

**VISION SYSTEM BASED PRODUCT SORTING MACHINE**

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**This report is submitted in partial fulfillment of the requirements for the award of  
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**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**  
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## **DEDICATION**

Special dedication to my husband, my loving family, and my kind hearted supervisor  
Mr. Khairul Azha Bin A. Aziz and also dearest friends.

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## ABSTRACT

This project was discussed about the ‘Vision System Based Product Sorting Machine’, is targeted to be operated using webcam as an object detector and based system to analyze and classifications object. The application will involve a one software and computer where will be a based system and able to monitor and control sorting process regardless they are in real or not real time. The big part of the project will be the programming (probably using Matlab). This system uses morphological based approach and neural network method to identify, recognize and classify the image. The webcam takes a picture object or model and based system converts that image into respective black and white picture and analyzes the image using morphological based approach and neural network. The final outcome of this system recognition reached values up to 100% for the bottles classify and also the overall computing time is comfortably short.

## ABSTRAK

Project ini membincangkan tentang merekabentuk sebuah projek yang di beri nama ‘Mesin Pengasingan Produk Berdasarkan Sistem Penglihatan’ yang menggunakan kamera sesawang sebagai pengesan objek dan sistem untuk analisis dan pengkelasan objek. Kegunaannya akan melibatkan komputer dan perisian yang bertindak untuk mengawal process pengasingan tanpa menghiraukan objek tersebut dalam keadaan bergerak atau tidak. Perkara yang mungkin paling susah adalah membina satu aturcara (Matlab). Kegunaan aturcara ini adalah untuk memproses gambar di mana projek ini menggunakan kaedah morfologikal dan jaringan untuk proses pengesanan, pengecaman dan pengkelasan objek. Kamera sesawang yang digunakan akan mengambil gambar objek yang kemudiannya ditukarkan kepada gambar hitam putih dan melakukan pemprosesan gambar dengan menggunakan kaedah morfologikal dan jaringan. Di akhir projek ini, sistem ini boleh digunakan dan keputusan bagi pengecaman objek mengikut klasifikasi mencapai 100% dan penggunaan masa untuk keseluruhan proses adalah singkat.



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## CHAPTER I

### INTRODUCTION

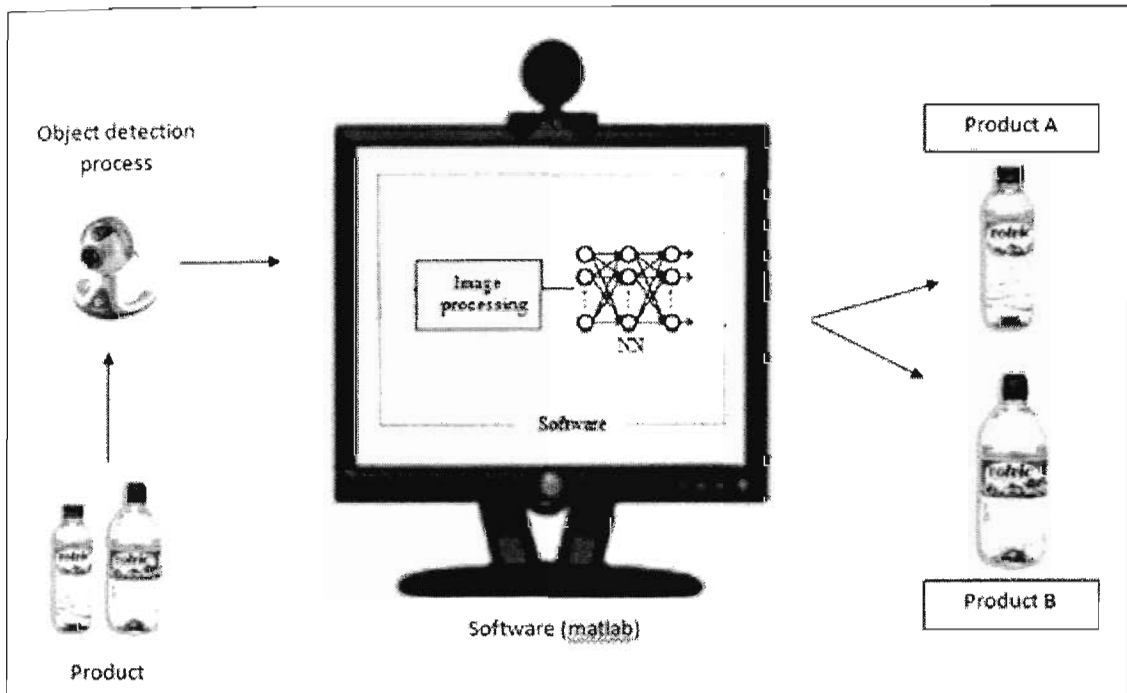
#### 1.1 Project Background

Vision System Based Product Sorting Machine is a project which is design to sorting object by used computer vision system. This project can identify and sort product using based system in real time or not real time. For example for a production line that runs with 2 models, the systems can differentiate between model A and B and then separate these models.

The application for this project will involve webcam as image detector and Matlab software as based system that use to separate the product based on image detection. For this project, morphological based approach and neural network method is use for image analysis and objects recognition.

Matlab is use as the platform of choice for implementation of this project because it is available in most Colleges and in the university. Matlab has excellent facilities for numerical computation and visualization, and there are many useful toolboxes (e.g. for image processing, statistics, optimization, neural networks). For reasons of runtime efficiency, it might however be appropriate to implement part of the

required functionality in a lower level compiled language such as Java or C++ and integrate such modules into Matlab by means of the Matlab compiler package.



**Figure 1.1: Overview of project**

Figure above explained the operation followed in this system which is given as;

The Webcam will be use to detect the object in real time or not real time. It will capture the models and send the data into the based system. Image pre-processing will run in system (matlab) which is here, the image will be converting to grey scale image from a color image before filtering process (thresholding and edge detection) has been done. Then, the neural network was apply in recognition process by define the models based on classification. Due to this process, the output image from image pre-processing will be input image to neural network and this input will be compare with the train data that already done. The result will analyze and separate the product based on image detection.

## 1.2 Project Objective

The objective for shape classification is to recognize the input object based on classification. This project is to design a system which can detect two objects and separate the object based on classification. The input of the system will be a two object image with multiple shapes. Besides that, this project also aimed to meet the following objectives;

- To apply Matlab programming for shape classification.
- To study and do a research in the field of image processing for sorting system.
- To develop a sorting based system using Matlab software.
- To design a system which can detect two objects and separate the object based on classification.
- To recognize the input object based on classification.
- To generate data analysis, exploration and visualization on shape recognition and classification.

## 1.3 Scope of the Project

All projects have their own scope or limitation as a guideline throughout the completion of the project. The project scope for implementation this project is Study and Research which is get as many information about this project from books, internet, journal, and also from the supervisor so that more knowledge can be obtained. This project also covers design software which is Matlab program to interface hardware computer in develop a system that can identify, sort and separate product. Then, construct the program to make sure that the program has error or not. Other aspects such as the marketing of the system will not be covered in this project.

## **1.4 Problem Statement**

The ability to classify object based on color or visual appearance creates a quality-control limitation in many manufacturing sectors, including the sorting of object such as bottle and plastic. When sorting is performed manually, it is subjective and prone to error. To automate the task, Vision System Based Product Sorting Machine is developed; a technology that the company says can reproduce human behavior in object-classification tasks and produce proper time consuming for sorting process. In real time and using a neural network, it can identify classification criteria such as shape, and size and separate the object based on classification.

## **1.5 Report Structure**

This report contains of 5 chapters that explain detail about this project. The first chapter is introduction of the project. This chapter contain of project introduction, project objectives, project scope, and problem statement.

The second chapter is literature review about sorting system information, image pre-processing, Neural Network and Matlab. This chapter discuss about source or article that related to the project.

The third chapter is Project Methodology. This part will give details about method used to solve the problem to complete the project.

The fourth chapter is about result and discussion of the project where finding and analysis throughout the research and project development from this project has being explained and lastly chapter fifth is conclusion. The overall conclusion of this project is showed.

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## **CHAPTER II**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter will explain and discuss the sources or articles that are related to the project. It consists of the information about the machine vision and computer vision, the theory of the Matlab software, image processing, neural network and parameters that is used in the project. From literature review, there will be an analysis concerning the advantages and disadvantages for neural network and sorting system method in this project.

#### **2.2 Machine Vision and Computer Vision**

##### **2.2.1 Machine vision (MV)**

Machine vision is the application of computer vision to industry and manufacturing. It being an engineering discipline is interested in digital input/output devices and computer networks to control other manufacturing equipment such as robotic arms. One of the most common applications of Machine Vision is the inspection

of manufactured goods such as semiconductor chips, automobiles, food and pharmaceuticals. Just as human inspectors working on assembly lines visually inspect parts to judge the quality of workmanship, so machine vision systems use digital cameras, smart cameras and image processing software to perform similar inspections [8].

### **2.2.2 Computer Vision (CV)**

Computer vision is the general discipline of making computers see (understand what is perceived visually). It is the science and technology of machines that see. As a scientific discipline, computer vision is concerned with the theory for building artificial systems that obtain information from images. The image data can take many forms, such as a video sequence, views from multiple cameras, or multi-dimensional data from a medical scanner [8].

### **2.2.3 Pre-processing in Computer Vision**

Before a computer vision method can be applied to image data in order to extract some specific piece of information, it is usually necessary to process the data in order to assure that it satisfies certain assumptions implied by the method [5]. Examples are:

- Re-sampling in order to assure that the image coordinate system is correct.
- Noise reduction in order to assure that sensor noise does not introduce false information.
- Contrast enhancement to assure that relevant information can be detected.
- Scale-space representation to enhance image structures at locally appropriate scales.