

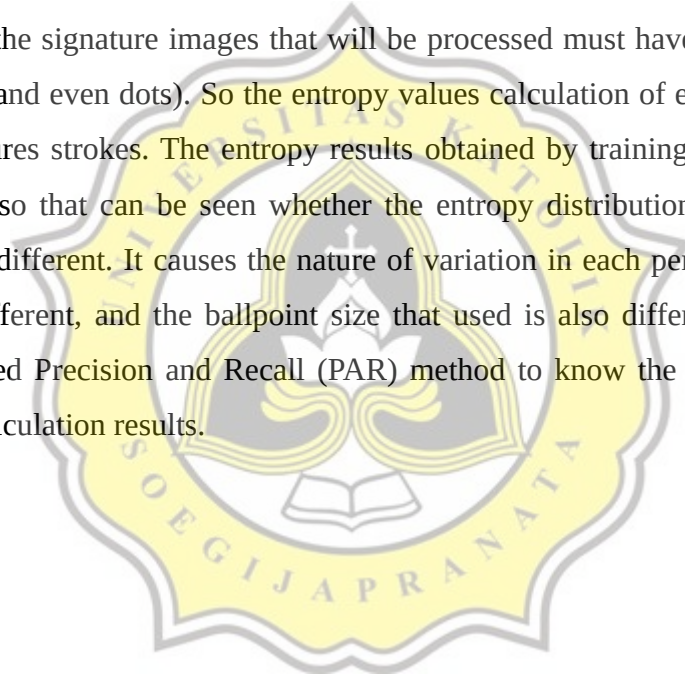
CHAPTER 4

ANALYSIS AND DESIGN

4.1 Analysis

When processing images, it must be done sequentially. First, from Preprocessing, which is changing the images to grayscale and binary images. Then calculating the entropy values in each image. When the entropy values are obtained, the time of the process will be count too.

In the signature images that will be processed must have no noise (stains, scratches, and even dots). So the entropy values calculation of each image is only the signatures strokes. The entropy results obtained by training and test must be compared so that can be seen whether the entropy distribution of the 2 tests is similar or different. It causes the nature of variation in each person's signature is usually different, and the ballpoint size that used is also different. The analysis will be used Precision and Recall (PAR) method to know the percentage of the entropy calculation results.



4.2 Desain

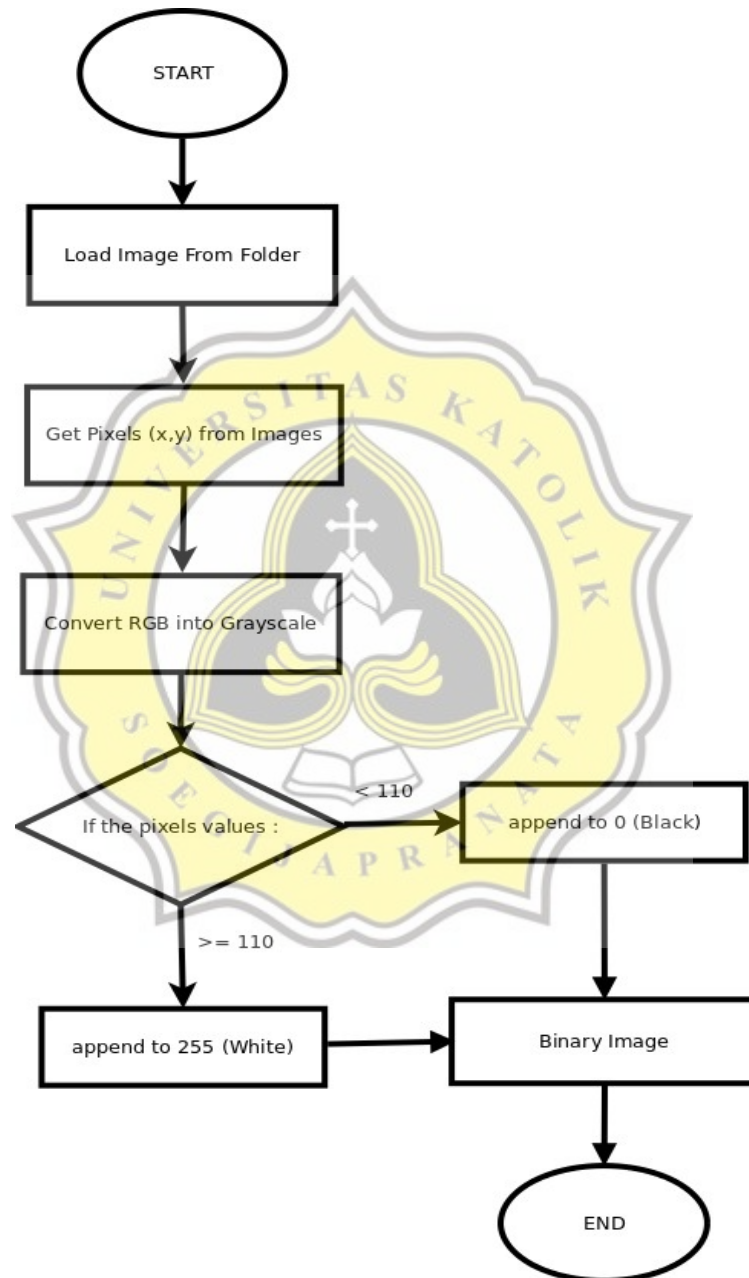


Illustration 4.1 : Flowchart Pre Processing

Before get the entropy calculation, the program will be start with Load Image from folder and Preprocessing step. Preprocessing program start with input the signatures image's folder path. Then the program will get the pixels of the images. The Images are RGB and then their will be converted into grayscale and then from grayscale into Binary images (If the pixel is ≥ 110 then append to 255 (white) and if pixel is < 110 then append to black).

Below are the Signature Images Sample in RGB, Grayscale and Binary Images.

Signature Images from Respondent 1 :

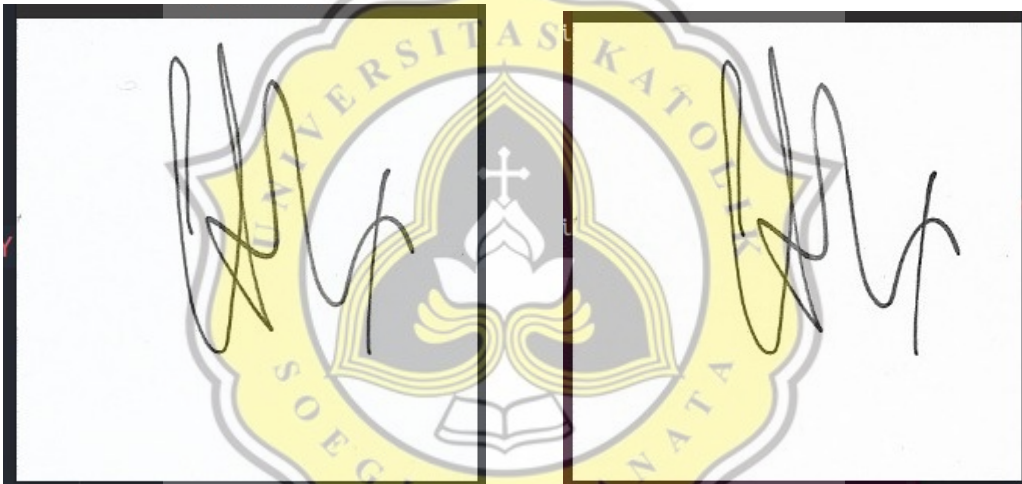


Illustration 4.2 : RGB Image R1

Illustration 4.3: Grayscale Image R1

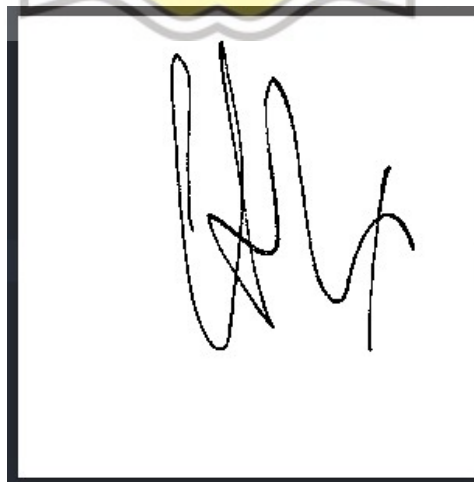


Illustration 4.4 : Binary Image R1

Signature Images Respondent 2 :



Illustration 4.5 : RGB Image R2



Illustration 4.6 : Grayscale Image R2

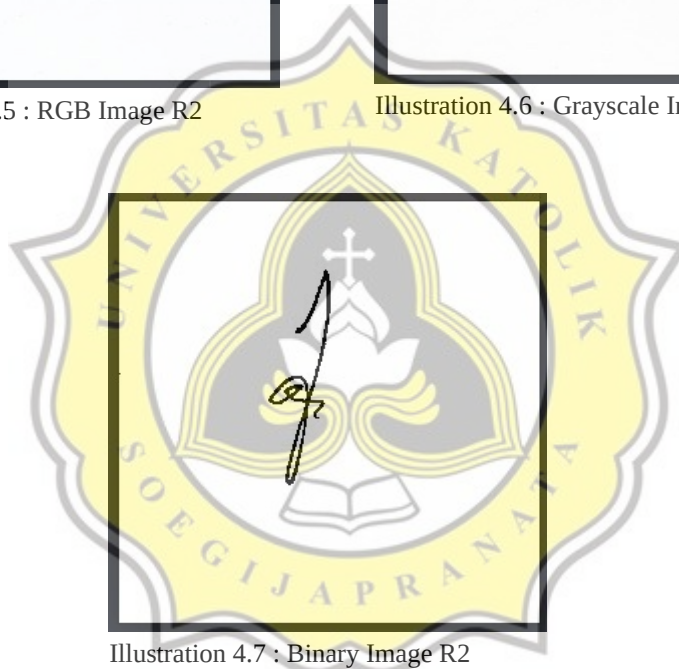


Illustration 4.7 : Binary Image R2

Fake signature samples :



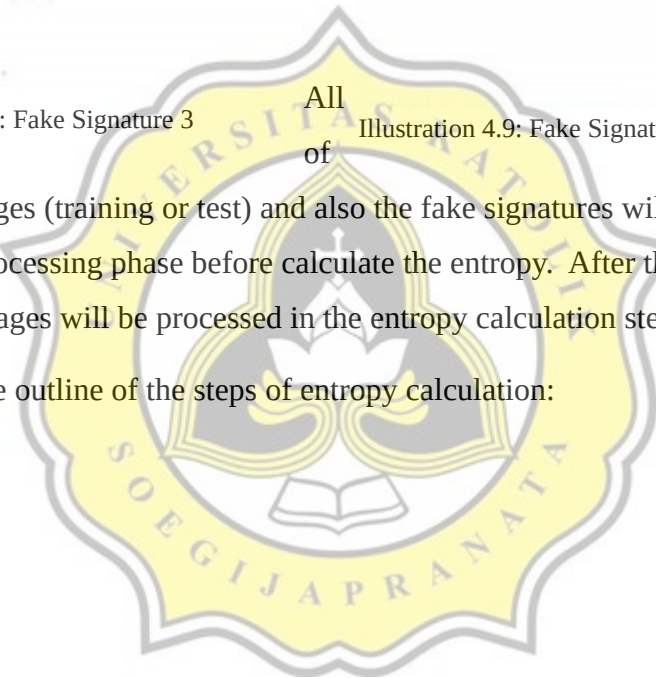
Illustration 4.8: Fake Signature 3

All
of

Illustration 4.9: Fake Signature 1

sample images (training or test) and also the fake signatures will be processed from pre processing phase before calculate the entropy. After the preprocessing step, the images will be processed in the entropy calculation step.

Below is the outline of the steps of entropy calculation:



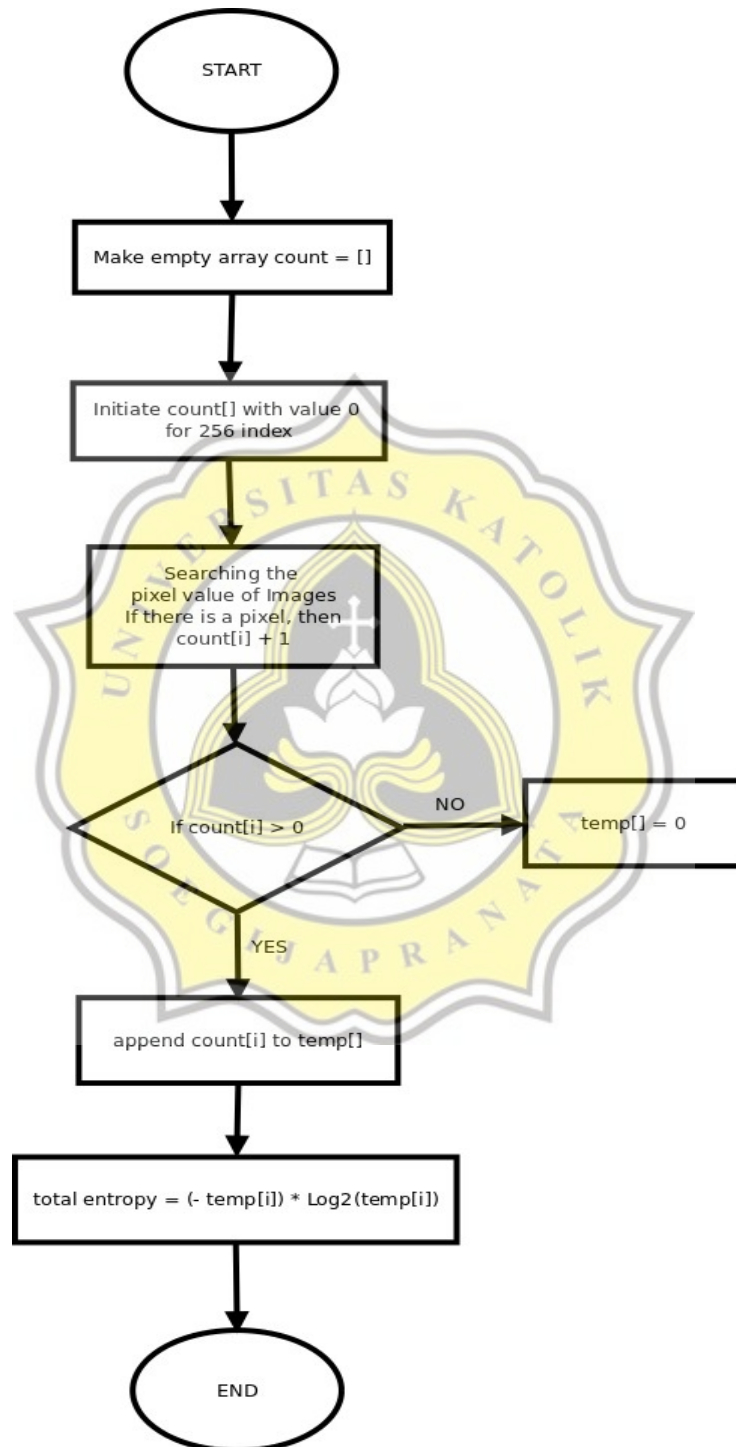


Illustration 5.0 : Flowchart Entropy Process

After the program get the Binary Images from preprocessing step, the program continues to the Entropy calculation. Entropy is a value to measure the randomness of a variable. Minimum Entropy value that can be reach is 0 and it happens when image pixel value is constant and the maximum entropy value for an image depends on number of gray scales. If the Entropy value is 0, it happens when image pixel value is constant. Maximum value of entropy depends on value of the grayscale. The entropy can explicitly be written as :

$$H(X) = - \sum_{i=1}^n P(x_i) \log_b P(x_i)$$

Figure 1: Entropy Formula

where H is Entropy, and b is the base of the logarithm used. Common values of b are 2. P(xi) is the probability of x (random variable). In this project, entropy calculation formula can be written as :

$$E = - \sum_{i=0}^{255} P(i) \log_2(P(i))$$

Figure 2: Entropy Formula for this Project

Note :

E = Entropy Value

P(i) = Incidence Probability

In the entropy calculation, the index start from 0 and maximum index is 255. The logarithmic calculation is using the base 2 logarithm (Log2).