Development of Algorithm for classification Siamese rosewood and Rosewood using the Analysis of Color Histogram graph

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Abstract ---The purpose of this study was to develop the Algorithm for classifying Siamese rosewood and rosewood. The principle of the system used the cumulative color histogram emphasized green and blue colors. The objective was to classify the type of woods from the analysis of colors from the histogram graph. The results from the proficiency test collected from the 2 sample groups consisted of 30 images per group, 60 images in total. The precision means of group 1: Siamese rosewood was 90%, and group 2: rosewood was 80%. The overall mean of precision was 85%. It concluded that the analysis of the cumulative frequency of Histogram color was relatively precise. Thus, it is suitable to apply in wood classification using this technique in the future.

Keywords- Histogram, cumulative frequency, digital image, graph, color intensity

I. Introduction

Currently, construction materials and home decoration materials play a vital part in people's lives. Especially furniture in households made from expensive woods such as Siamese rosewood. Generally, people cannot classify the two types of wood: Siamese rosewood and rosewood. So, applying information technology is essential for wood classification. In addition, specialized systems, organization implementation for fast decision-making. Using human resources in management will be lesser because of some limitations. Thus, information technology may be used in this area. However, the cost of production is high at first; it will be worthwhile in the long run. Today, information technology is more developed that affects the lower cost of production because of the implementation of the analysis of the cumulative color intensity and color distribution from histogram graph using images stored in the computer for color analysis [1].

A digital image that we normally see whether it is taken by a regular camera or a digital camera, for a computer, processes the image as several color dots A histogram is made of every part of an image that represents the color in the image[2].

Typically, the classification of the type of woods relies on using color comparison and wood analysis; however, it lacks precision. Thus, it is vital to use Histogram color analysis because it is more reliable than color intensity. Moreover, it is widely used in object recognition [3]. There are attempts to improve the similarity measures of the histogram for Algorithm histogram matching to have brighter proficiency for the comparison[4]. including using other properties, for example, color replacement technique, color ratio technique[5]. and color contrast ratio technique[6].

To analyze the types of wood by looking requires the experience and expertise of each individual to classify types of wood. People, in general, cannot precisely do it because of a lack of experience. The researcher was aware of the importance of using technology in the area mentioned earlier. So, the researcher studied and developed the Algorithm to compare the similarities and differences of woods taken by the camera using a color histogram graph[7]. In addition, to use this study as a guideline for research and development and apply it more efficiently in the future.

II. Materials and methods

2.1 Exploring and analyzing the problem.

For typical consumers, the issue they have when they buy wooden furniture is some of them lack the expertise to tell the Siamese rosewood and rosewood apart. So, people who can classify the different types of woods are experts with intensive experience in this field. Due to the limited numbers of experts and their specialization to distinguish these two types of woods. So, it is essential to apply information technology to assist the software and device development to save time yet elevate the support for this work. The various uses of technology help increase job capability. They result in the shorter time used and life being more convenient.

1)The analysis of 3-color distribution of the Siamese rosewood

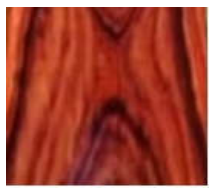

Figure 1. Siamese rosewood

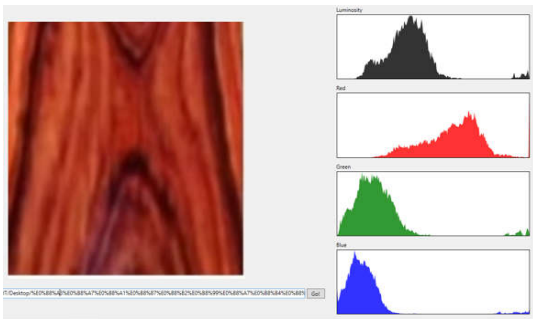

Figure 2. 3 color distribution graph of the Siamese rosewood

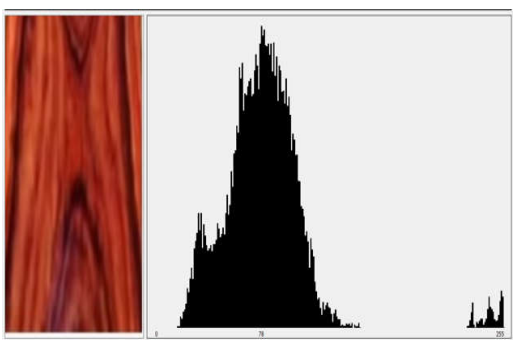

Figure 3. Mean of color distribution graph

From Figures 2 and 3, the 3-color distribution of the Siamese rosewood was used as an experimental model and used to analyze the level of color histogram intensity graph. The results found that the color intensity level of green and blue were not higher than 120 out of 255 with a cumulative frequency of 80%, as shown in Figure 2. The mean of the color distribution graph was crowded lower than 150 out of 255 of the brightness level. It was 80% of the overall cumulative frequency, as seen in Figure 3.

2)Analysis of 3-color distribution from histogram graph of the rosewood

Figure 4. Rosewood

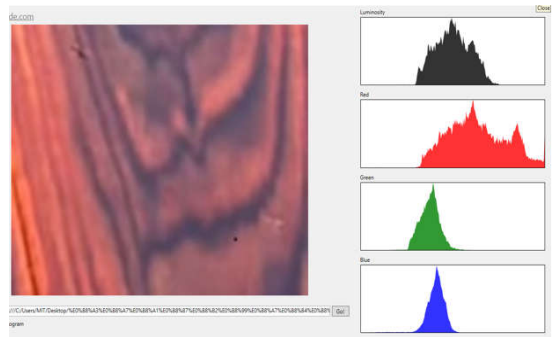

Figure 5. 3-color distribution graph of the rosewood

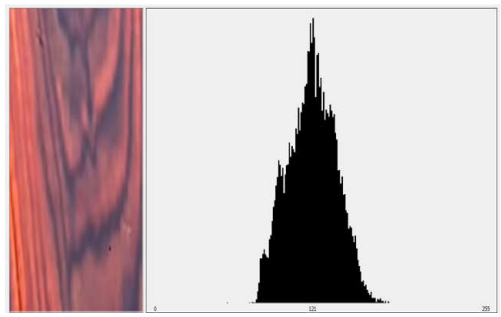

Figure 6. Mean of color distribution graph

From Figures 5 and 6, a 3-color distribution graph of the rosewood was a model in the experiment. The analysis of the color intensity distribution of the histogram indicated that the color intensity of green and blue was higher than 80 out of 255 with the cumulative frequency of 80%, shown in Figure 5. The mean of color distribution was at 150 out of 255 brightness levels presented in Figure 6.

3)Analysis of 3-color distribution graph of two kinds of wood

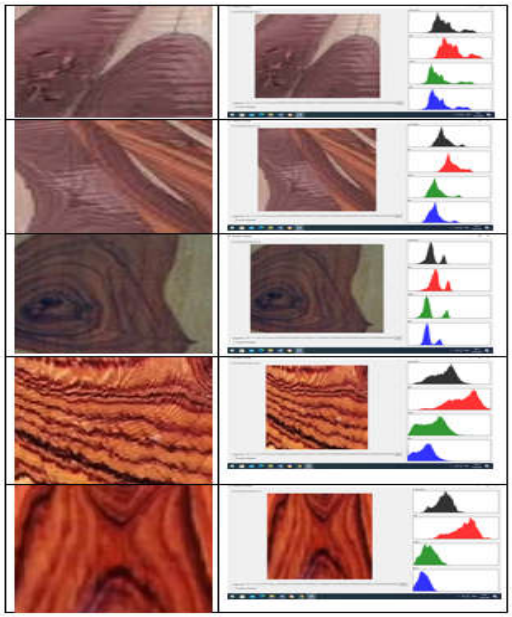

Figure 7. Group color distribution graph of the Siamese rosewood

From Figure 7. the color intensity of the Siamese rosewood included three colors. Only two colors which were green and blue used as models because of their reliable values. For high precision results, five models were used in the system testing and for writing the Algorithm.

4)3-color distribution graph of the rosewood

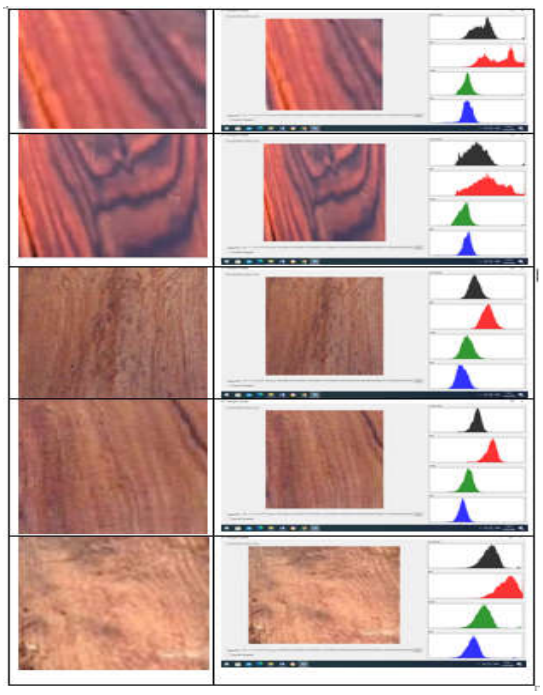

Figure 8. Group color distribution graph of the rosewood

From Figure 8. the RGB color intensity included three colors. Only two colors which were green and blue used as models because of their reliable values. For high precision results, five models were used in the system testing and for writing the Algorithm[8],[9],[10].

2.2 System design

1)Context diagram of a system is shown in Figure 9.

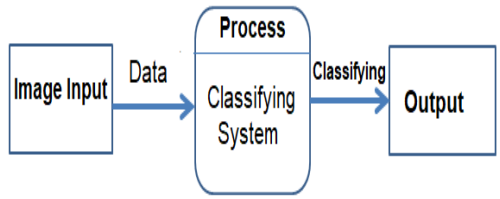

Figure 9. Overview of context diagram of a system

2)The system structure shown in Figure 10

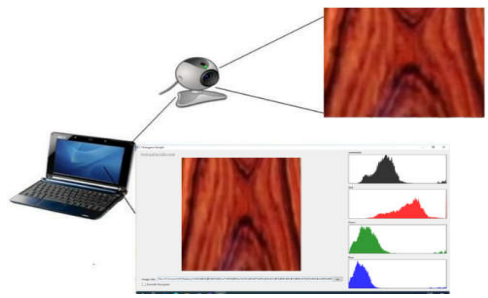

Figure 10. System structure

3)The system process shown in Figure 11

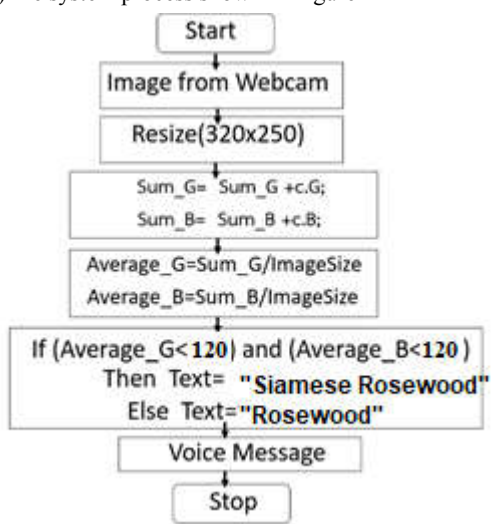

Figure 11. System process

4)Algorithm

```
for (inti = 0; i<bmap.Width; i++)
    {
    for (int j = 0; j <bmap.Height; j++)
```

```
{   color  c = bmap.GetPixel(i, j);
/*********Siamese rosewood
  If (c.R <= 120) && (c.B<=120)
{
  Sumpayoog_R=  Sumpayoog_R +c.R;
Sumpayoog_B=  Sumpayoog_B  +c.B;
}
/******** Rosewood
   If (c.R >= 80) && (c.B<=80)
{
Sumchigchun_R=  Sumchigchun_R +c.R;
 Sumchigchun_B=  Sumchigchun_B +c.B;
}
}
} /******End for Loop
   intensiveR=                    Sumpayoog_R/
   (bmap.Width*bmap.Height);
   intensiveB=                    Sumpayoog_B/
   (bmap.Width*bmap.Height);
 if ((intensiveR<= 120) && (intensiveB<= 120)
                {
  text1 = " Siamese rosewood ";
                }
 else
 if  ((intensiveR>=  80)  &&  (intensiveR<=  80)
                {
          text1 = " Rosewood ";
    }
 SpeechSynthesizer synthesizer = new
 SpeechSynthesizer();
synthesizer.Volume = 100;
synthesizer.Rate = 0;
synthesizer.Speak(text1);
```

2.3 System design and development

This research was to develop the classifying system to distinguish the Siamese rosewood and the rosewood. To identify and classify these two kinds of wood, used Visual C# as a tool for designing and connecting with the user interface. And a webcam was used as an image receiver for the image datasets for the processing.

1)Context diagram of a system

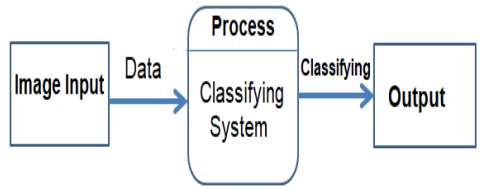

Figure 12. Overview of a system context diagram

2)System structure

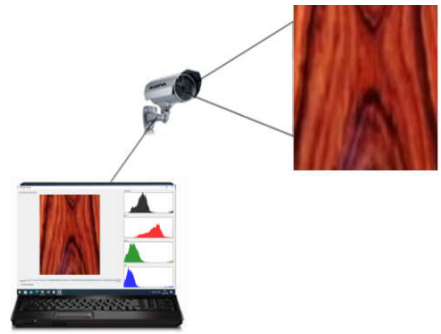

Figure 13. System structure

Visual C# program was used a tool in the design of model system, the system interface, shown in Figure 14

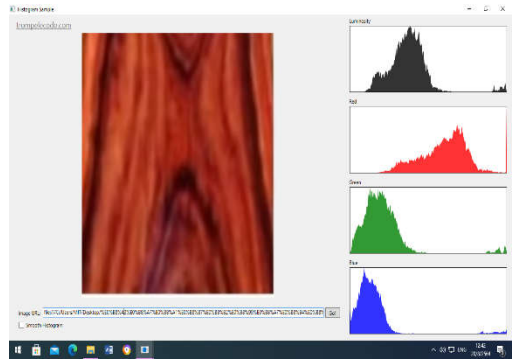

Figure 14. User interface of a system

3)System testing

The precision proficiency of the color comparison could be measured by the precision value method. It was the comparison of the images from the database and the datasets considering the color distribution. The process was to find how many images were in the same group as in the graph distribution and standard normal distribution graph from the database. And it compared the number of images that match with those in the database then calculated the number, as shown in the equation[11],[12].

$$\text{Precision} = \left| \frac{x_i - x_m}{x_m} \right|$$

$$x_m = \frac{1}{n} \sum_{i=1}^{n} x_i$$

X_m = Mean

X_i = Value of each measurement

III. Results

3.1 Results of the system development

The user interface is shown in Figure 15

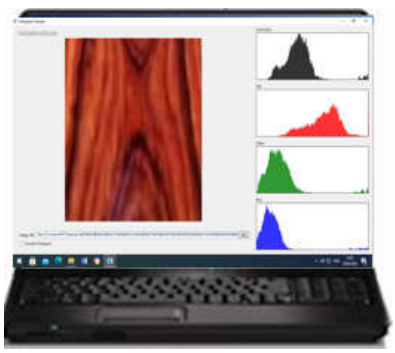

Figure 15. Model of the user interface

3.2 Results of the assessment of system proficiency

After the software testing using the Black Box method, the following process was to find the system proficiency to meet the acceptance test by the user. The evaluation process was to evaluate IT proficiency and software consisting of 4 parts;

1. Function Requirement Test
2. Function Test
3. Usability Test
4. Security Test

In this case, the emphasis was on the system or software proficiency; thus, the function test criteria were used for regular digital color images. The images used were in *.jpg file type consisting of 60 images with the resolution of 640 x 480 pixels, divided into two groups which each group contained 30 images.

3.3 Datasets for system testing

The images used were in *.jpg file type consisting of 60 images with the resolution of (640 x 480) pixels, divided into two groups which each group contained 30 images.

Group 1 was 30 samples of the Siamese rosewood; group 2 was 30 samples of the rosewood, as shown in Figure 16 and Figure 17

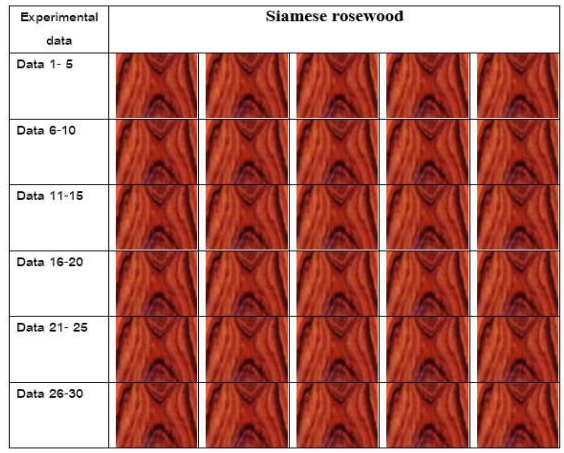

Figure 16. Datasets of the Siamese rosewood

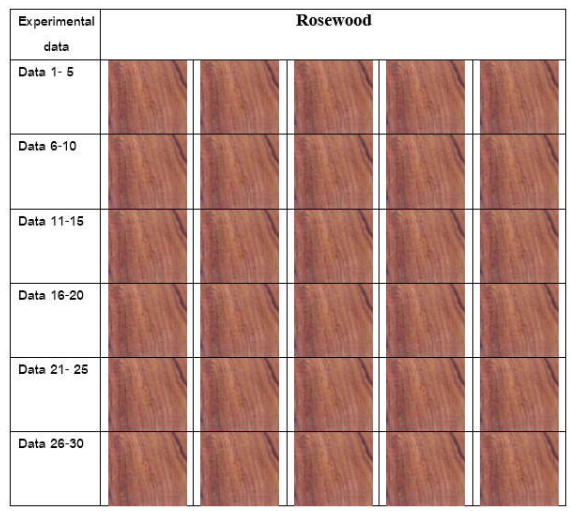

Figure 17. Datasets of the rosewood

From Figures 16 and Figures 17. the datasets of wood were the samples in the developing system, and test processing analysis included two experimental groups. Group 1 was 30 samples of the Siamese rosewood; group 2 was 30 samples of the rosewood used in this experiment.

Table 1. Comparison of the precision of 60 sample images

Comparison of intensity distribution in histogram	the amount of experimental data	The readable number is correct.	Relative Error	% Error	% Accuracy
1.picture of siamese rosewood	30	27	3	10%	90%
2. picture of rosewood	30	24	6	20%	80%
sum	60	51	9	15%	85%

From the precision test of color intensity, considering the cumulative frequency of color histogram of the sample images, the images were divided into two groups which each group contained 30 images. To find the proficiency of the color distribution graph, it revealed that the precision means of group 1 was 90%, and group 2 was

80%. The overall mean of precision was 85% which was considered acceptable.

IV. Discussion

The findings from the proficiency assessment from the models using 60 images with the resolution of 640 x 480 pixels showed that the mean precision of groups 1 and 2 was 85% which is considered preferably good. for the sake of honesty It is necessary to shoot at a distance of no more than 1meter and at the appropriate brightness level. which will make the system more accurate and if it is an old image to be processed If the old image is unclean, the cumulative frequency band can be distorted. The need for new images or reshoots made the developed system highly accurate. The result of the new development was the comparison of classification Siamese rosewood and Rosewood. is to use the cumulative frequency of the color intensity level to process to find the same level of the number of cumulative frequencies.

V. Conclusions

It concluded that the comparison of the cumulative color intensity was relatively precise. Moreover, it was suitable for applying in wood classification. Nevertheless, the system should be compared to other systems or related research to find the precision. So, the Algorithm can be applied in the future application

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