r$ color space:*

The $YC_bC_r$ color space has been extensively used for skin color segmentation. We use the $YC_bC_r$ color space which is widely used in video compression standard sand the color difference of human perception can be directly expressed by Euclidean distance in the space. The intensity and chromatic components can be easily and independently controlled [1].

## III. CANNY EDGE DETECTION

Our proposed algorithm using a canny edge detection algorithm that provides the intensity of edge information appears in an image. This edge information is used to detect the individual regions in a segmented image and it is also used to initialize the seed point and start the region growth procedure [9].

Canny approach is based on three basic objectives.

1. Low error rate: The edges detected must be as close as possible to the true edges.
2. Edge Points should be well localized.
3. Single edge Point response, this means that detector should not identify multiple edge pixels where only a single edge point exists.

In Canny edge detection, first smoothing the image with a color 1-D Gaussian function, computing the gradient of the result, and then using the gradient magnitude and direction to estimate edge strength and direction at every point.

Let F (m, n) denote the input image and G(x, y) denote the Gaussian function:

$$G(m, n) = e^{\frac{m^2+n^2}{2\sigma^2}}$$

We form a smooth image, Fs (m, n) by convolving G and F

Fs (m, n) =G (m, n)∗F(m,n)

then compute the gradient magnitude

$$M(m, n) = \sqrt{G_m^2 + G_n^2}$$

Where $G_m = \frac{\partial f_s}{\partial m}$ and $G_n = \frac{\partial f_s}{\partial n}$

Canny edge detector can be used to control the amount of details that appear in the edge image, and, it can be used to suppress noise. An edge point is defined to be a point whose strength is locally maximum in the direction of the gradient. The canny edge detection algorithm performs edge linking by incorporating the weak pixels that are 8-connected to the pixels

## IV. REGION BASED SEGMENTATION

### *A. Region growing*

Region growing is a procedure that groups pixels or sub regions in larger regions based on predefined criteria for growth. The basic approach is to start with a set of seed points and from these grow regions by appending to each seed those neighboring pixels that have predefined properties similar to the seed such as specific range of intensity or color [10].In automatic selection depends on the grey statical properties and histogram.The three criteria for automatic seed selection are [1]

1.Seed pixel must have high similarity to its neighbors.

2. For an expected region at least one seed must be generated in order to produce this region.

3. seeds for different regions must be disconnected.

Figure 1. Shows the region growing process.

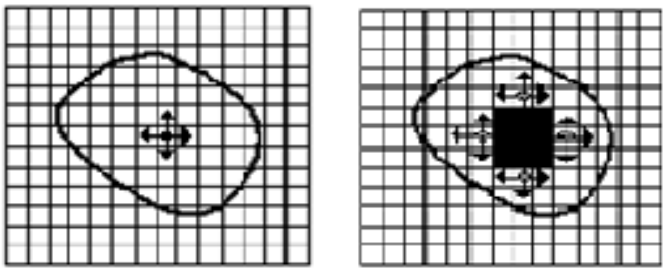

Figure 1. Region growing process.

## V. PROPOSED ALGORITHM

In our proposed algorithm, First the RGB color image is transformed to CIE L*a*b (or) $YC_bC_r$ color Space. Second we are applying gradient Edge detection to detect the edges and calculate the gradient value. Edge information is used to choose a seed inside the region to start growth and edge information is included in the definition of the resolution principle which controls the growth of the region. Next histogram for the gradient value and number of pixels. Based on the histogram analysis, we initialize the seed point to start the region growing process. Finally we are applying canny edge detection to enhance the border of the region and get the final segmentation output.

Here we are using two different color spaces depending upon the color image segmentation application. Generally we are using seeded region growing; which has two draw backs, first the selection of seed points and second is time-consuming problem. Our proposed algorithm is using gradient edge detection to detect the edge information to solve the above problems. Figure 2 illustrates the block diagram of our proposed method.

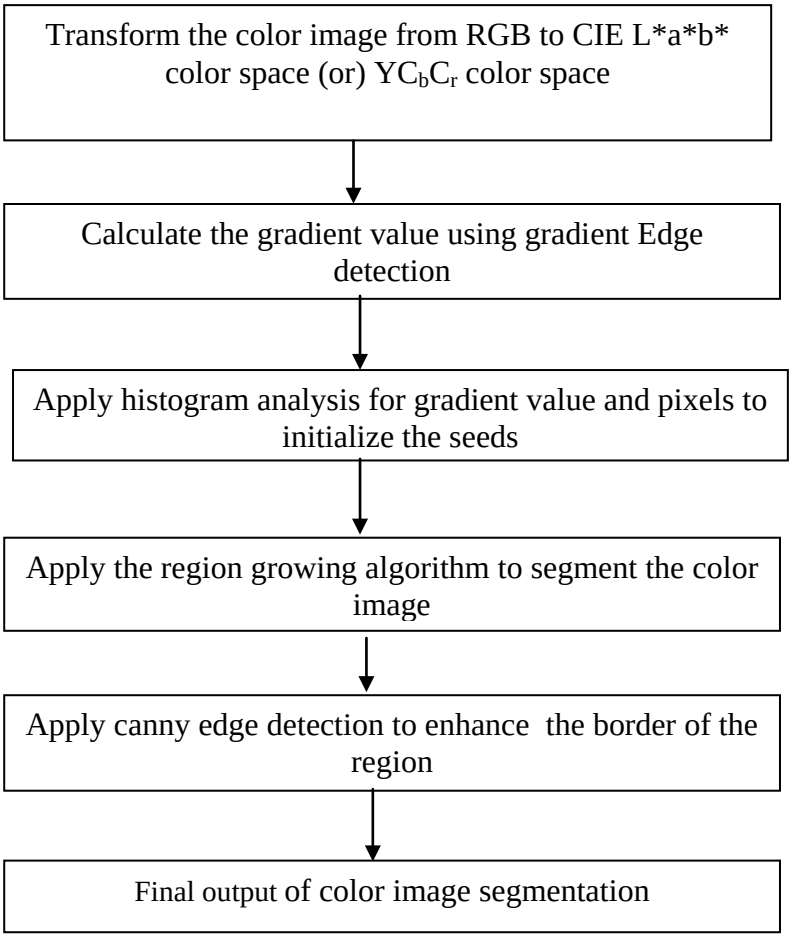


Figure 2.Block diagram of proposed algorithm

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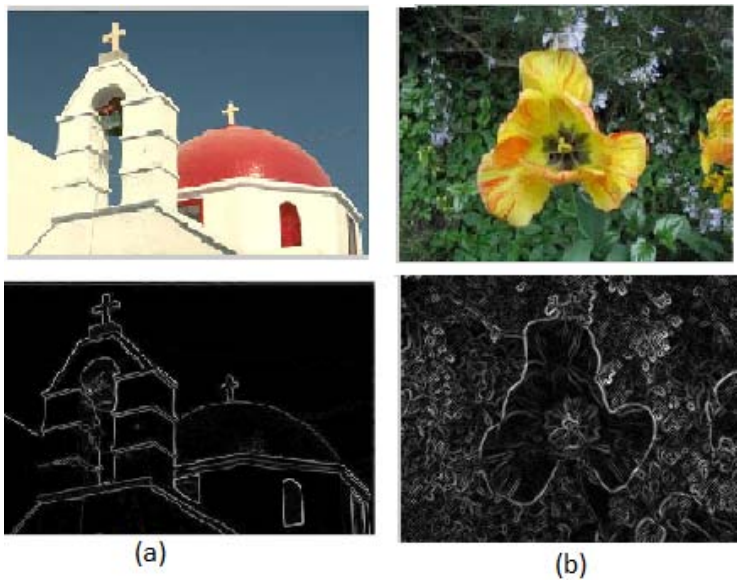
## VI. EXPERIMENTAL RESULTS

To test how effectively the algorithm works using mat lab 2010Ra, we select the two color space models to analyze the color images,. First, we need to transform the RGB color image to CIE L*a*b* or $YC_bC_r$. Color space. Fig 4.b, 5.b, shows the output of color space conversion. By applying gradient edge detection algorithm to detect the edge information of color images shown as output in Fig 2.a and 2.b. Based on the edge information we calculate the gradient value and select the seed point based on the histogram. Fig 4.c, 5.c, shows the output of region growing. we are applying canny edge detection to enhance the region growing output. Fig 4.d, 5.d, shows the output of the final segmented output.




**Fi**g. 3. (a) gradient edge detection of church image :(b) gradient edge detection flower image

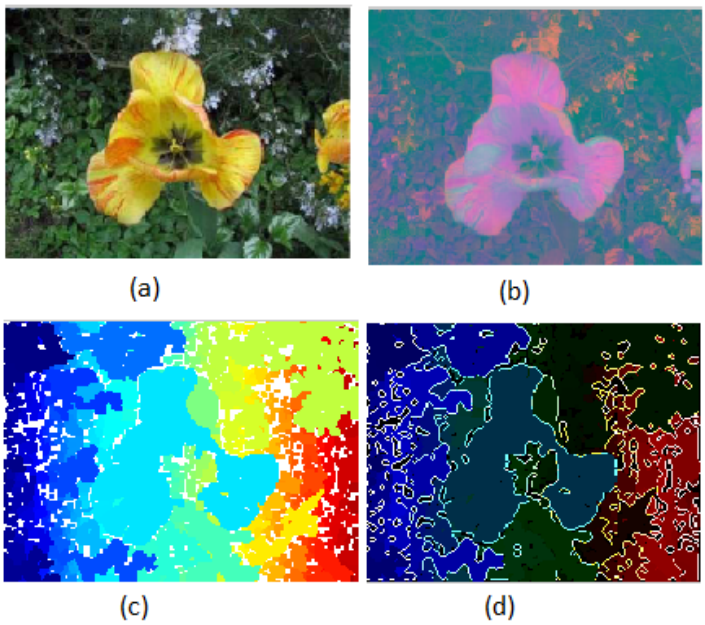



Fig. 4. (a) Original RGB flower image. (b)RGB to CIE L*a*b*.(c) region growing. (d) Final segmentation output after canny edge detection

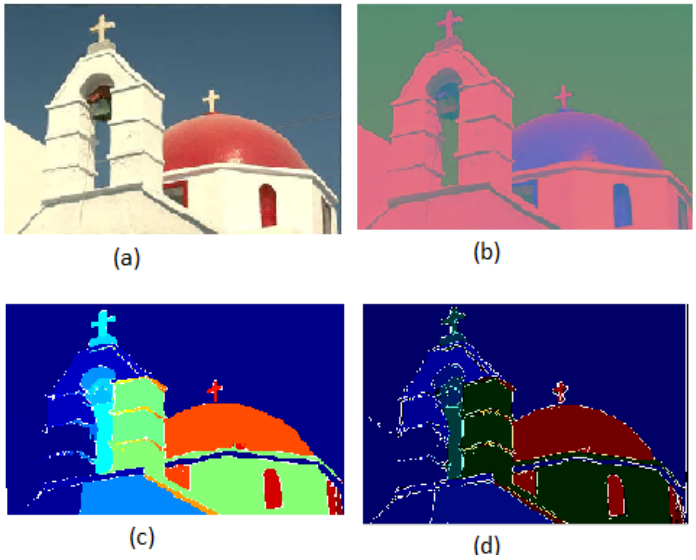



Fig. 5. (a) Original RGB church image. (b)RGB to $YC_bC_r$.(c) region growing. (d) Final segmentation output after region merging

## VII.CONCLUSION

In our proposed method, the segmentation regions and boundaries were defined superior and precisely positioned as in. Fig 4.d, 5.d, and we enhance border of the results using canny edge detection produced by the region growing algorithm.Color image segmentation methods can be seen as an addition of the gray image segmentation method in the color

images, but many of the original gray image segmentation methods cannot be openly applied to color images. This is required to develop the method of original gray image segmentation method according to the color image having the value of information in new image segmentation methods which is particularly used in color image segmentation. Using color based image Segmentation, it is possible to minimize the computational cost avoiding feature calculation for every pixel in the image. Although the color is not frequently used for image segmentation, it gives a high discriminative power of regions present in the image.

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