UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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PRODUCT IDENTIFICATION FOR STORAGE SYSTEM USING MATLAB

This report submitted in accordance with the requirement of the Universiti Teknikal Malaysia

Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering

(Robotics and Automation) with honours.

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FACULTY OF MANUFACTURING ENGINEERING

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **Product Identification For Storage System By Using MATLAB**

SESI PENGAJIAN: **2012/13 Semester 2**

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I hereby, declared this report entitled "Product Identification For Storage System Using Matlab." is the results of my own research except as cited in the references.

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APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Process) with Honours. The member of the supervisory committee is as follows:

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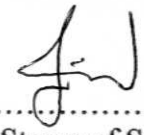

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ABSTRACT

The aim of this project is to develop an identification system in products storage using image processing. The project is based on Matlab software program to develop interface in the system and will be integrated with a webcam or a digital camera. The system is able to identify images taken using the webcam products. This article storage system consists of storage shelves and a webcam was placed on a 2-axis vertical platform which will then interface with Personal Computer (PC). The motor on the camera platform will rotate the pulley which will then move the camera to the front of the compartment that required by the user. The system will analyze the acquired images and displays information about the product in a graphical user interface. It is hoped that the results of this project will expand the technology in the storage system and at the same time will be given the benefit to industry.

ABSTRAK

Tujuan projek ini adalah untuk menghasilkan satu sistem simpanan yang berkeupayaan mengenalpasti produk dengan menggunakan pemprosesan imej. Projek ini adalah berdasarkan program perisian Matlab untuk membangunkan antaramuka pada sistem dan akan dihubungkan dengan webcam atau kamera digital. Sistem ini dapat mengenalpasti imej produk yang diambil menggunakan webcam. Sistem simpanan barang ini terdiri daripada rak penyimpanan dan webcam yang telah diletakkan pada platform menegak 2-paksi yang kemudiannya akan berantara muka dengan Komputer Peribadi (PC). Motor pada platform kamera akan memutarkan takal yang kemudiannya akan menggerakkan kamera ke hadapan ruang simpanan yang dikehendaki oleh pengguna. Sistem ini akan menganalisis imej-imej yang diperolehi dan memaparkan maklumat mengenai produk pada antara muka pengguna grafik. Adalah diharapkan bahawa hasil projek ini akan memajukan teknologi dalam sistem penyimpanan dan pada masa yang sama akan memberi manfaat

DEDICATION

Special Dedication to my family members, my friends, my fellow colleague and all faculty members for all your care, support and believe in me.

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Thank You.

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INTRODUCTION

1.1 Project Background

There are various types of storage system in the industry either multilevel yacht in port, car parking system and products sorting in the warehouse. One of the most important things in a storage system in the industry is to identify products that are available at the place of deposit. Intelligent of a storage system is dependent on the competence to carry out identification products. There are various methods or systems used in identification of product in the storage system.

This project is about developing storage system to identify the product using a vision system. The storage system consists of a storage rack and webcam that were placed on 2-axis vertical platform then will be interfaced with Personal Computer (PC). The motor on the camera platform will rotate the pulley which will then move the camera to the front of the compartment that required by the user. The function of the webcam was to detect the products that are available in the storage rack. The direct USB connection is used to make the connection between the PC and webcam at storage .The software that used in this project is a MATLAB software. In the software there are two important parts that concentrated on which are real time image processing and graphical user interface (GUI) to display the product information for the user. With the invention of this project, it can improve the performance of storage systems by adding the

intelligence of the system because it is not only to identify the product, but also allows users to see the actual condition of the products available in the storage location.

1.2 Problem Statement

Nowadays most of the storage system use Barcode and Radio Frequency Identification (RFID) to identify the products. This is because this system can overcome the shortcomings found in the manual system. This two method makes the process of identifying, monitoring and record storage more effective because it allows the data to be recorded automatically when the product arrive. The use of both systems requires attachment tag and barcode label on the product. But this method can lead to issues where the efficiency of both systems requires adhesion tag or barcode on each product. The scanner is required to read and identify the information contained in it. This situation sounds easy, but in a real situation it will cause difficulties to attach a tag or barcode on each item. The more intelligent technology required for detection of the storage system without detector tag attachments on each product. The project is supposed to solve the problems described on the top. This system is used only one programmed camera and connected to a computer system to identify items that are available in the storage area.

1.3 Project Objectives

The main objective of this project is to develop alternative ways of product identification by using a computer vision system. This project also includes the design and develop the product identification for storage system.

1.4 Project Scope & Limitations

- This storage system is specialized to identifying the geometric product by using a webcam to acquiring images in real time.
- Design program by using MATLAB for product identification.
- Develop graphical user interface (GUI) using image processing commands in MATLAB.

1.5 Project Outcome & Benefit

- Easier for users to find and identify the products that are available in the storage.
- Reduce the cost associated with labor, time and efficiency.
- Can be applied to almost all types of products in storage.

1.6 Project Gantt Chart

TASK NAME		WEEK															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
STAGE 1 (PSM1)																	
1.Planning	1.1 Project flow planning	■	■														
2.Information gathering	2.1 Storage System			■	■												
	2.2 Identification technique					■	■	■									
	2.3 Software development							■	■								
3.Proposed system	3.1 Hardware									■							
	3.2 Software										■	■	■				
	3.3 Identification processing											■	■	■			
	3.4 System integration													■			
4. Submission report															■		
5.Presentation																	■
STAGE 2 (PSM 2)																	
1.Hardware development		■	■														
2.Software Development				■	■	■	■	■	■	■							
3.System integration										■	■	■					
4.Testing and analysis													■	■			
5.Submission report															■		
6.PSM 2 Presentation																	■

Table 1.1 Gantt Chart

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter describes about the literature review which is focused on the research and information about the project. Every facts and information which is found through journals or other references will be compared and the better methods have been chosen for this project.

2.2 Storage System

According to University Press Oxford Dictionary 2012, 'storage' means space available for storing something, in particular allocated space in a warehouse. While the 'system' means a set of things working together as parts of a mechanism or an interconnecting network: a complex whole. What can be summarized for 'storage system' is the use of several mechanisms, such as hardware, software or a combination of hardware and software for the purpose of storage an item. The figure below refers to a conventional storage system which is frequently used today.

Figure 2.1 : Conventional storage system

2.2.1 Requirement of Storage System

The storage system is very important especially in the industry. A good storage system depends on the effectiveness or the ability of the system to facilitate the users in its operation. All storage should have a system that is able to record data about the product in storage. This is intended to facilitate the user to control the input or output and also for the purpose of storage security.

2.2.2 Storage System

The storage system which can improve the efficiency of storage and transportation of goods, is widely used in different kinds of corporations. The current storage which are often operated manually usually include palletizing robots, carton flow order picking systems, automated guided vehicles, rotary storage cabinets, and automated storage and retrieval systems (AS/RS). The main shortcoming of the current warehouse is that the efficiency of its storage and retrieval systems is very low, which is also a bottleneck to restrict the development of automated warehouse. However, this project focused on the process of identifying products available in the storage system. In

order to improve the detection of the products in the storage/retrieval, automated storage used in the design of storage systems. (Xue, 2011)

There are different types of transportation in a storage system. It includes Automated Storage and Retrieval Systems (AS/RS) , Automatic Guided Vehicles (AGV), Carousels and a Vertical lift module. Its use is dependent on the load weight, size and height required to be carried by the system. All type transportation system has been described above is commonly used in various material handling applications that require complete automation. Figure Automatic Guided Vehicles (AGV) below are an example of an automated transport system in a storage system.

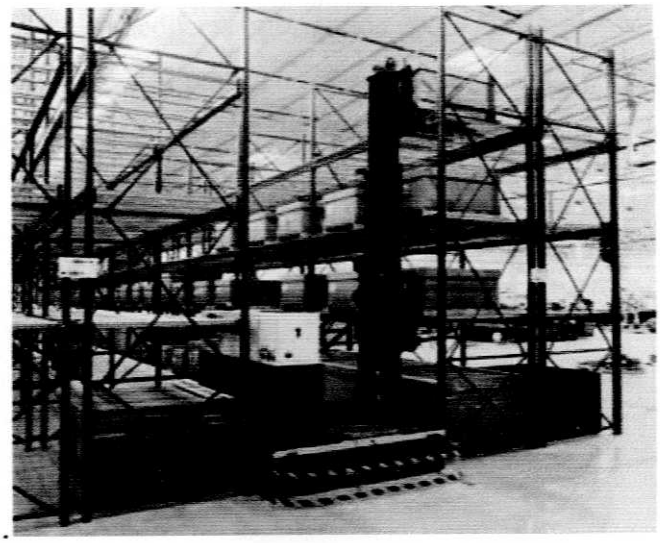

Figure 2.2: Automatic Guided Vehicles (AGV)

2.3 Product Identification Technique

There is also a large variety of solutions to the object or product recognition problem, producing a wider still range of results, depending on the domain of the problem, the sensor hardware, the lighting conditions and the object to be identified. (Reinaldo A. C. Bianchi). With automation technology there are several methods that can be used to identify the products.

2.3.1 Radio Frequency Technique

RFID stands for Radio Frequency Identification, which is a wireless communication technology that is used to uniquely identify tagged objects or people . RFID systems have been widely used in many application areas, such as inventory control, product tracking through manufacturing and assembly, parking lot access and control, container or pallet tracking, ID badges and access control, equipment or personnel tracking in hospitals, etc. RFID systems use radio waves to transmit information from an integrated circuit tag through a wireless communication to a host computer. These systems consist of three components that are the tag (transponder), the reader (interrogator) and the host computer (controller). The reader communicates with the tags in its wireless range and collects information about the objects to which tags are attached. RFID has the following main components.(Silva, 2008). Figure 2.3 below refers RFID system that consists RFID tag, antenna, reader and computer host.

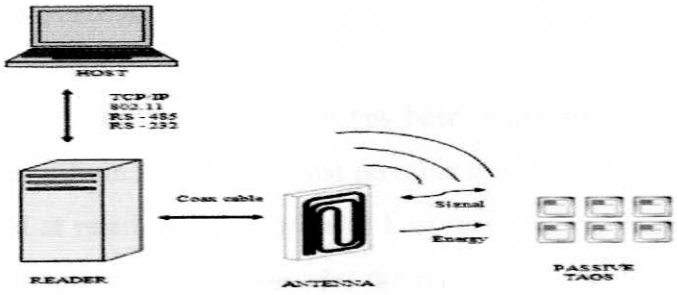

Figure 2.3: RFID System (Silva, 2008)

The table below refers to the advantages and disadvantages of the RFID technique in product identification.

Table 2.1 RFID advantages and disadvantages (Kamran AHSAN1, 2010)

Advantages	Disadvantages
• High Speed • Multipurpose and many formats • Reduce manpower •High accuracy •Complex duplication •Multiple reading (tags)	• Interference • High Cost •Some material may create signal problem •Overloaded reading (fail to read)

2.3.2 Bar Coding Technique

The bar code is a visual depiction of information in the form of bars and spaces on a surface. The bars and spaces are different widths and consists of numbers, characters and symbols such as dot, colon and others. Different combinations of these alphanumeric characters are used to depict information. There are various types of barcodes in use today. (Brain, 2000)

The successful barcode technology has been constantly improving in order to accommodate most information in the least possible space. Today barcodes are widely used on books and at retail stores in order to keep track of the products available and easy checkout of the products. The barcodes are read using scanners using laser beams or cameras. (Seideman, 1993)& (Yen, 2001).

Figure 2.3 was shows the basic components of Barcode systems and concepts Barcode label/ Transponder