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Applies Image Processing for Identify Varieties of Rough Rice

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Abstract

Identify variety of rough rice is importance in the market. Thai Hom Mali 105 or Khao Dawk Mali 105 long grain is the popular in Thailand. The sample of this study was used seven variety of rough rice. In this study aims to apply the image processing to identify seven variety of rough rice in Thailand, the image processing is nondestructive and fast method for measuring. The color extracting of rice kernel by RGB, HSV and L*a*b* color, then calculate color, classify with correlation between color and variety of rice. The result shows that L* was showed color value 12.91 on Hom ma li 105, 10.54 (RD6), 11.11 (Red Brown Rice), 14.21 Hom Nil (Black Jasmine Rice), 28.95 (Khao' Hawm Daeng), 7.46 (Niaw San-Pah-Tawng) and 5.91 (RD31 Pathum Thani 80), that the color of varieties were difference in each groups when compare with seven groups. , that mean the image processing method can apply to identifies the varieties of rice kernel.

Keywords: rough rice kernel, image processing, Thai Hom Mali 105.

1. Introduction

Rice production in Thailand is difference varieties obtain to quality of rice. Grain color, including texture, moisture content, sizes and shapes are important to quality of rice grains [1]. Rough rice quality inspection by human eye is neither objective nor efficient, but inaccurate on sometimes due to inexperience [2] and determined by physicochemical properties [3]. Rice production it high influences on the final output, because the consumer demands are depends on the economic profitability of the grower and miller. However, physicochemical properties of rice are determined amylose content but time consuming [4]. Shei and Lin [5] using image processing techniques with automatic measurement to determine moisture content of rough rice , the image processing could be applies to measure automatic of drying process. Image processing is the fast and nondestructive method for apply to classify varieties of rough rice by extract color and seed angle features [6]. Archana Chaugule and Suresh N. Mali are evaluating the texture and shape features using the most commonly used neural network architectures for cereal grain classification. In this research aims to apply image processing to identify varieties of rough rice with extracting color RGB, hsv, L*a*b* and classify correlation between color and variety of rice.

2. Materials and Methods

2.1 Samples preparation

The species of rice were used Thai long grain rough rice seven varieties in table 1. The moisture content of rough rice was 13-14% measuring by oven method (ECOCELL-55 (220v) 33kw) with hot air at 105 ^{o}C for 72 h [7]. Rough rice samples randomly collected from groups were clean by fan sorted with a blower. Before capture image, the sample was put in the room temperature (23±2^{o}C) with 24 h ahead [7, 8]. and second portions the samples were used for capture image about 700 kernels (100 kernel x 7 groups) for rough rice, after they were pre-processed into single kernel rough rice with size of image 165x124 pixel (width="165" height="124") illustrate in Fig.1.

Table. 1 The varieties of rough rice samples

Varieties of Rough Rice	Number of Sample
Hom ma li 105	100 kernel
RD6	100 kernel
Red Brown Rice	100 kernel
Hom Nil (Black Jasmine Rice)	100 kernel
Khao' Hawm Daeng	100 kernel
Niaw San-Pah-Tawng	100 kernel
RD31 (Pathum Thani 80)	100 kernel
total	700 kernel

2.2 Box Chamber

The box chamber was applies from electrics controls box with size wind *x* long *x* tall (16.5x29.5x35 cm.) webcam and a block smooth fur-like drapery was used as a background and the illumination was move controllable. After finish making a box chamber, then integrate with the laptop (computer hardware software) to build low-cost computer vision system (Fig.1), that it has own monitored, so that it will save more space and money. For capture the samples of rough rice, the image of rough rice and brown rice were capture at the center orientation from perpendicular views using webcam camera (Gtech GT-412) brand of webcam, the specification are 720p HD resolution (32 M pixel) with recommended system, lens type: manual focus, interface USB 2.0). Images were taking with LED

desk (light in box chamber about 800 lumens and in the sample 30 lumens determine by lux meter) and the light source has been calibrating before. LED have a lot of advantages over traditional lightning, such as long lifetime, low power consumption, low heat generation, small size, fast response and insensitivity to vibration. The webcam was set up in a fixed position for get an appropriate and best image.

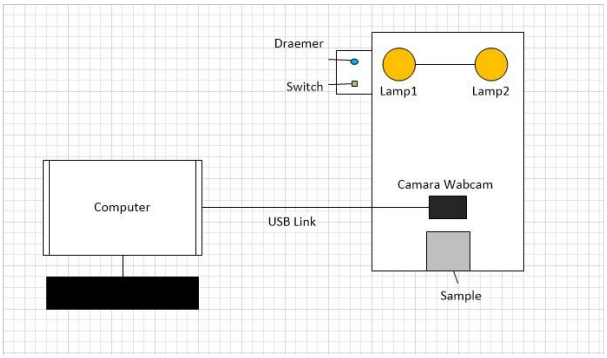


Fig. 1 System of box chamber

2.3 Extracting color

HSV stands for Hue, Saturation and Value. These terms have the following meanings Hue. The true color attributed (red, green, blue, orange, yellow, and so on). Saturation is the amount by which the color has been diluted with white and the more whites in the color, the lower the saturation. So a deep red color have has a high saturation, and a light red (a pinkish color) has low saturation. Value is the degree of brightness a well lit color has high intensity; a dark color has low intensity. Suppose a color is species by its RGB values show in Eqs. (1) – (3). If all the three values are equal, then the color will be a grey scale; that is, an intensity of white. Such a color, containing just white, will thus have a saturation of zero. Conversely, if the RGB values are very different, we would expect the resulting color to a high saturation. In particular, if one or two of the RGB values are zero, the saturation will be one, the highest possible value [9]. Then it is using extracting color with RGB, HSV and L*a*b* after that invert them and calculate average, R-squared of each color. The inverse transformation is easily obtained by inverting the matrix. The X, Y, Z color matching function corresponding to the R, G, B and the matrices can be defined according to the definition of color white. To discuss color independent of brightness, the tristimulus values can be normalized by dividing by X + Y + Z: and so x + y + z =1[10].

$$x = \frac{X}{X+Y+Z} \qquad (1)$$

$$y = \frac{Y}{X+Y+Z} \qquad (2)$$

$$z = \frac{Z}{X+Y+Z} \qquad (3)$$

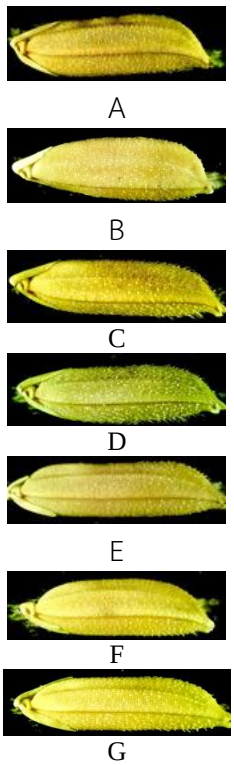
$$\begin{bmatrix} R \\ G \\ B \end{bmatrix} = \begin{bmatrix} 3.063 & -1.393 & -0.476 \\ -0.969 & 1.876 & 0.042 \\ 0.068 & -0.229 & 1.069 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}$$

The XYZ color matching function corresponding to the R, G, B and the matrices can be defined according to the definition of color white.

3. Results and Discussion

3.1 Samples preparation

Rough rice seven varieties were included A (Hom ma li 105), B (RD6), C (Red Brown Rice), D (Hom Nil (Black Jasmine Rice)), E (Khao' Hawm Daeng), F (Niaw San-Pah-Tawng) and G (RD31 (Pathum Thani 80)) illustrated in Fig.2. In the figure have designed name and code to easily for understand what were name and varieties showing image a litter difference color.



A Hom ma li 105
B RD6
C Red Brown Rice
D Hom Nil (Black Jasmine Rice)
E Khao' Hawm Daeng
F Niaw San-Pah-Tawng
G RD31 (Pathum Thani 80)

Fig. 2 Varieties of rough rice

Table. 2 Value of color

Rough rice varieties	Color								
	R	G	B	h	s	v	L*	A*	b*
Hom ma li 105	13.75	12.09	1.85	0.06	12.09	1.85	12.91	127.94	133.06
RD6	10.46	10.24	1.36	0.06	10.24	1.36	10.54	127.42	132.04
Red Brown Rice	11.29	10.64	2.04	0.06	10.64	2.04	11.11	127.64	132.03
Hom Nil (Black Jasmine Rice)	13.75	13.97	3.11	0.06	13.97	3.11	14.21	127.05	132.91
Khao' Hawm Daeng	25.12	29.24	7.96	0.08	29.24	7.96	28.95	124.48	137.45
Niaw San-Pah-Tawng	7.38	7.33	2.44	0.06	7.01	2.04	7.46	127.62	130.31
RD31 (Pathum Thani 80)	5.77	5.84	1.75	0.05	5.08	1.05	5.91	127.63	129.89

In table 2 illustrate result color of value with difference varieties of rough rice, the color rgb, hsv and L*a*b* were differenced especially color L*. Color L* was showed color value 12.91 on Hom ma li 105, 10.54 (RD6), 11.11 (Red Brown Rice), 14.21 Hom Nil (Black Jasmine Rice), 28.95 (Khao' Hawm Daeng), 7.46 (Niaw San-Pah-Tawng) and 5.91 (RD31 Pathum Thani 80), that the color of varieties were difference in each groups when compare with seven groups.

3.2 Extracting color

In the figure 3 illustrated about resulted of extracting color RGB, hsv and L*a*b*, the variety was used Hom ma li 105 to see how difference color when compare with each color. However, when compare the variety of Hom ma li 105 rough rice and RD31 (Pathum Thani 80) rough rice were separated by color L*(score 3), s (score 2), and R (score 1) that showed with three dimension in figure 5.

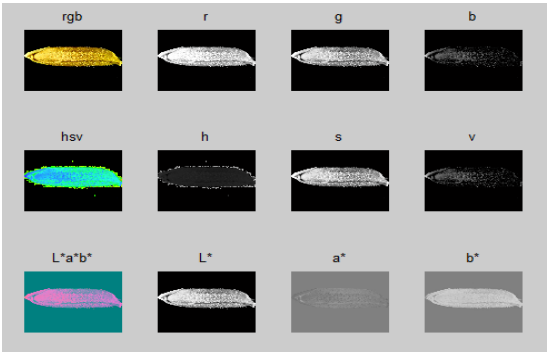


Fig. 3 Result of rough rice color RGB, hsv and L*a*b*

3.3 Box Chamber

Box chamber system designed for capture the samples of rough rice, the image of rough rice was capture at the center orientation from perpendicular views using webcam camera the specification are 720p HD resolution with recommended system, lens type: manual focus, interface USB 2.0 illustrate in Fig.4.

Fig. 4 Box chamber system

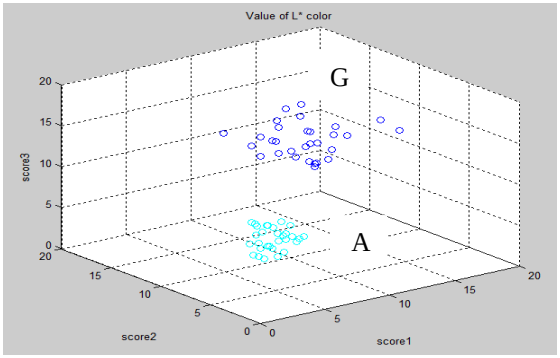


Fig. 5 Resulted of 3D L*, s, and R color compared between Hom ma li 105 (Each groups of samples =30 n) and RD31 (Pathum Thani 80) (Each groups of samples =30 n)

Three dimension of L*(score 3), s (score 2), and R (score 1) color in Fig.6 illustrate the Red Brown Rice was separated from six variety, (Each groups of samples = 30 n)

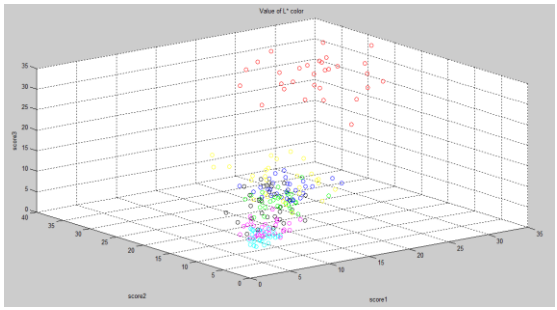


Fig. 6 Resulted of 3D L*, s, and R color with seven variety of rough rice

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In table 3 illustrate the color of value on difference varieties of rough rice, compare between the color R and L*were differenced especially color L*. Color L* was showed color value differenced in each groups when compare with two groups, but R color was a little different.

Table. 3 Total petroleum products consumption (million liters) in Thailand by economic sector

Rough rice varieties	Color	
	R	L*
Hom ma li 105	10.23	10.53
RD6	12.08	12.91
Red Brown Rice	10.63	11.11
Hom Nil (Black Jasmine Rice)	13.96	14.20
Khao' Hawm Daeng	29.23	28.94
Niaw San-Pah-Tawng	7.33	7.46
RD31 (Pathum Thani 80)	5.84	5.91

4. Conclusions

The color extracting of rice kernel by RGB, HSV and L*a*b* color, then calculate color, classify with correlation between color and variety of rice. The result shows that L* color was high correlation, that mean the image processing method can applies to identifies the varieties of rice kernel.

5. Acknowledgement

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7.1 Article in Journals

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