A Study on Palmistry Color Reflectance Related to Personality of Subject

Siti Lailatul Mohd Hassan, Hadzli Hashim, Noor Ezan Abdullah, Abdul Hadi Azman

Faculty of Electrical Engineering Universiti Teknologi MARA (UiTM)
40450 Shah Alam Selangor
Malaysia

***Abstract*— Palmistry technique is traditionally known as an ancient art of reading the palm and it can be found in many parts of the world. Since blood circulation in the palm contains valuable information about the health condition of a person, this technique acts as one of the aid tools for diagnosing purposes. This paper presents a novel study on palmistry color reflectance related to personality of subject. The main objective is to collect personality and health information as well as to capture palm images digitally from sample of subjects representing various faculties at Universiti Teknologi Mara. Afterwards, appropriate statistical tools will be used for significant information that can relate personality and health index. This paper focus on contribution in the field of color image processing of palmistry with the help of advanced RGB color image processing techniques in order to study the personality index of a subject. In this work, samples of palm images are digitally captured under standard and control environment. Other characteristic parameters representing the subject's personality are also taken. Statistical tools are applied to the quantified color component indices from the processed image for significant findings that can relate color of palm with respect to the subject's character. As the conclusion, the non-social group can be discriminated from all other groups based on all color components.**

***Keywords*— RGB, Digital Image Processing, Palmistry, SPSS**

I. Introduction

Palmistry is not fortunes telling but it is the process that can tell about knowing yourself and your personality. Through the study of palmistry, opportunity to see to what extent our thought and feelings influence our happiness and the harmony of those around us can be analysed [1]. From an ancient technique the way to study hand palm by examining characteristics of the fingers, fingernails, fingerprints and palm skin patterns, skin texture and the famous technique is hand's line reading. But many casual observers of the hand argue that the lines are merely flexure creases, allowing the opening and closing movements of the hands. So palmists have discovered that the lines are continually changing and rarely constant. Observation has shown that the line can and do change in appearance, length, quality and that no two hands ever reveal the same formation. Conventionally, the palm lines, texture and color are observed visually by the human eye, this method might results error in percentage accuracy since people have different depthness in visualization. Furthermore, it consumes time and experience for any conclusive prediction. With the advancement of computer and vision technology, color reflected from the palm can be quantified using advanced image processing method [1]. These numerical can be analysed for further experimental research in palmistry.

This project presents a different kind of method than the conventional method which is analyzing palms using basic color (RGB). It can be utilized as one of the image features because light emitted by a source interacts with the surface and the interior layers of the skin through absorption and scattering causes alteration in the spectral composition of the light. The changes reflect the structure and optical properties of the skin quantification of the reflected light will encode these properties [2].

Sample of palm images are processed to produce color indices with respect to RGB model. These indices are evaluated and analysed with the application of statistical techniques in order to find any significant relationship that can reflect the subject's personality. The features information can later be used in designing an automated model for discriminating subject personality based on the reflected color of the palm.

II. RGB Color Space

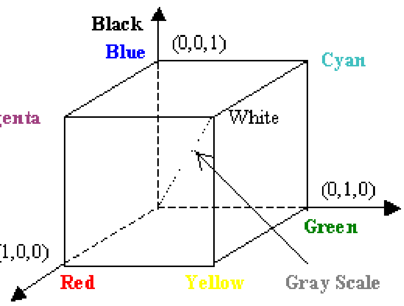

Figure1-The RGB Color Cube

The red, green, and blue (RGB) color space is widely used throughout computer graphics. Red, green and blue are the three primary additive colors (individual components are added together to form a desired color) and are represented by three dimensional, Cartesian coordinate system (Figure 1). The indicated diagonal of the cube, with equal amounts of each primary component, represents various gray scale levels. Table 1 contains the RGB values for 100% amplitude and 100% saturated color bars, a common video test signal.

The RGB color space is the most prevalent choice for computer graphics because color displays use red, green and blue to create the desired color. Therefore, the choice of the RGB color space simplifies the architecture and design of the system. Also, a system that is designed using the RGB color space can take advantage of a large number of existing software routines, since this color space has been around for a number of years.

Table 1- 100% RGB Color Bars

Color	Norminal range	White	Yellow	Cyan	Green	Magnenta	Red	Blue	Black
R	0 to 255	255	255	0	0	255	255	0	0
G	0 to 255	255	255	255	255	0	0	0	0
B	0 to 255	255	0	255	0	255	0	255	0

III. METHODOLOGY

A. Data Collection

In this research, 302 sets of the questionnaires had been distributed to students who study at the Science and Technology building, UiTM Shah Alam. The questionnaire is divided into four parts which is sociability, intelligent (CGPA), sport and health condition. From the 302 respondents, 197 belong to the sociability group, 102 belong to the sport group, and 176 are intelligent respondents. Other than filling the questionnaire, right hand palm of each respondent was captured at the Image Capturing Studio Room (ICS Room), Advance Signal Processing (ASP) laboratory (Faculty of Electrical Engineering). It should be noted here these images were captured under controlled environment [3]. Before image can be captured, the raw measurement (Lux reading) of light was recorded using Heavy Duty Light Meter connected with Data Logger or directly to computer. The measurement was recorded and categorized as whether image capturing is in the morning, evening or night session. Figure 2 below shows an example image of right hand palm of a respondent.

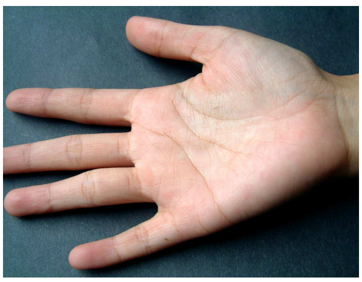

Figure 2-Sample of Right Hand Palm

B. Data Capturing

The Red, Green, Blue (RGB) component color images were acquired using FinePix 6900 Zoom (FujiFilm) digital camera, with pixel resolution of 1280x960 and saved in JPEG format. This size is sufficient for analysis, as all relevant details of the hand palm are shown [4]. During the photo session, the camera was placed at a distance of one foot directly above the hand palm of respondent (Figure 3). The lighting used for capturing images was from a spotlight (Digicolor K-250C). The light intensity was measured using Heavy Duty Light Meter (Model 407026) and Heavy Duty Data Logger (Model 380340). The recommended light measurement during calibrating has a mean lux of 2677± 48 for morning and 2681 ± 43 for evening session [3]. The lux values were taken using Heavy Duty Light Meter connected to the Data Logger with an interval time one second for each session (>20 sec). The suitable time for capturing image is in the morning at 0800 to 1200 and in the evening at 1400 to 1800, because the significant 0.614 p-value for lux reading was obtained during these sessions as described in Table 2.

Table 2- Paired Sample Test for Morning, Evening and Night session

Paired Sample Test	P-Value
Morning – Evening	0.614
Morning – Night	0
Evening – Night	0

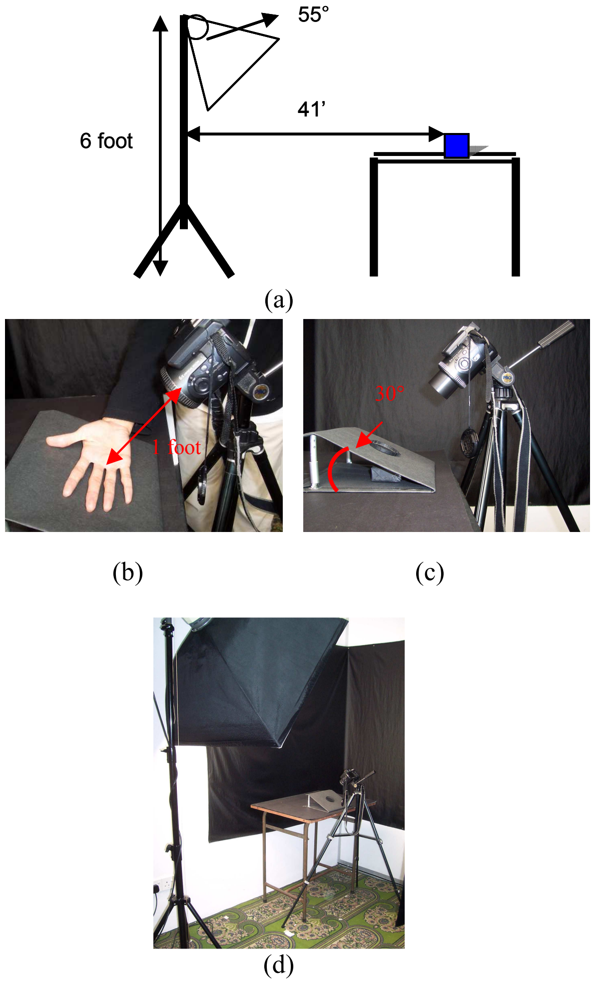

Figure 3 - Arrangement of equipments; (a) placement of light source with subject (b) distance between palm and camera (c) degree of subject platform (d) picture of equipments

C. Image Processing

Two sample regions of interest (ROI) from each hand palm image were identified and the color of each pixel was expressed as an additive mixture of the three primary RGB bands. Initially altogether, twenty ROI samples were considered in this work for each set of images [4]. After the regions of image have been identified, they were cropped out sequentially with the first cluster image and followed by the other cluster image sample. All samples were then resized to a dimension of 50 x 50 pixel area [5].

Once sample from each image has been identified, its RGB mean pixel value will be recorded. Then, it will be analyzed using SPSS software. Below is the flowchart of image processing.

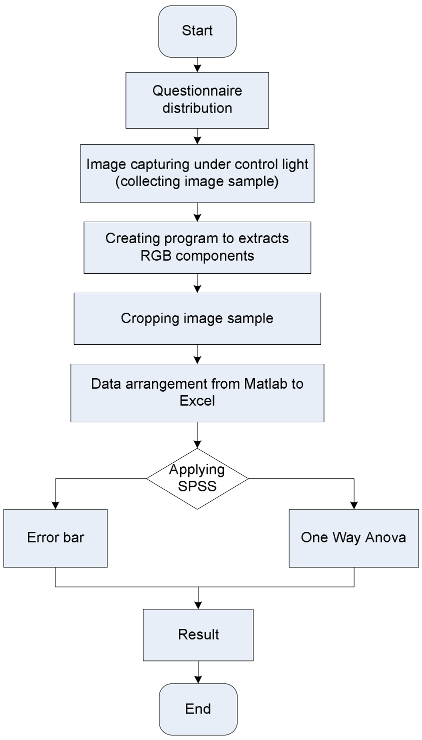

Figure 4-Image processing flow chart

D. Median Filtering

The first step was the pre-processing of images with the purpose of reducing noise and facilitating image segmentation by using median filtering. The imaging technique may be noisy in terms of small white ellipse lines or dots. This can be considered as impulsive noise and may thus be reduced using a median filter given by:

$$P_{med}(m,,n) = median\left\{P(m-k, n-1) \;\middle|\; -\frac{N_{med}-1}{2} \le k,\ l \le \frac{N_{med}-1}{2} \wedge 1 \le m-k \le m \wedge 1 \le n-1 \le N \right\} \quad (1)$$

where N_{med} is odd[2] and indicates the size of the two dimensional median filter. P represents all the three color components and only square median filter kernel was considered [3].

E. Statistical Measurement

In order to evaluate the identification of personality of subjects, statistical analysis such as error plot and t-test was conducted. The mean and standard deviation of the three types of personality were compared. All mean and standard deviation values for all images were transferred to SPSS for analyses.

F. Inference Test

The p-value of a test is the probability of observing a test statistic at least as extreme as the one computed given that the null hypothesis is true. The p-value of a test provides valuable information because it measures the amount of statistical evidence that supports the alternative hypothesis. The smaller the p-value, the more statistical evidence exists to support the alternative hypothesis and it is more precise analysis compared to graphical output of error plot. The p-values are the smallest level of significance at which H_0 would be rejected when a specified test procedure is used on a given data set. Once the p-value has been determined, the conclusion at any particular level alpha results from comparing the p-value to alpha which is p- value ≤ 0.05 reject H_0 at level 0.05, p-value > 0.05 do not reject H_0 at level 0.05. Each sample mean was considered to be independent and uncorrelated from each other. Before conducting the t-test the necessary assumptions must be met. The assumptions for the t-test are [6]:

1) Population normality – populations from which the samples been drawn should be normal. Check this for each group using normality statistics such as skewness and Shapiro-Wilks.

2) Homogeneity of variance – the scores in each group should have homogeneous variances. As with the t-test, Levene's test determines whether variances are equal or unequal.

Hence, the null and alternative hypothesis, and the t-test used are shown below [3]:

$$\textit{Null}\ \text{Hypothesis}\ (H_0): (\mu_1 - \mu_2) = 0 \quad (2)$$

$$\textit{Alternative}\ \text{Hypothesis}\ (H_1): (\mu_1 - \mu_2) \ne 0 \quad (3)$$

$$\textit{Test}\ \text{statistic}: t = \frac{(\bar{\chi}_1 - \bar{\chi}_2) - (\mu_1 - \mu_2)}{\sqrt{\sigma_p^2 \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \quad (4)$$

$$\textit{Degree}\ \text{of freedom}: df = n_1 + n_2 - 1 \quad (5)$$

where

$$\sigma_p^2 = \frac{(n_1 - 1)\sigma_1^2 + (n_2 - 1)\sigma_2^2}{df} \tag{6}$$

$\bar{\chi}_1, \bar{\chi}_2$ – population mean

μ_1, μ_2 – sample mean

σ_1^2, σ_2^2 – sample variance

n_1, n_2 – number of samples

IV. Result and Discussion

A. *Error Plots*

RGB error bar plots shown will provide better interpretation if discrimination is required through observation [3]. Figure 5 shows the resulted RGB error plot respectively. By observation, the color space of nonssl (nonsocial) can be distinguished clearly from other type of personality in RGB color space.

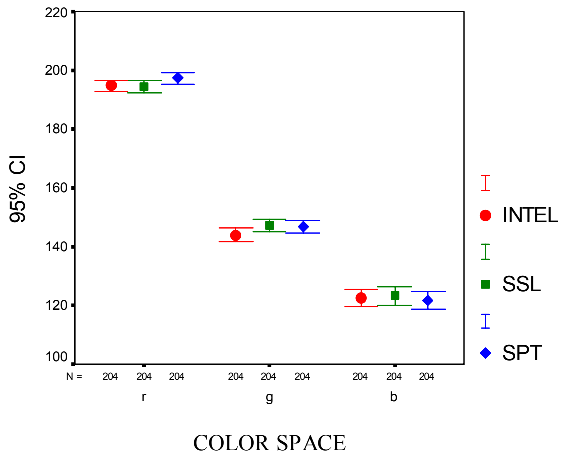

Figure 5- RGB error bar for color space for Intel, ssl, spt

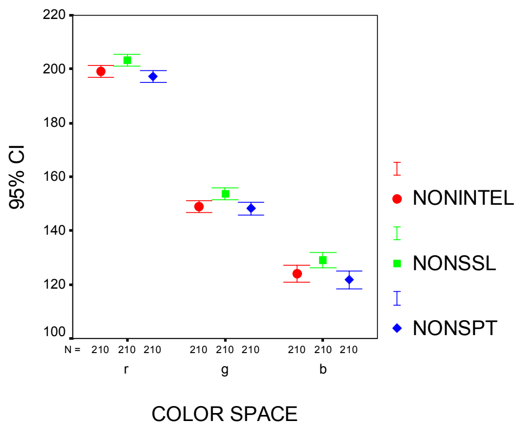

Figure 6- RGB error bar for color space for nonintel, nonssl, nonspt

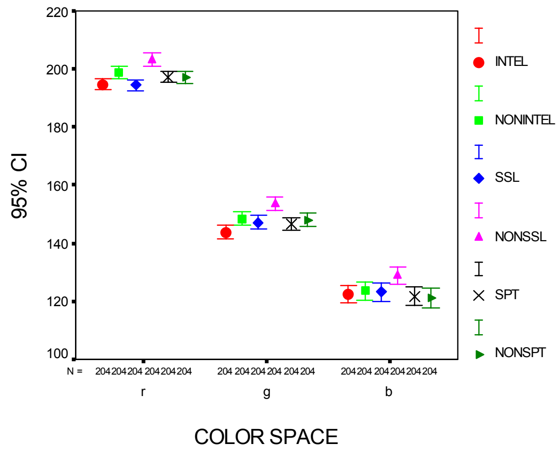

Figure 7- RGB error bar for color space for all type of personality

B. *ANOVA Test*

Since the assumption of two conditions has been met, which is population normality and homogeneity of variance test [7] therefore hypothesis for ANOVA can be made:

H_0 = No different in RGB color space between each type of personality.

H_I = At least one different type of personality in RGB color space

The ANOVA table (Table 3) shows there is a significant difference in RGB color space across the different type of personality. The H_0 hypothesis can rejected or accepted the alternative hypothesis since the F_{RED} (5, 1806) = 8.573, p-value < 0.05, F_{GREEN} (5, 1806) = 8.085 , p- value < 0.05, F_{BLUE} (5,1806) = 3.306, p- value < 0.05.

Table 3 ANOVA Table

		Sum of Squares	df	Mean Square	F	Sig.
RED	Between Groups	9496.342	5	1899.268	8.573	.000
	Within Groups	400084.5	1806	221.531		
	Total	409580.8	1811			
GREEN	Between Groups	10635.869	5	2127.174	8.085	.000
	Within Groups	475176.4	1806	263.110		
	Total	485812.3	1811			
BLUE	Between Groups	8192.931	5	1638.586	3.306	.006
	Within Groups	895142.2	1806	495.649		
	Total	903335.2	1811			

C. *Inference Test*

From the independent t-test, p-value can be obtained to infer where there is evidence of group population or not between types of personality based on reflectance RGB mean indices.

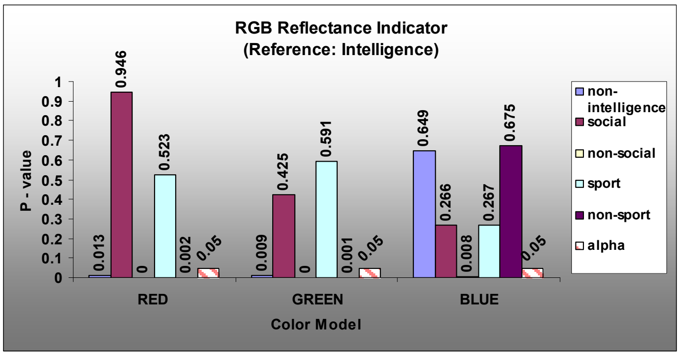

Figure 8- Bar graph represents T-test with reference of intelligent

With reference to the intelligent group (Figure 8) it can be seen from the plot, that this group is significantly different from the non-intelligent, non-social and non-sport with p-value < 0.05 for all color components. However, it is shown that respondent who is intelligence, might also be active in sport and social activities.

Figure 9 depicts the T-test with reference to non-intelligent group. There is an overwhelming evidence for all color components, that the non-sport group is also non-intelligent.

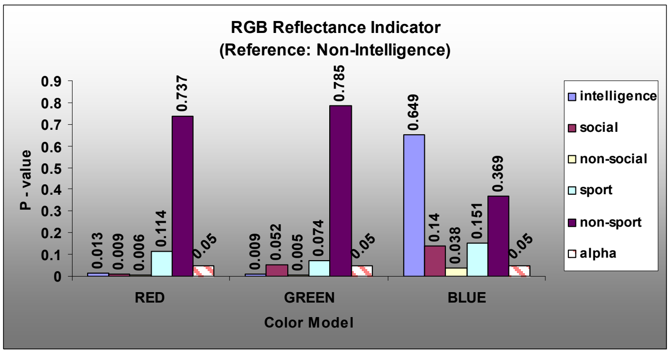

Figure 9-Bar graph represents T-test with reference of non- intelligent

Figure 10 shows T-test with reference to social group where there is significant evidence for social, intelligence and sport belongs to the same group of personality.

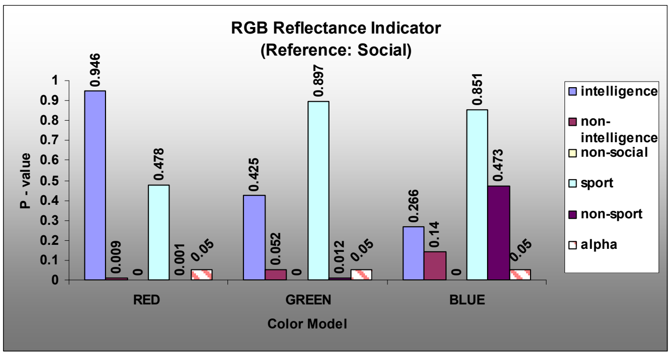

Figure 10- Bar graph represents T-test with reference of social

Figure 11 depicts the T-test with reference to non-social group. From the plot, this group has overwhelming evidence that the respondents are significantly different from all other groups.

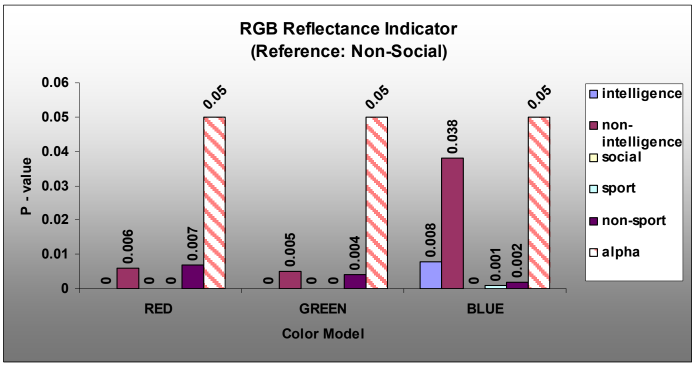

Figure 11- Bar graph represents T-test with reference of non- social

Whereas in Figure 12 shows the T-test result with reference to sport. By observation it can be seen that intelligent and social can be categorized into the same group and there is overwhelming evidence that this group does not belong together with non-social group.

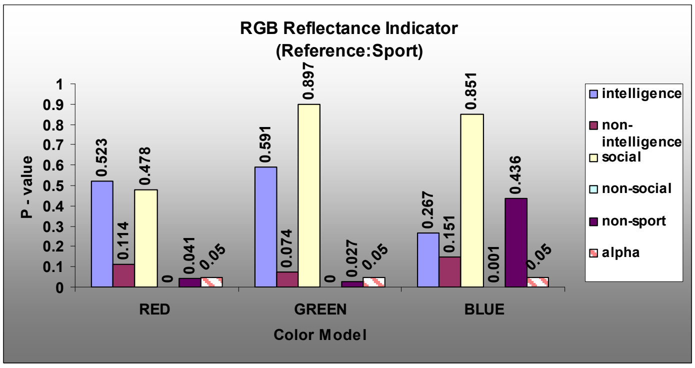

Figure 12-Bar graph represents T-test with reference of sport

Figure 13 shows the p-value performance with reference to non-sport. It can be observed that non-intelligent and non-sport group are related to each other.

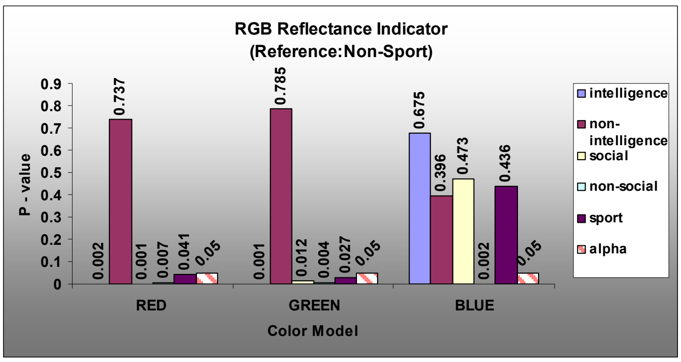

Figure 13- Bar graph represents T-test with reference if non-sport

V. CONCLUSIONS

Algorithm which produced the reflectance RGB color indices for personality types was presented. Six group of personality types were identified for data processing either by using error bar or t-test. All groups consist of data images captured under controlled specifications. Performances of the methods used were analyzed and compared by displaying their error bar and then it was further tested with statistical inference tools. Result shown that by observing the error bar plots, the non-social group can be discriminated from all other groups significantly based on all color components. Measurements from the applied t-test outcomes have shown that RGB reflectance color space can portray and relate with personality of the subject.

VI. FUTURE RECOMENDATION

In order to improve the capability and effectiveness of this research, this work can be extended by using the same algorithm but with other color models. In addition, the quantified color features can be used to train an intelligent system to classify types of the personality. It is also highly recommended to use more precision equipments for capturing image to avoid interference in brightness and sharpness of color. For future work, lighting control will be suggested for daylight when capturing image in order to get the best image.

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