CONTENT

[CONTENT 1](#_Toc163718104)

[1 Literature Review 2](#_Toc163718105)

[1 RGB and CIELAB Conversions 2](#_Toc163718106)

[2 Taguchi Method 2](#_Toc163718107)

[3 Ellipsolid Skin-Colour Model 3](#_Toc163718108)

[2 Result and Discussion 4](#_Toc163718109)

[1 Verification for 6 Points to Detect Facial Color 4](#_Toc163718110)

[2 FaceRGB Program 4](#_Toc163718111)

# Literature Review

## RGB and CIELAB Conversions

Since RGB colour models are device-dependent, there is no simple formula for conversion between RGB values and L∗a∗b∗. The RGB values must be transformed via a specific absolute colour space. This adjustment will be device-dependent, but the values resulting from the transform will be device-independent. After a device-dependent RGB colour space is characterized, it becomes device-independent. In the calculation of sRGB from CIE, XYZ is a linear transformation, which may be performed by a matrix multiplication. Referring to equations and , it presents that these linear RGB values are not the final result as they have not been adjusted for the gamma correction. sRGB was designed to reflect a typical real-world monitor with a gamma of 2.2, and the following formula transforms the linear RGB values into sRGB. Let be , or , and be , , or . The sRGB component values , , and are in the range 0 to 1 (a range of 0 to 255 can simply be divided by 255.0).

|  |  |
| --- | --- |
|  | () |

where a = 0.055

C is R, G, or B.

It is followed by a matrix multiplication of the linear values to get XYZ:

|  |  |
| --- | --- |
|  | () |

These gamma-corrected values are in the range 0 to 1. If values in the range 0 to 255 are required, the values are usually clipped to the 0 to 1 range. This clipping can be done before or after this gamma calculation.

## Taguchi Method

The Taguchi method is used to make the designed product to have stable quality and small fluctuation and makes the production process insensitive to every kind of noise. In the product design process, it uses relations of quality, cost, and profit to develop high-quality product under condition of low cost.

## Ellipsolid Skin-Colour Model

Zeng and Luo conducted the studies in human skin colour luminance dependence cluster shape discussed in the Lab colour space. e cluster of skin colours may be approximated using an elliptical shape. Let be distinctive colours (a vector with two or three coordinates) of a skin colour training data set and (i=1, … ,n) be the occurrence counts of a colour, Xi. An elliptical boundary model Φ(X) = (X, Ψ, Λ) is defined as

|  |  |
| --- | --- |
|  | () |

where Ψ and Λ are given by

|  |  |
| --- | --- |
|  | () |
| , | () |

where , is the total number of occurrences in a training data set and

the mean of colour vectors. To consider the lightness dependency of the shape of skin cluster, the cluster of skin colours in a lightness-chrominance colour space may be modeled with an ellipsoid.

# Result and Discussion

## Verification for 6 Points to Detect Facial Color

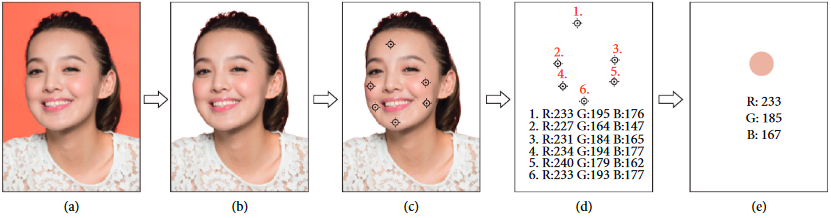


Figure 1 – The traditional procedure to capture skin colour

In the course of the study, it is assumed that the typical image processing software (eg., Photoshop and CorelDraw) is as shown in different steps in Figure 1. There is a step-by-step procedure, Figure 1(a), which means that the file has been read. As for Figure 1(b), it shows that the background has been cut out and completely ensured the face shape. User could capture the skin colour manually.

## FaceRGB Program

The procedure of the FaceRGB program is as follows:

1. Calculate Faceskin data. All points of the average distance to FaceLABavg (ΔEavg) and standard deviation σ
2. Outlier is far from the distance of FaceLABavg (Distanceavg + 2σ)
3. According to CIE2000.
4. Delete the outlier from the six points

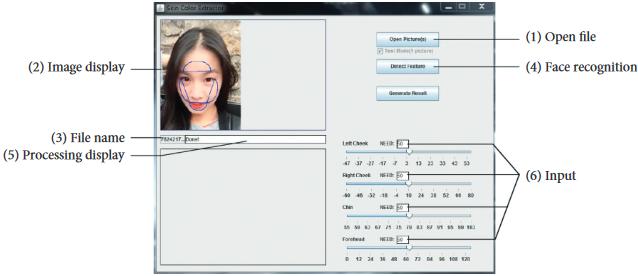


Figure 2 – Instruction for SCE operation.

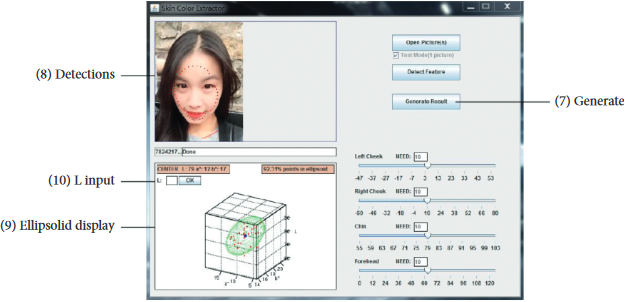


Figure 3 – Processing by single image.

The FaceRGB program is described individually as follows:

* Open the program, the title indicates FaceRGB.
* When the file has been read, the image will appear in this picture window; it includes big data read or operation. There is instant synchronization status presenting in the window.
* Spreadsheet progress strip windows, the situation will progress to the long schedule for a presentation to show they reached results.
* For big data, create four computation channels in the program, and it will be dealing with huge data in the same time. Figure 8 shows the situation as it is working.
* Option is designed to be read as a single image or input for only one time.
* This is a single image processing result, including the colour, RGB values, and LAB values.

Figure 2, 3 and Table 1 presents the example.

Table 1 – A control factor table that may be generated for the colour detection.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Level of control factors | Level | Level 1 | Level 2 | Level 3 |
| Chin Radian    Points | A  B | -1  3 | 0  25 | 50 |
| R-cheek Radian    Points | C  D | -1  3 | 0  25 | +1  50 |
| L-cheek Radian    Points | E  F | -1  3 | 0  25 | +1  50 |
| Forehead Radian    Points | G  H | -1  3 | 0  25 | +1  50 |