CHAPTER 4
ANALYSIS AND DESIGN

4.1. ANALYSIS

In this chapter, there will be an explanation of the methods used to solve the problems in the problem formulation. The main objective to be solved is to do testing by comparing the classification accuracy results of the Support Vector Machine when using Canny edge detection and when not using it.

OpenCV (Open Source Computer Vision) is a library that is usually used for image processing. OpenCV can be used in many programming languages but is most commonly used in Python. OpenCV was first introduced and created by INTEL, a semiconductor company that controls most of the processor market. The OpenCV library was created using the C++ programming language and released in 1999 by Intel Research. OpenCV library is used in this research to help the segmentation process with canny edge detection.

The dataset used in this research is a leaf image that has been grouped by the plant. The captured image should be as clear as possible, and there should be no shadows or other objects except the leaf itself. these conditions must be observed because lighting, shadows, and other objects can interfere with the image segmentation process.

First, all images are read using a method called *cv2.imshow()* from the OpenCV library. After the images are read, all images are resized to 200 * 200 pixels using the *cv2.resize()* method so that all images have the same size. The next step is image segmentation using Canny edge detection to extract the leaf edge pattern. After passing through edge detection, the results of image segmentation will be labeled one by one and stored in a ***Pickle*** file. Then, the data is reloaded and separated between features (binary) and labels (class). After that, the data will be divided equally as test data and train data with several ratios. Then the data will be classified using SVM with different cost parameters and kernel parameters set to Radial Basis Function. For analysis, we compare the accuracy of the classification results before and after using Canny Edge Detection.

4.2. DESIGN

In image processing, sometimes we only want to process certain objects in an image. Therefore, it is necessary to do image segmentation which aims to separate the foreground from the background. In general, the output of image segmentation results is binary where the desired foreground will be worth 1 and the background that you want to remove will be worth 0. In image segmentation, there are several methods, one of which is edge detection. Edge detection is one of the most researched image processing. This process is often placed as the first step in image segmentation applications with the aim of recognizing the overall image context. Edge detection has many types of methods including Roberts, Prewitt, Sobel, and Canny. In this research, I used canny edge detection to identify the boundary of the leaf image as the first step after reading the image dataset

Support Vector Machine (SVM) is one of the supervised learning methods usually used for classification and regression. Basically, a Support Vector Machine is a classification algorithm that separates two classes using a hyperplane by maximizing the distance between the classes. For any data that is not separated by a hyperplane, it is called non-linear data. Usually, non-linear data is separated by irregular curves. But for non-linear data, SVM is difficult to classify the data. For that reason, a kernel trick is created to help the classification process. The way kernel trick works to map the non-linear data and convert it into a high-dimensional. There are several kernel tricks in SVM including the linear kernel, polynomial kernel, radial basis function (RBF) kernel, and sigmoid kernel. In addition to the trick kernel, there are also 2 other parameters that are often used to influence the hyperplane, namely the Cost (C) and Gamma parameters. In this research, the trick kernel used is RBF and the parameter used is the Cost parameter.

The flowchart below is the foundation for building programs in this project.

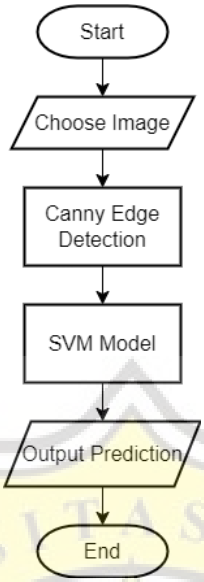

Figure 4. 1 Flowchart GUI

According to the flowchart above, the first thing to do after the program begins is to input or select a picture as test data. Once the picture has been inserted, the picture will be processed through an edge detection process by the Canny algorithm. Once the edge detection results have been obtained, the picture goes through the model that has been created to obtain the prediction results and the results will be displayed.