

## CHAPTER IV

### ANALYSIS AND DESIGN

#### 4.1. Analysis

In this program, there are several problems that may occur. The first problem is the position of triangle object of the image that will be tested never be the same with the triangle object of the reference images although it will be rotate in several times. The second problem is if the triangle through many rotate process, the pixel of 255 (white) will disappear so is not formed a perfect triangle.

#### 4.2. Design

##### 4.2.1. Use Case Diagram

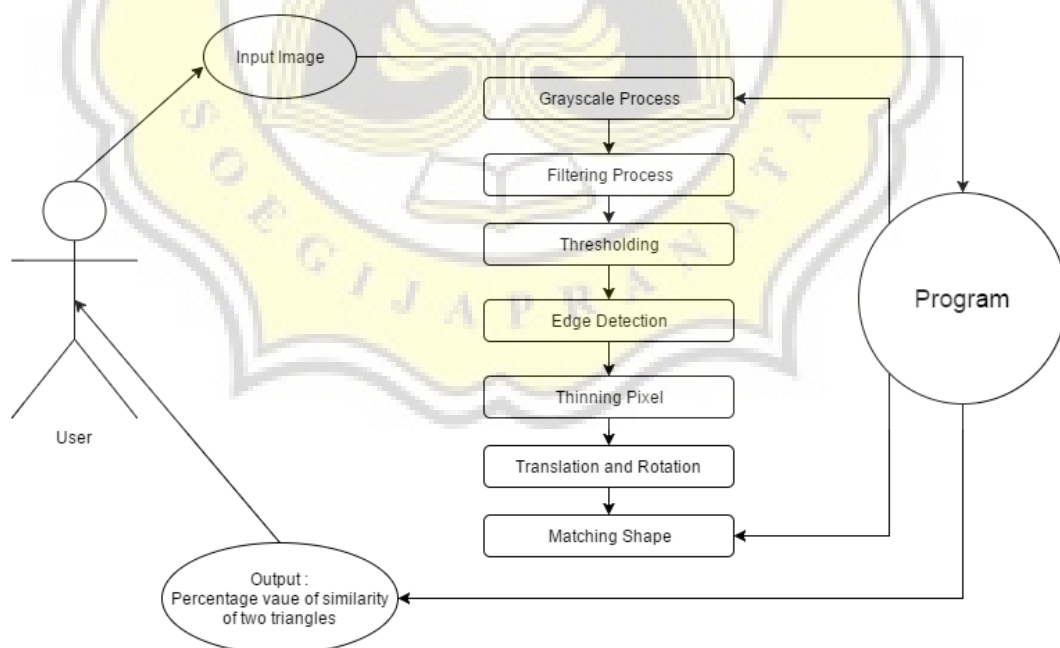


Figure 1 : Case Diagram

In the diagram above shows that the user can use the system that is created in this project with a few steps. The first step, the user must input the triangle image that will be tested. Second, the image will through a series of image processing are handled by the program that is changing into a gray scale image, smoothing the image to decrease the noise, threshold process to get the binary image, edge detection of triangle objects, thinning the edges pixel of the image, translation and rotate process and the last process that matching the shape to determine the percentage value of similarity of two triangles. After through a series of image processing, then program will display the highest percentage value of similarity as output and can be seen by the user.

#### 4.2.2. Flow Chart

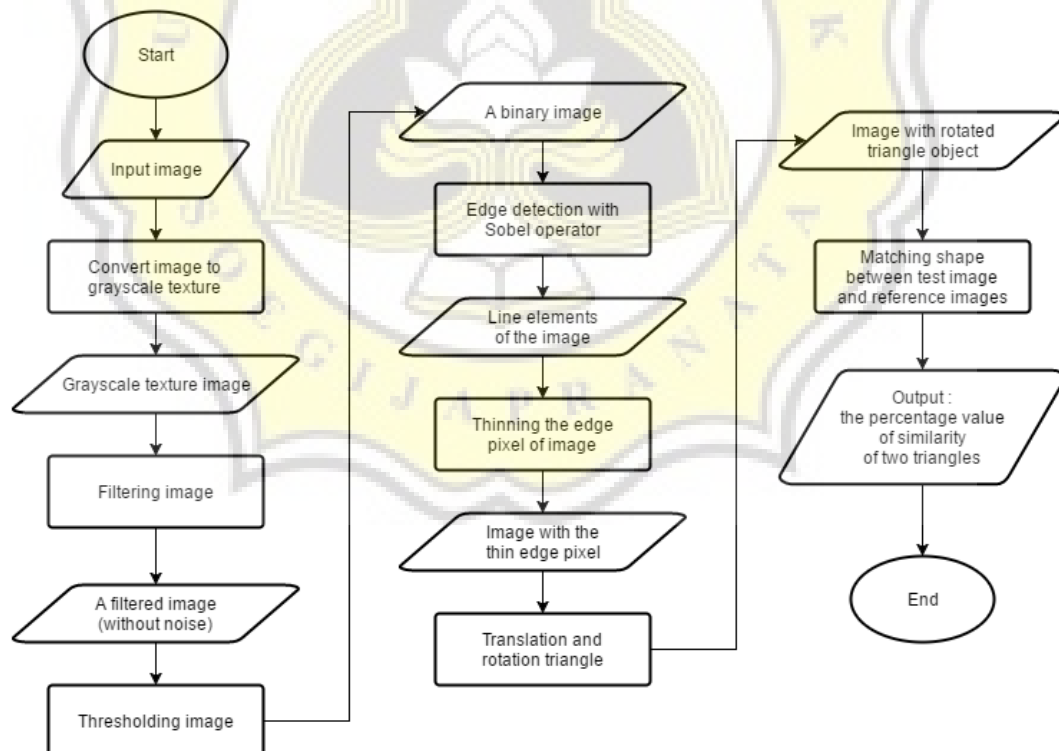
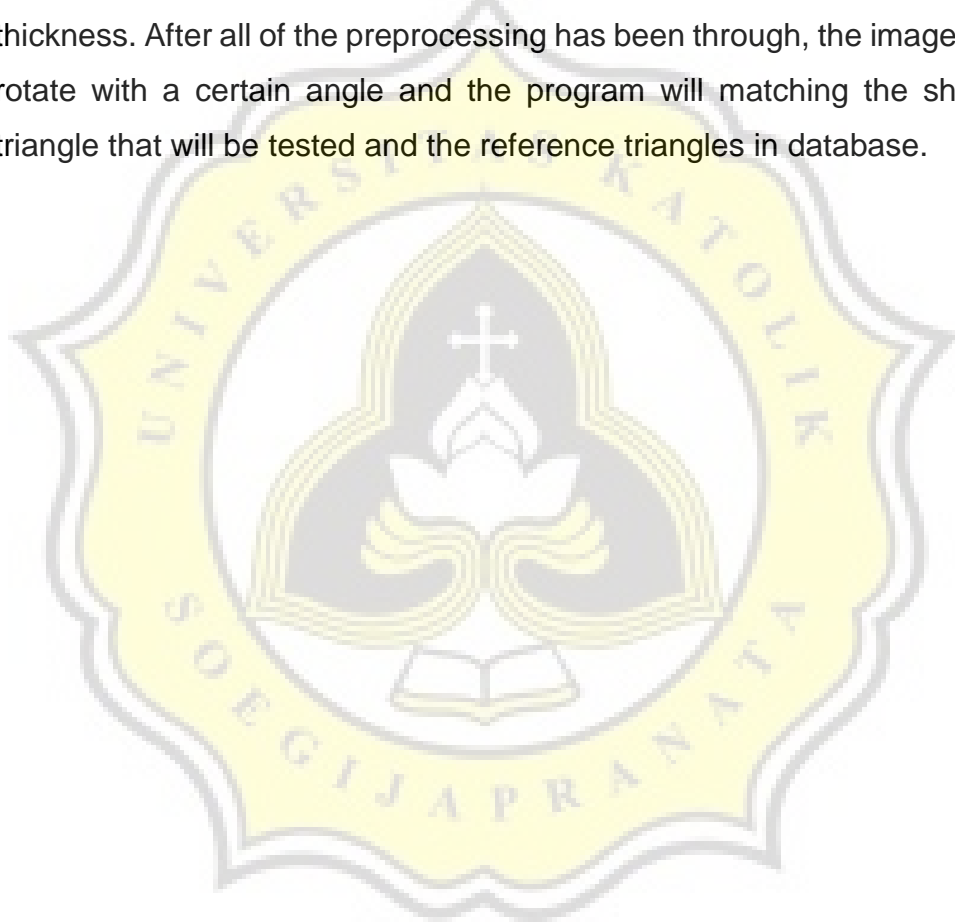


Figure 2 : Flow Chart

In the diagram above shows that the system can be use in several steps. Firstly, user input the triangle image that will be tested. Secondly, the program will process it into gray scale image and will be display as output of gray scale process. Thirdly, the image will through filtering process so decrease the noise at the image. Fourthly, the filtered image will change into a binary image on threshold process. After that, the program will detect the edges of image and thinning the edge pixels so it has only one pixel thickness. After all of the preprocessing has been through, the image will be rotate with a certain angle and the program will matching the shape of triangle that will be tested and the reference triangles in database.



### 4.2.3. Class Diagram

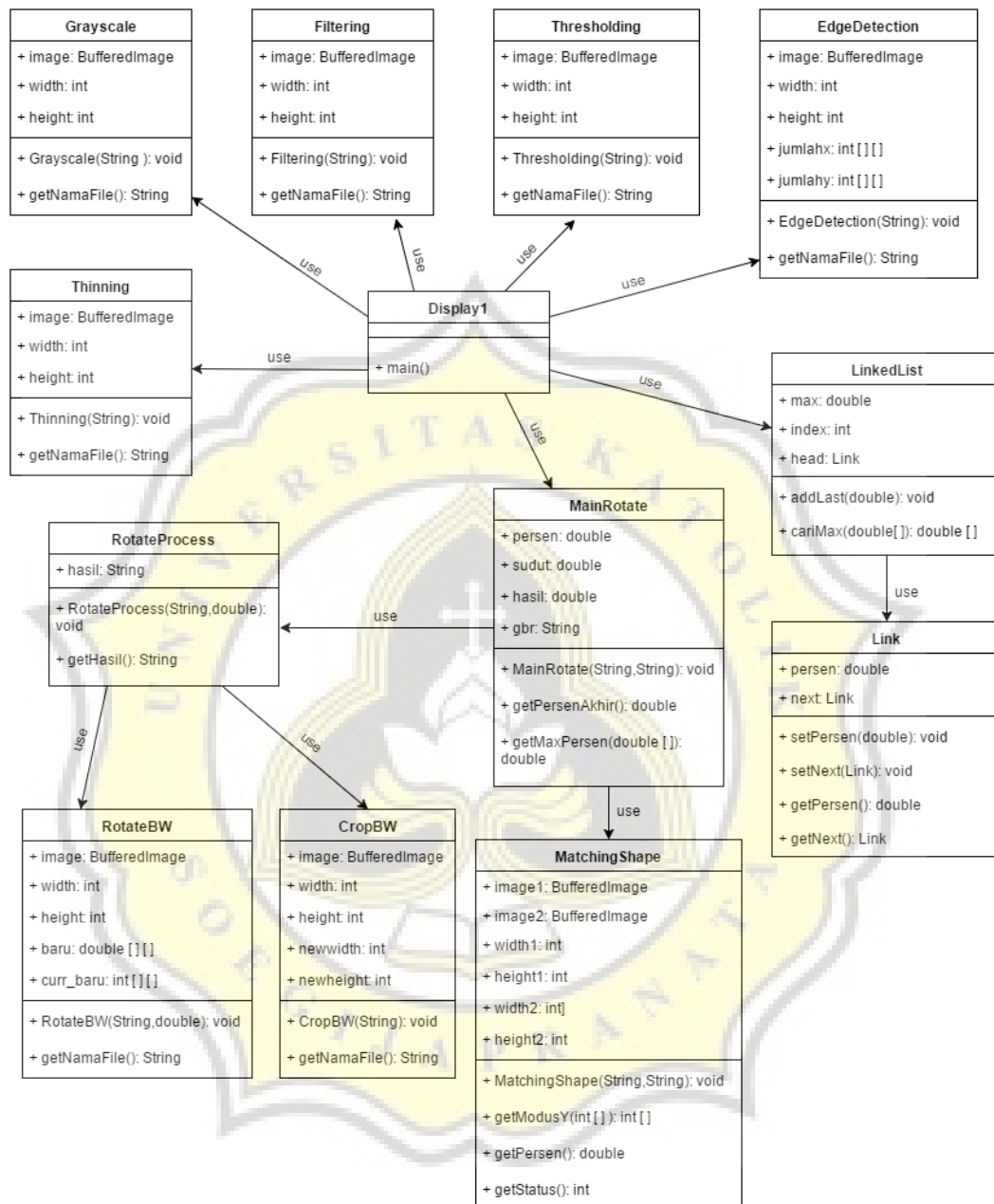


Figure 3 : Class Diagram

#### 1. Display1

The main display of this program as user interface.

#### 2. Grayscale

The class to process image to change into grayscale image.

### 3. Filtering

The class to smoothing the grayscale image to decrease the noise.

### 4. Thresholding

The class to process filtered image into binary image.

### 5. EdgeDetection

The class to detect the edge of the object in the threshold image.

### 6. Thinning

The class to thinning the edge of the object until one pixel.

### 7. RotateBW

The class to translation and rotation the object in the image.

### 8. CropBW

The class to crop the rotated image into original size.

### 9. RotateProcess

The class to process RotateBW class and Crop class.

### 10. MatchingShape

The class to matching the shape of tested image and reference images.

### 11. MainRotate

The class to process RotateProcess class and MatchingShape class.

### 12. Link

The class to create a new node to storage the result of this program.

### 13. LinkedList

The class to link the node that has been created.