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IMAGE QUANTIZATION IN COLOR

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ABSTRACT

We're going to quantize an image here. The amplitude values are digitalized during quantization. We'll give a single coloured image and get an output of 8 images. We'll alter the spatial and intensity resolution independently, and the final image will have either two parameters. By measuring the effect of the image quality created by the interaction of the two variables, we can obtain the output. We'll use a coloured image to demonstrate the image quantization approach. As a result of the results acquired using different quantization methods, the number of final colours is highly dependent on the image's attributes.

Keywords: Amplitude, Resolution, Quantization, Interaction, Parameters.

1. INTRODUCTION

Quantization is a signal compression technique that reduces a signal's range of values to a single value. Color quantization is a technique for reducing the amount of colours in an image to make it smaller. This section will go over how to use the java function to do colour quantization. In most images, there are three colour channels: red, green, and blue. Color quantization on these three channels can be done independently, and then the image can be reformatted.

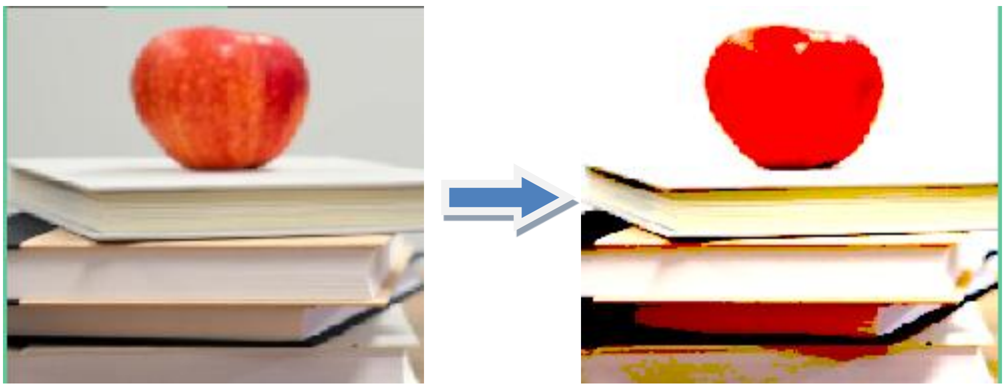
2. METHODOLOGY

2.1 Definition of Quantization:

Quantization is the process of mapping input values from a big set (typically a continuous set) to output values in a smaller (countable) set, sometimes with a finite number of elements, in mathematics and digital signal processing. Quantization techniques include things like rounding and truncation. Because the process of encoding a signal in digital form usually entails rounding, quantization is used in practically all digital signal processing. Quantization is also at the heart of almost every lossy compression method. Quantization error is defined as the difference between an input value and its quantization value. A quantizer is a device or computational function that performs quantization.

2.2 Color quantization

Color quantization is a technique for reducing the amount of colours in an image without sacrificing quality or global information. Pixels in photographs might have 24-bits connected with them, which could have up to 224 = 16,777,216 different colours. These colours are represented as three-dimensional vectors with an 8-bit dynamic range, allowing for a total of 28 = 256 possible possibilities. RGB triplets are a common name for these vectors. Color palette refers to a smaller group of the image's representative colours. The main principle for colour quantization of colour images is shown in Figure 1.



The original image with various colours, the colour palette made using a colour quantization algorithm, and ultimately the reconstructed image created using that palette, from left to right.

The amount of final colours in photographs is computed automatically in the suggested method, with the main goal of preserving as much of the image's qualitative description as feasible.

For image and scene analysis, colour has long been acknowledged as a significant visual cue. Color picture generation, colour quantization, human visual perception, image segmentation, color-based object detection, and image retrieval have all received a lot of attention in colour analysis. The method of colour image quantization reduces the amount of colours required to represent a digital colour image. Color quantization, being a fundamental operation in image processing, is significant in many of the subfields indicated above. Color image quantization is separated into four parts [1]: (1) sampling the original image for colour statistics; (2) selecting a colour map based on the colour statistics; (3) mapping original colours to the colour map's nearest neighbours; and (4) quantizing and rendering the original image.

When designing a new colour quantization method, several aspects such as colour distortion, algorithm complexity, and hue, lightness, and saturation (called HVS) characteristics must be taken into account.

Many color quantization methods are there. Notable examples include the

- median-cut algorithm, the uniform algorithm ,the octree algorithm ,the center-cut algorithm , PGF , the window-based algorithm , clustering-based algorithms such as kmeans ,the adaptive clustering algorithm , SOMbased clustering algorithms ,and an ant colony clustering algorithm .

Since these methods focus on analysis in different aspects of the quantization process, they have unique advantages and disadvantages depending on the color data sets encountered.

3. MODELING AND ANALYSIS

THEORY EXPLANATION:

Quantization using the color image for RGB filters:

- First of all we need to get image width and height set it to a variable.
- Our output is buffered to an array of images containing 8 image hence set the array variables.
- Initialize, declare and use buffered variable as output variable.
- Use the formula math.pow(2,i) and set it to variable pv
- Consider a pixel name it p[x][y],
- If p[x][y] is red and <127 then use p[x][y]-p[x][y]% pv and set it to variable iv
- Else
- Use p[x][y]+(p[x][y]+1)%pv;
- If iv>255 set iv to 255
- If iv<0 then set iv to 0
- Then set p[x][y] to iv
- Same is repeated for green and blue
- Output of green is saved in iv1 and blue is saved in iv2
- And then set the iv,iv1 and iv2 to the colored variable
- At last set the colored variable to and array of image variable using setRGB() and getRGB() function.

Color Image Quantization plays an important role for image analysis and visualization.

In this paper, RGB color image quantization using apple image based optimization is implemented.

The apple image based optimization is applied to RGB color model for image quantization.

The Euclidean Distance metric is used for color difference between pixels.

Color elimination and reproduction is done by evaluating the Euclidean Distance.

Threshold value is taken as the fitness function to calculate the popular and unpopular colors.

Color difference calculated using Euclidean Distance and correlate better with visual assessment than color differences calculated using other distance metrics.

The RGB Color Model:

RGB stands for red, green, and blue, as you may know. The RGB colour model is additive, meaning that red, green, and blue light are mixed in various proportions to create a wide range of colours.

RGB data is very simple to understand because RGB imaging is all about intensity. A photosensor that measures light intensity is transformed into an R, G, and B colour wheel.

Recognizing that an RGB image is just a composite of three distinct grayscale images that correspond to the intensity of red, green, and blue light is the key to comprehending RGB image processing.

Quantization:

The brightness of a photo at each pixel is typically distributed among integers from 0 to 255. However, since some images are desired to limit the number of colors, the brightness value has to be rounded off to fit the size of the image.

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During the procedure of quantization, there must be some loss of data. To avoid high error percentage and remain quality as good as possible, Maximize the quantizier

To start the operation, the image have to be reshaped into a X-3 matrix that contains R,G and B as we used in lab 5. Where X is the number of pixels in each row. %Seperate the image matrix into R G and B

R = rgb(:,:,1);

G = rgb(:,:,2);

B = rgb(:,:,3);

The image matrix in size-3 matrix

img(:,1) = R(:);

img(:,2) = G(:);

img(:,3) = B(:);

int pv=(int)(Math.pow(2,i));

if(p[x][y]<127) begin

iv=p[x][y]-p[x][y]%pv; end

else begin

iv=p[x][y]+(p[x][y]+1)%pv;end

P[x][y]=pixels in the image

Here is the 8-color quantization compared with the original image.

4. RESULT IMAGES

Purpose:

Quantization, in essence, lessens the number of bits needed to represent information. Lower-precision mathematical operations, such as an 8-bit integer multiply versus a 32-bit floating point multiply, consume less energy and increase compute efficiency, thus reducing power consumption.

5. CONCLUSION

Color Quantization is commonly used in image processing. We studied Uniform Quantizer and Max Quantizer. But this quantization performs better than just operating Max Quantizer or Uniform Quantizer on image. And it's not that hard. In this java applet, however, minQ is not necessary. It would be the reason why the function perform slowly if the pv became too large.

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