HALAL FOOD RECOGNITION SYSTEM USING BARCODE

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ABSTRACT

With the steady growth and affordability of webcam, more applications technology is necessary. Nowadays the industry technology began to pay more attention to barcode applications for domestic users need. This thesis describes a webcam support application for Muslims to identify the Halal status (prepared in accordance to Islamic law) of the product. The barcode image is using several images preprocessing technique in order to extract the barcode into database and also barcode recognition process. Halal Food Recognition System Using Barcode is a low cost barcode reader, which was developed by using a simple webcam as the input device. Barcodes are a class of the simplest printed patterns that can be reliably recognized by a computer. These codes consist of sequence of parallel, light and dark stripes printed on papers. This is a real time application and that requires good processing power. This is the main reason for using the language MatLab for the development of the Halal Food Recognition System Using Barcode. The webcam application is an economical and effective way to speed up the Halal verification process. This thesis discusses the barcode concept and its applications in consumer product industry. The experimental results obtained have system able to shown that recognition rates of 68% have been achieved. The result also revealed that the technique is robust and invariant to rotation. For future research and development can be done to improve the percentage of recognition so that zero error recognition is achieved.

ABSTRAK

Dengan pertumbuhan yang stabil dari webcam, lebih aplikasi teknologi yang diperlukan. Teknologi industri lebih menumpukan aplikasi barcode. Sistem ini memberitahu umat Islam untuk mengenalpasti status Halal (sesuai dengan undang-undang Islam) dari produk tersebut menggunakan webcam. Gambar barcode akan menjalankan teknik preprocessing untuk mengekstrak imej tersebut. Sistem ini memerlukan kos yang rendah untuk membangunkannya. Barcode adalah bahan yang paling mudah dicetak oleh komputer. Kod-kod ini terdiri dari rangkaian selari, garis-garis terang dan gelap dicetak di atas kertas. Ini adalah aplikasi *real time* dan memerlukan daya proses yang baik. Sistem ini menggunakan perisian Matlab dalam melaksanakan projek ini. Aplikasi webcam merupakan cara yang ekonomi dan berkesan untuk mempercepatkan proses pengesahan Halal. Tesis ini membahaskan konsep barcode dan aplikasinya dalam industri produk kepada pelanggan. Keputusan yang diperolehi ialah menunjukkan bahawa 68% kejayaan telah dicapai. Keputusan ini juga menunjukkan bahawa teknik ini dapat memberi keputusan yang tepat dan sistem ini juga dapat membaca imej walaupun dalam keadaan terbalik . Untuk kajian akan datang, sistem ini dapat memberi peningkatan dengan meningkatkan peratusan kadar bacaan dan ketepatan dalam mendapatkan keputusan yang tepat.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

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 webcam 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 (حلال) 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, the Department of Islamic Development (JAKIM) is responsible for Halal certification. This approval can only be issued by JAKIM. It covers consumer products such as foods, drinks, cosmetics, etc. Each of these must pass the JAKIM requirements for Halal Certification.

Now, the 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 Halal Food Recognition Using Barcode 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 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

Before this in market, we quick familiar hear with scanner barcode and barcode food also. The barcode scanner only knows about the price of product. The big problem using barcode is if a barcode becomes scratched or crumpled the reader may not be able to read it also. For this system using camera to scan the barcode image. The administrator (JAKIM) keeps the barcode detail to database, using camera to catch the barcode image to know about the food status. This image can match the data food from the database. 2D imaging scanners are the fourth and newest type of barcode reader currently available. They use a small video camera to capture an image of a bar code. The reader then uses sophisticated digital image processing techniques to decode the bar code. Video cameras use the same CCD technology as in a CCD bar code reader except that instead of having a single row of sensors, a video camera has hundreds of rows of sensors arranged in a two dimensional array so that they can generate an image.

1.3 Objective

Base on the problem statement that was founded, the objectives are achieved in the develop this system:

i. Improve barcode recognition rate.
ii. Implement the webcam into barcode recognition system

1.4 Scope

i. Implement the new barcode system into HALAL food recognition system.
ii. Using line detection algorithm to improve recognition rate.
iii. To integrate a standard protocol to webcam application between barcode system.

1.5 Thesis Organization

This thesis consists of six chapters (6) that will explain each of part of the system. Chapter one (1) will briefly explain about the overview of the entire project including the objective, scope and problem statement.

Chapter two (2) will explains about the manual process of the Halal Food Recognization Using Barcode System and background of the project studied.

Chapter 3 is the methodology of developing the application, it also details about the system life cycle that start with project identification, project planning, analysis, design, implementation and maintenance. It also explains about the software and hardware that will be used during develops the system.

Chapter 4 will explain about the coding of the system and discuss about the structured language (sql) that will be used. System must have the right function so that it

will be some complete system. Sequential and right coding must be written in systematic way.

Chapter 5 is about the output or result about Halal Food Recognization Using Barcode Syatem.The weakness of the system will be identified. The result and recommendation of the system will be discussed for further research of the system.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Nowadays, computer application almost synonyms that have brought changes for the better, practically in every area where they have found an application. For the barcode, its very important area of application of computer technology, especially in the area manufacturing, distribution, as well as in the development of management information system.

A barcode is a code in a printed form, which can easily read by a machine connected to the computer and the codes in the labels can be stored in the computer database. The machine readable codes that the computer can reproduce directly into the bit streams zeros and ones, which is the machine language of all computer also known as the digital language.

Barcode is the most popular automatic identification technology used in many applications. A barcode is a machine-readable code of a series of bars and spaces printed

in defined rations, whose principle function is to convey data, and symbologies are sets of rules that relate those patterns to their encoded message.

The barcode keep the information about country code, manufacture's name, the product details, etc. In fact the amount of information that can be stored in these labels is limited by the choice of the symbology. It can vary from a few characters in the linear bar code symbology to hundreds or even thousands of character depending on the type of symbology used.

In industry barcode, to read the barcode, they use a photo sensor to convert the barcode into electrical signal that the signal moves across the barcode. The scanner also can measures the bars and spaces then translate the different patterns back into regular characters, then sends them to computer .

2.2 Barcode Background

Beginning with 1932, when an ambitious project was conducted by a small group of students headed by Wallace Flint at the Harvard University Graduate School of Business Administration. The project proposed that customers select desired merchandise from a catalog by removing corresponding punched cards from the catalog.

Barcode was first used commercially in 1966, however, it was soon realized that there would have to be some sort of industry standard set. By 1970, the Universal Grocery Products Identification Code or UGPIC was written by a company called Logion Inc. The first company to produce barcode equipment for retail trade use (using UGPIC) was the American company Monarch Marking in 1970, and for industrial use, the British company Plessey Telecommunications was also first in 1970.

UGPIC evolved into the U.P.C. symbol set or Universal Product Code, which is still used in the United States. George J. Laurer is considered the inventor of U.P.C. or Uniform Product Code, which was invented in 1973. In June of 1974, the first U.P.C.

scanner was installed at a Marsh's supermarket in Troy, Ohio. The first product to have a barcode included was a packet of Wrigley's.

2.3 Advantage and disadvantage using barcode

Firstly improve operational efficiency, barcodes is faster and more accurate recording of information, the process can move quickly and can detect accurately. Its needed quite a bit of time can be spent tracking down the location or status of projects, folders, instruments, materials, or anything else that moves within an organization. Its can help you keep better track then you can save time and respond more quickly to inquiries and changes.

Secondly save time, depending on the using this application, time savings can be significant. The most dramatic examples involve the beloved chore of taking inventory is often. The barcode have the ability to process the data by the computer system, resulting in saving time not only of the customer but also the management.

Thirdly reduce errors, clerical and data entry errors can be a significant source of costs and related problems are extra freight costs, unhappy customers, and time spent to track down problems. Its also economics because of the speed and reduction of the error in data entry, users can save time and costs. Its obtain more accurate and reliable information is an added advantage for the management in cost cutting.

Fourthly cut cost because barcodes are effective tools that can be used to address specific, localized problems or integrated into organization-wide information systems. When applied with thought and planning they can save time and reduce errors, resulting in a reduction of costs.

Fifthly benefit from customer or regulatory requirements, regulatory agencies or your customers may impose labeling requirements that you must meet. While these requirements may be a necessary part of doing business, you can save time and money by utilizing the barcodes within your own operations. For example, you can collect

shipping manifest information quickly and accurately by scanning the barcode labels that you printed to satisfy the customer.

There are some disadvantages in these kinds of barcode readers. These disadvantages includes that the barcode has to be manually oriented towards the laser beam to get the barcode value, high cost and the harmfulness for the user from the exposure to the laser beam. In the recent past several techniques and algorithms have been proposed for vision-based barcode reading. These Include two-step paradigms of image feature extraction method, Hough Transformation, Neural Networks Method, Texture Analysis and Mathematical Morphology for barcode localization within the image and Selective Sampling method, EM Algorithm and Statistical Pattern Recognition for decoding the sequence.

2.3.1 Advantages of RFID versus Barcodes

RFID tags and barcodes both carry information about products. However, there are important differences between these two technologies. Barcode readers require a direct line of sight to the printed barcode RFID readers do not require a direct line of sight to either active RFID tags or passive RFID tags.

RFID tags can be read at much greater distances an RFID reader can pull information from a tag at distances up to 300 feet. The range to read a barcode is much less, typically no more than fifteen feet.

RFID readers can interrogate, or read, RFID tags much faster read rates of forty or more tags per second are possible. Reading barcodes is much more time-consuming; due to the fact that a direct line of sight is required, if the items are not properly oriented to the reader it may take seconds to read an individual tag. Barcode readers usually take a half-second or more to successfully complete a read.

Line of sight requirements also limit the ruggedness of barcodes as well as the reusability of barcodes. Since line of sight is required for barcodes, the printed

barcode must be exposed on the outside of the product, where it is subject to greater wear and tear. RFID tags are typically more rugged, since the electronic components are better protected in a plastic cover. RFID tags can also be implanted within the product itself, guaranteeing greater ruggedness and reusability.

Barcodes have no read or write capability that is, you cannot add to the information written on a printed barcode. RFID tags, however, can be read or write devices the RFID reader can communicate with the tag, and alter as much of the information as the tag design will allow. RFID tags are typically more expensive than barcodes, in some cases, much more so.

2.4 Type of barcode

To understand the contents of barcodes or be able to produce own barcodes one has to understand the barcode symbology. The symbology is very much a like a language defining how different combinations of various wide bars and spaces shall be interpreted. There are many different barcode symbologies, one- dimensional or two-dimensional, fixed-width or multi-width, each with various properties such as data density or type of data stored, all designed to fulfill a specific purpose.

The symbology also defines properties such as, Quiet Zone, a quiet area around the barcode to avoid interference with surrounding textures. Start and Stop Patterns, speeds up the localization of the barcode.

Aspect Ratio, defines the relations between width and height of the whole symbol and the different widths of bars and spaces. Parity and Redundancy, ensures a low error rate and enables damaged barcodes to be read.

Bar code systems can use several symbologies. A symbology is equivalent to a language. Each symbology has strengths and weaknesses. Many symbologies are around for historical or political reasons, while others have definite technical advantages.

2.4.1 One Dimensional barcodes

It is employed in low information content applications like product index registry (e.g. automatic price tagging and inventory management), or serial number registry (e.g. test-tube tagging in automated medical tests). Two-dimensional barcodes are used in applications that require more information contents like mail addresses (for automated mail reading and distribution systems), or compressed content of a printed page (to avoid the need for optical character recognition.

i. Numeric-only barcodes

Figure 2.1: Numeric barcode

ii. Alphanumeric barcodes

It is graphical patterns composed usually of dots. They are rendered using two-toned dots (e.g. black dots on a white background), and occupy, usually a rectangular area. Two-dimensional barcodes incorporate various registration and fiducially marks, enabling automated identification, and accurate registration of the barcode, which might be read-in in arbitrary orientations. In addition, two dimensional barcode systems employ various error correcting codes for reliable automated retrieval.

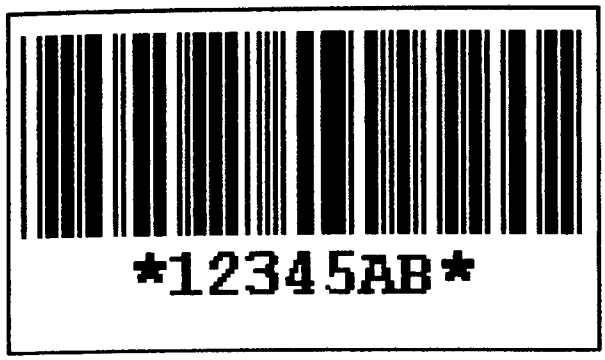
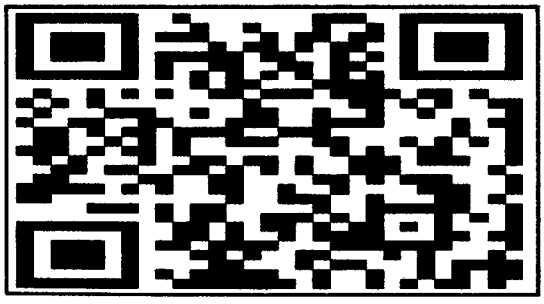


Figure 2.2: Some types of barcode, 2D

2.4.2 Two - Dimensional barcodes

It is graphical patterns composed usually of dots. They are rendered using two-toned dots (e.g. black dots on a white background), and occupy, usually a rectangular area. Two-dimensional barcodes incorporate various registration and fiducially marks, enabling automated identification, and accurate registration of the barcode, which might be read-in in arbitrary orientations. In addition, two dimensional barcode systems employ various error correcting codes for reliable automated retrieval.



Figurev2.3: Two - Dimensional barcodes

2.5 The Physical Reader

A physical barcode reader is considered to contain two separate elements: the input device and the decoder. These two elements can either be separated into two different

physical units or they can both be in one single unit. The input device includes the electro-optical system and the camera system, while the decoder equals the processor.

2.5.1 Input Device

There are different ways to read a barcode: by a scanner, using a wand or a vision-based `device. All these devices share a common structure in how the reading process is performed. The user either holds the reader over the barcode or holds the barcode image in front of the reader. All approaches scan a line across the .Barcode and measure the intensity along the scan line. High intensity corresponds to a bar and low intensity corresponds to a space. If the scan line does not cross the entire bar code, the code will not be read. Then, another line must be scanned such that the barcode is converted. The user has to ensure that the scan line is in the right direction and that it covers the entire bar code.

i. Scanner

A scanner is usually a handheld device and is often used in the retail industry. In some cases, the scanner is stationary and the user places the barcode in front of the beam, like in the supermarket. The scanner either moves the beam over the code by itself or the user has to move the beam over the barcode. In the second case, the user has to be able to move his hand with some skill. The handheld device must stay at the same distance from the barcode while the beam is moved over the code. A scanner does not have contact with the barcode.

A handheld, moving beam scanner has a large advantage over a fixed beam scanner. It can scan with a much higher frequency, up to 40 scans per second, and almost no operator skill is required. There is another type of handheld scanner that uses a raster laser scan pattern to read 2D symbols.

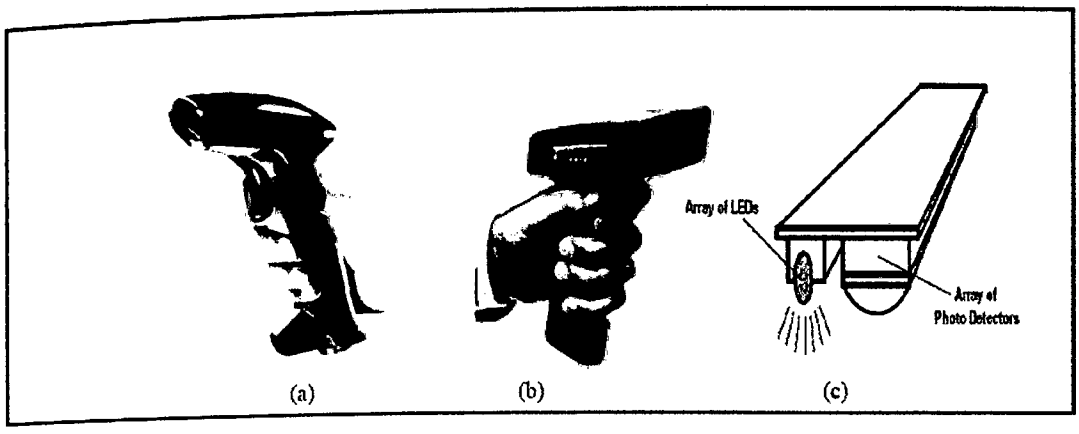


Figure 2.4: (a) Laser Scanner, (b) CCD Scanner, (c) CCD Sensor by a lens

ii. Wand

A wand is a handheld device with a fixed beam that physically touches the barcode. The reading device of the wand is in the tip and the wand looks like a pen that is moved over the barcode. The user has to provide the moving motion of the beam, and therefore, some operator skill is required to use wand. The hardest thing is to move the wand at the right speed and to not make too high accelerations.

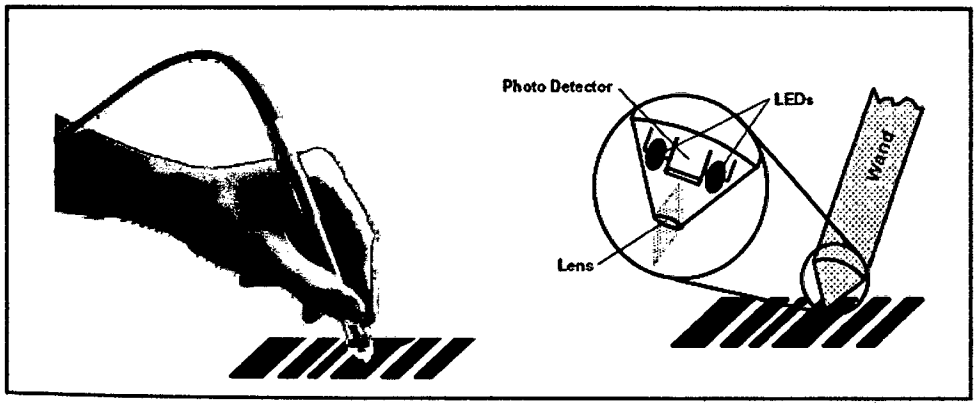


Figure 2.5: Pen-Type Reader

iii. Vision-Based Scanning

Vision-based scanners use a camera to read the barcode. An image is taken over the barcode area and is then analyzed so that the code can be decoded. This technique has an advantage over the others when reading 2D-symbols. It is not as fast but more accurate and thus better to use in some applications, than the other two techniques. The performance and symbols available for decoding have been evaluated.

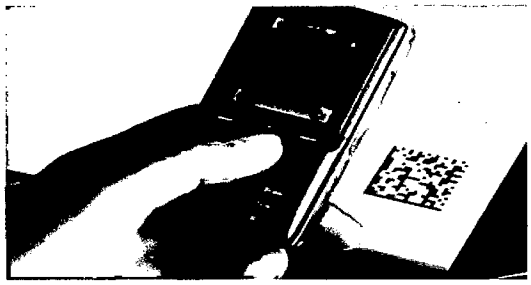


Figure 2.6: Some camera can use to read barcode

However, there are many kinds of a camera using with other devices. There are built–in cameras, wireless camera and digital card camera. The most of modern Smartphone's and PDA's have built-in camera. This the camera usually used with PDA to take a picture, video, etc.

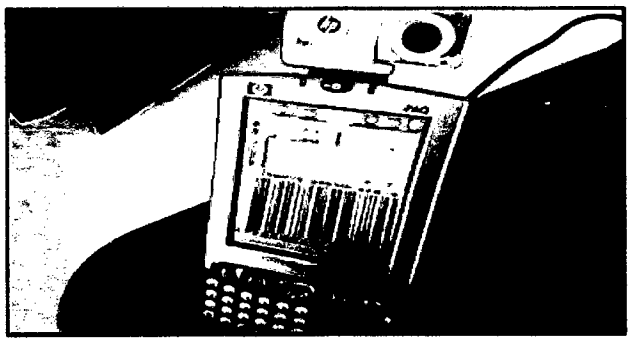


Figure 2.7: Digital camera card can read barcode (Photosmart mobile camera)