CHAPTER 4
ANALYSIS AND DESIGN

4.1   Analysis

When processing image it must be done correctly. First from pre processing we making a mask for image to determine which area will be processed and to get right range color for yellow jaundice, second step changing image color space from RGB to HSV, we choose HSV as color space because HSV obtain Hue, Saturation and value which is very important for color detection method.

In the sample image that will be processed must have high quality image or no noise, therefore a filter is added to solve this problem and help the program work, and then we re sized the image, after we processed the image, next program will implementation kernel method to the image,first step after we get a information value of yellow jaundice, we set the yellow jaundice color range. In my program, i give the minimum yellow jaundice color 15,150,50 and the maximum yellow jaundice color we set at 30,255,255,after that we compare the image with the yellow jaundice color range that we specified earlier(threshold), to get a yellow color on the skin. Then the results will enter to the process convolution kernel to get a better result.

If we find yellow jaundice in our image, program will drawing contour lines on the detected area
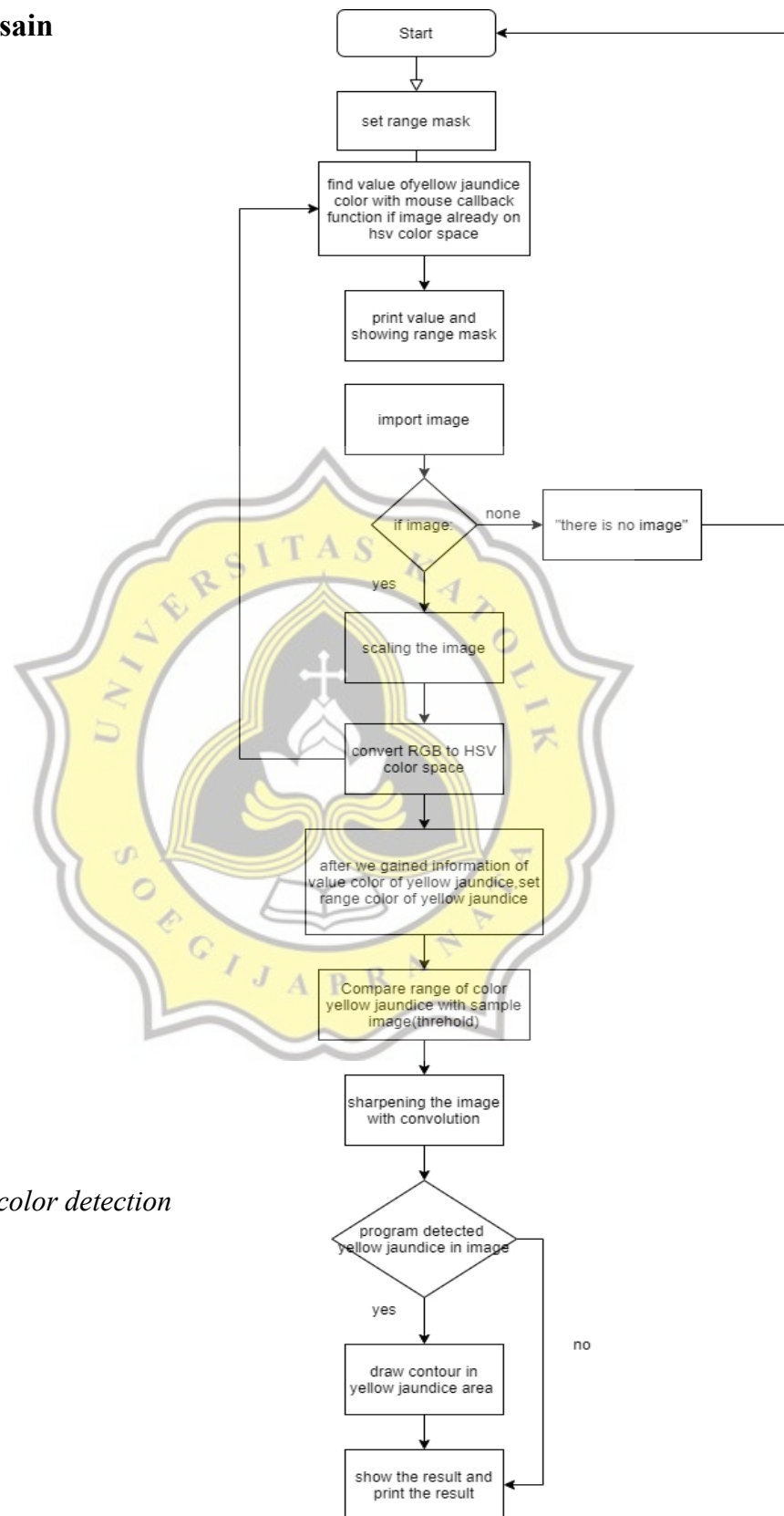
4.2 Desain

figure 4.1 color detection Flowchart

Below its show how program detect yellow jaundice

figure 4.2 positive dataset

Convert image from RGB to HSV, because we using imshow,then
The result might be end up like below, because

(M, N): an image with scalar data. The data is visualized using a colormap.

(M, N, 3): an image with RGB values (0-1 float or 0-255 int).

(M, N, 4): an image with RGBA values (0-1 float or 0-255 int), i.e. including transparency

it means that whatever matrix of 3 channels you give it (like HSV), it will be taken as an RGB image. That means, whatever number is in H it will be taken as R and so on. So Hue values will be the red ones, Saturation values the green ones and value ones will be blue. This is image will be interpreted as RGB

figure 4.3 result of rgb to hsv

figure 4.4 Result from getting value color (we gained information of value of
yellow jaundice color)
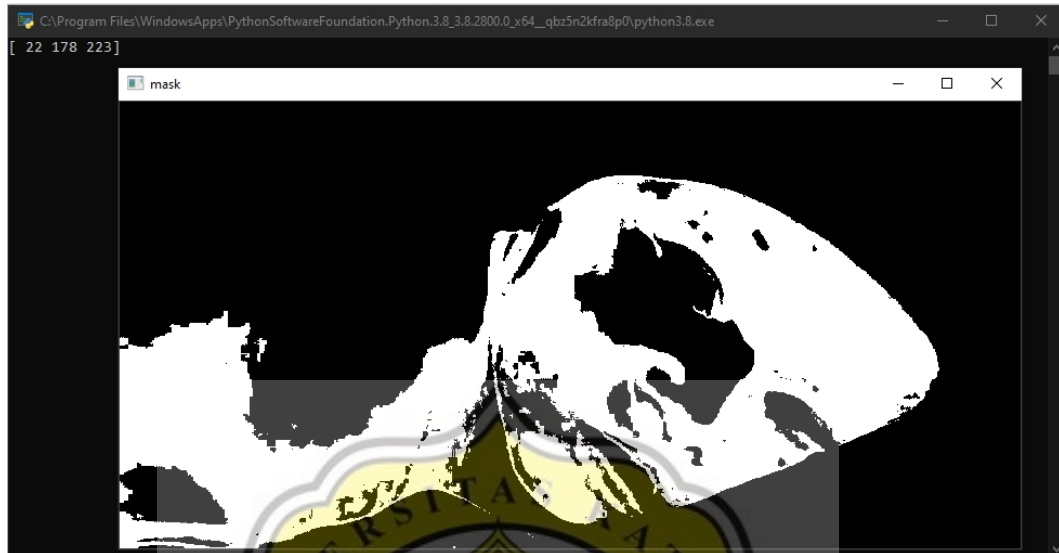
figure 4.5 Final result, program draw a line where's area detected yellow jaundice
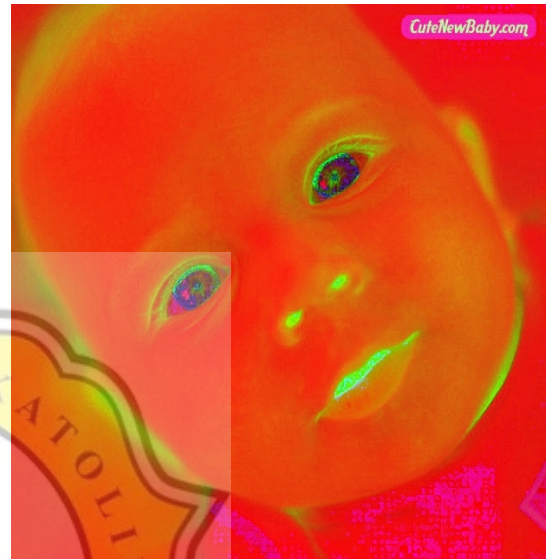
This is the result for negative dataset

figure 4.6 Negative dataset   *figure 4.7 HSV Negative dataset*

This program using color detection which is color space is so important to gained perfect color to detect yellow jaundice color. RGB color space is not preferred for color based detection and color analysis because of mixing color (chrominance) and intensity(luminance) information and its non uniform characteristic (Comparative Study of Skin Color Detection and Segmentation in HSV and YCbCr Color Space by K.B Shaik et al). The rgb to hsv be written as:

the transformation of RGB to normalize

$$r = \frac{R}{R+G+B} \qquad (1)$$

$$g = \frac{G}{R+G+B} \qquad (2)$$

$$b = \frac{B}{R+G+B} \qquad (3)$$

$$r + g + b = 1 \qquad (4)$$

(R=Red G= Green B= Blue)

HSV (Hue,Saturation and Value)is Luminance and Hue based approaches discriminate color and intensity information even under uneven illumination condition, this is why HSV color space is so perfect to be color space to color based detection or color analysis. But the conversion RGB to HSV will take time and expensive.

$$H = arccos \frac{\frac{1}{2}(2R-G-B)}{\sqrt{(R-G)^2-(R-B)(G-B)}} \qquad (5)$$

$$S = \frac{max(R,G,B)-min(R,G,B)}{max(R,G,B)} \qquad (6)$$

$$V = max(R,G,B) \qquad (7)$$

Whereas in the classification method I use the kernel because according to the journals I read, Skin detection using HSV color space and the kernel method is a very good combination, here's how the kernel works. When two images are compared, the proposed kernel maps the images into a high-dimensional feature space where the features are image fragments of the two images and the similarity between them is obtained through the inner production of the two images. Where in this project the yellow skin area will be compared with the original image, then the yellow skin area will enter into a high dimensional space, so that the area that is not yellow will be below it so that the program will be able to detect the yellow and non-yellow areas
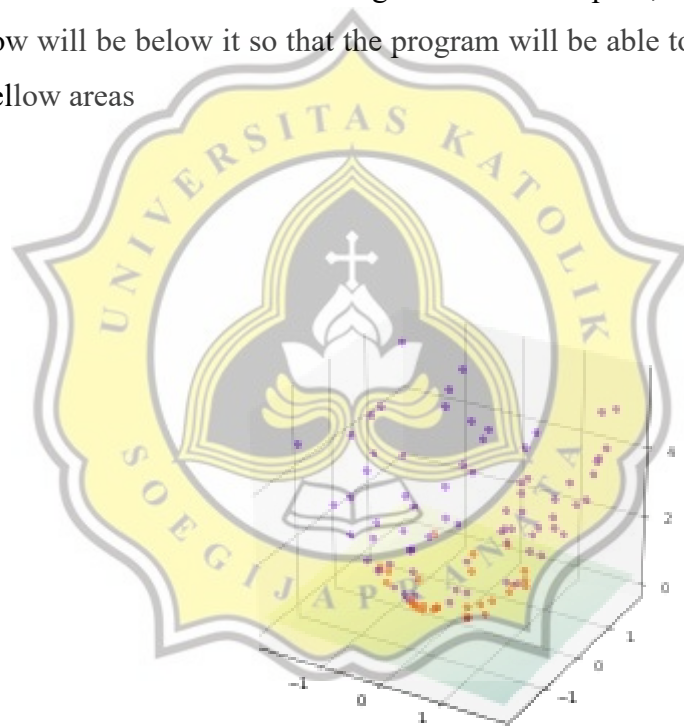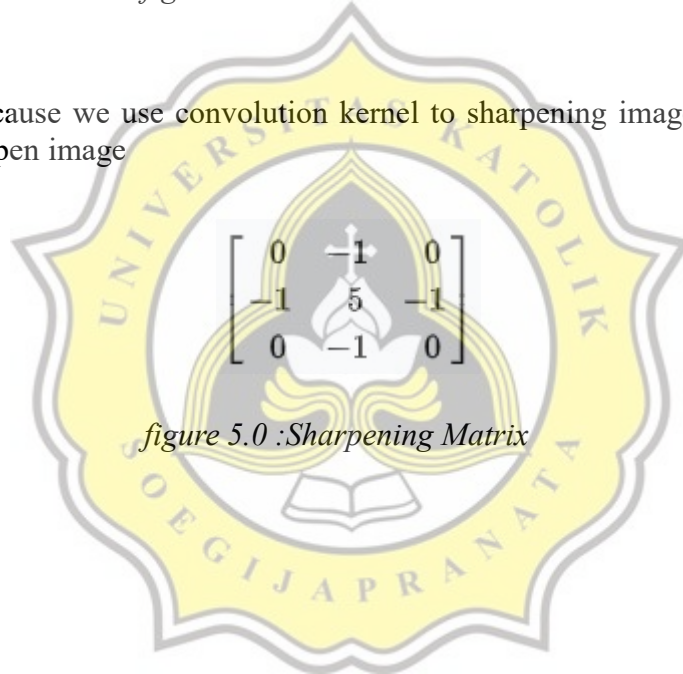

Figure 4.8 kernel method

This program also use Convolution,to produce sharp images,what is convolution,convolution is the process of adding each element image to its local neighbors, weighted by kernel. This is related to a form of mathematical convolution. The matrix operation being performed.

There is a example how kernel work if we have two three-by-three matrices, the first a kernel, and the second an image piece, convolution is the process of flipping both the rows and columns of the kernel and multiplying locally similar entries and summing.

$$\left(\begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix} * \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}\right)[2,2] = (i \cdot 1) + (h \cdot 2) + (g \cdot 3) + (f \cdot 4) + (e \cdot 5) + (d \cdot 6) + (c \cdot 7) + (b \cdot 8) + (a \cdot 9).$$

figure 4.9:Convolution Kernel

Because we use convolution kernel to sharpening image so there is array to get sharpen image

$$\begin{bmatrix} 0 & -1 & 0 \\ -1 & 5 & -1 \\ 0 & -1 & 0 \end{bmatrix}$$

figure 5.0 :Sharpening Matrix