COMPUTER VISION BASED BARCODE READER FOR HALAL JAKIM
VERIFICATION SYSTEM

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"Saya akui laporan ini adalah hasil kerja saya sendiri kecuali ringkasan dan petikan yang tiap-tiap satunya telah saya jelaskan sumbernya."

Tandatangan   : …………………………………..
Nama Penulis   : MOHD NIZAR BIN ZAINUN
Tarikh   : 6 JUNE 2014

"Saya/kami akui bahawa saya telah membaca karya ini pada pandangan saya/kami karya ini adalah memadai dari skop dan kualiti untuk tujuan penganugerahan Ijazah Sarjana Muda Kejuruteraan Elektronik (Elektronik Komputer)."

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To my beloved parents Zainun Barahim and Maimunah Chin, my family and all my fellow friends.

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ABSTRACT

At present, many people are looking for applications that can facilitate and launch their daily life. The industry technology began to pay more attention to barcode application for domestic users need. This thesis describes an android application for Muslims to identify the Halal Status (prepared in accordance to Islamic law) of the product. The barcode images is need for preprocessing in order to extract the barcode into the database and also barcode recognition process. A Computer Vision Based Barcode Reader For Halal Jakim Verification System is a low cost barcode reader, which is develop by using Android developer. Barcode are a class of the simplest printed patterns that can be reliably recognize by a computer vision or an any operating system. These codes consist of sequence of parallel, light and dark stripes printed on papers. This is a real time application that requires high processing time. This is the main reason for using the language JAVA for the development this project.The objective is supported by several sub-objectives, namely to gain knowledge of Java Eclipse, Android versions and able the development of an algorithm for Smartphone on Android. This project consists of analysis, scematic design, system development and testing. The purpose is to determine the basic flow and system testing of the barcode scanner. The halal jakim database is also develop in this system. In conclusion, a new system for Halal status checking was develop for new android application.

ABSTRAK

Pada masa kini, ramai orang yang mencari aplikasi yang dapat memudahkan dan melancarkan kehidupan harian mereka. Teknologi industri mula menumpukan aplikasi barcode. Tesis ini menerangkan applikasi android untuk umat Islam mengenalpasti status Halal (sesuai dengan undang-undang Islam) sesuatu produk. Gambar kod bar digunakan untuk teknik preprocessing untuk mengekstrak kod bar tersebut ke dalam pengkalan data dan proses pengecaman. Sistem Visual Komputer Berdasarkan Pembaca kod bar untuk Pengesahan Status Halal Jakim merupakan sistem kos rendah yang dibina menggunakan pembina android. Kod bar adalah bahan yang paling mudah dicetak oleh komputer atau mana-mana sistem operasi. Kod-kod ini terdiri dari rangkaian selari, garis-garis terang dan gelap dicetak di atas kertas. Ini adalah aplikasi masa nyata dan memerlukan masa proses yang tinggi. Sistem ini menggunakan perisian JAVA dalam melaksanakan projek ini. Objektif disokong oleh beberapa sub-objektif, iaitu menimba ilmu mengenai *Java Eclips,*versi android dan algorithma untuk Android. Projek ini terdiri daripada analisis, reka bentuk skematik, pembangunan system dan ujian. Tujuannya adalah untuk menentukan aliran dan sistem ujian asas pengimbas kod bar. Pengkalan data halal JAKIM juga dibina di dalam sistem. Kesimpulannya, system baru untuk semakan status halal telah dilaksanakan.

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LIST OF ABBREVIATION

JAKIM	-	Jabatan Kemajuan Islam Malaysia
1D	-	One dimensional
2D	-	Two Dimension
SQLite	-	Structured Query Language
EAN	-	European Article Numbering
UPC	-	Universal Product Code
JVM	-	Java Virtual Machine
FDS	-	Flex Data Services
AIR	-	Adobe Integrated Runtime
API	-	Application Programming Interface
SDK	-	Software Development Kit
ADT	-	Android Developer Tools
GUI	-	Graphical User Interface
IDE	-	Integrated Development Environment
OS	-	Operation System
UI	-	User Interface
CPU	-	Central Processing Unit
PIN	-	Personal Identification Number
PC	-	Personal Computer
IDE	-	Integrated Development Environment
JDK	-	Java Development Kit

CHAPTER 1

INTRODUCTION

1.1 Project Background

Nowadays, almost all products have its unique barcode numbers. It represents loads of information about a product. Many people familiar with halal food issue. Other popular applications of bar code include the logistic industry and domestic consumer food monitoring. The android application has the potential of changing the consumer business landscape in the near future. Also it has opened up exciting new channels for any type of products identification using mobile technology. Meanwhile, Halal consumer products have become a crucial concern that affects Malaysian's Muslims as well as around 1 .5 billion Muslim throughout the world. The word Halal is an Arabic term meaning "permissible". It is important to understand that Halal is a unique comprehensive Islamic concept encompasses the matters of food and drink, and all other

matters of daily life. In Malaysia, Jabatan Kemajuan Islam Malaysia (JAKIM) is responsible for Halal certification. It covers consumer products such as foods, drinks, cosmetics, etc. Each of these must pass the JAKIM requirements for Halal Certification. JAKIM department was provided SMS (Short Message System) to user know about the food status only send the food barcode and get the response in real time.

For this application from this project (Computer Vision Based Barcode Reader for Halal Jakim Verification System), user can know the food status only scan the barcode image to capture by camera .To make food reorganization processes become more effective, this proposed system is developed to make more systematic a consistence. It also keeps all the data about the food on the database.

By developing this system, it can upgrade to replace the current system for example it is provide with database to store all the information about the food. The barcode will be applied for this system and the barcode which capture by smart phones camera to give the food status .With the barcode on food, the identification of it will be more efficient and systematic.

1.2   Problem Statement

A lot of the existing products in the market use Halal Malaysia label without getting the certification from JAKIM. Thus, the halal status cannot be trusted just by looking at the label of product. In addition to this problem, some products still use the Halal Malaysia label even though the certification has expired. JAKIM has provided e-halal using web-portal and SMS to ascertain the halal status. However, both systems have limitations such as the need of internet access for the web-portal, consumers must remember the SMS number for verifying via SMS using mobile phone. Both systems are costly and need to key-in the product barcode manually for authentication. This system helping consumers to overcome these limitations by verifying halal status verification easily.

1.3   Objectives

The objective of this project:

1. To design barcode recognition system using image processing algorithms
2. To analyze the recognition rate of the image processing algorithm.
3. To construct Halal system verification system using the barcode images captured.

1.4   Scope of Project

The scope of the project is as following:

1. Type of barcode use is 1D barcode.
2. This project concentrates on the process of detection barcode and calls the data.
3. Eclipse software will be used to develop the algorithms barcode scanner and application.
4. SQLite (Structured Query Language) will be used to manage the details data.

1.5   Methodology of Project

- Analysis some related project, study and analysis the existing project.
- Design specification of detail framework that chooses in Android.
- System development of project.
- System testing the performance.

1.6   Thesis Organization

This report contains five chapters. Chapter one describe about introduction of *Computer Vision Based Barcode Reader For Halal Jakim Verification System*, problem statement of the project, objective of the project, the purpose of the project that describe the reason for developing this project, scope of the project and organization of the report.

Chapter two is literature review about the barcode system available, types of barcode, and Halal Jakim system available. This chapter review on previous research about the topic related to the project. Various methods and approaches that related to the project is discussed and reviewed.

Chapter three explains the theory of this project. This project theory includes Java Language, Android Architecture, SQLite and algorithms. This chapter will review the basic theory about application software, language, and management software.

Chapter four explains the methodology of the project. This project will used Java Android algorithms techniques to read the barcode and use the SQLite database management system to store all data. The flow chart of the project and the algorithms use is explained in this chapter.

Chapter five is about results of the Java Android simulation and discussion regarding the results. Analysis about scan the barcode in different condition will be discussed. Lastly, chapter six will conclude the project findings and recommendation for the further study.

CHAPTER 2

LITERATURE REVIEW

2.1   Introduction

A barcode is an optical machine-readable representation of data relating to the object to which it is attached. Originally barcode are systematically represented data by varying the widths and spacing's of parallel lines, and may be referred as linear or one-dimensional (1D). Later, they evolved into rectangles, dots, hexagons and other geometric patterns in two dimensions (2D). Although the 2D systems use variety of symbols, they are generally referred to as barcodes as well. Barcodes are "printed horizontal strips of vertical bars used for identifying specific items"[1].Barcodes originally were scanned by special optical scanners called barcode readers. Later, scanners and interpretive software became available on devices including desktop printers and smart phones. Many mobile applications that incorporate barcode reader have been developed in various areas such as blood bank [2], product recommendations [3], and logistic [4].

Figure 2.1 : European Article Numbering (EAN)-13

The European Article Numbering (EAN)-13 barcode is used internationally for tagging retail goods [5] (figure 2.1). The usage of barcode technology has provided enormous benefits to consumer and business. As a result, the process of capturing product data (price, etc.) is faster and more accurate. Mistakes are minimized and managing inventory has been much easier.

EAN-13 barcode has 13 numeric characters, also known as digits. The first two or three characters are the country code. Depending on the length of the country code; it followed by either nine or ten characters for manufacturer code and product code. The 13t character of the EAN-13 barcode is the checksum digit [6].

2.2 Categories of Barcode

Barcodes have now become an essential part of almost company. It is rarely to find a product without a barcode tag. Different types of barcodes are used for different purposes in business sectors. Typical usage of barcodes include tracking sale and purchase of large number of items in an inventory, pasted on sports tickets which allow one to enter a sports arena and often placed on gift tokens that when decoded tells which gift that token corresponds.

2.2.1 One Dimensional Barcodes

One dimensional or linear barcodes are commonly referred as first generation barcodes. A variety of 2D barcode shave been designed that are much better suited for camera acquisition[7],[8], but for the next several years 1D barcode will remain the dominant type of label for most packaged goods. These barcodes consist of vertical lines at specific gaps resulting in a particular pattern. There has been a variety of research done on algorithms for reading 1D barcodes, which we survey, briefly here. Most past work has dealt with scan line data (typically acquired by a laser scanner), using waveform analysis, debluring and other signal processing techniques to detect edges [9],[10],[11]. Hardware scanners are used to scan these patterns and decode the information stored in those particular patterns. These barcodes are also commonly called discrete, one dimensional or UPC barcodes. Commonly the 1D barcodes are:

Code 39

Figure 2.2: Code 39

Code 39 (also known as 3 of 9) is by far the most common barcode symbology outside the retail area and is read by most scanners, although it is not as compact as Code 93 or Code 128 (Figure 2.2). The normal Code 39 scheme encodes both numbers and upper case letters, and was the first alphanumeric symbology. Code 39 is a discrete, self-checking symbology - so the gap between ciphers may be larger than a unit space. Some users mistake that inter-cipher gap for a space and become concerned because it is not the same size as in another barcode representing the same characters.

Code 93

Figure 2.3: Code 93

Code 93 (Figure 2.3) is a variable length, continuous symbology using four element widths with each character consisting of three bars and three spaces. Code 93 was designed to complement Code 39 and is a more compact code than the latter. Code 93 is not a self-checking symbology.Code 93 symbols include two Mod 47 check characters.Special codes are used to allow full ASCII characters to be incorporated,