Implementation of Mobile Application for Product and Shelf Life Management Based on 2D-Barcode

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Abstract

2D barcodes have successfully captured people's attention among mobile applications by capturing images from various devices without hardware modification processes, and providing a possible mechanism for bridging the physical world of printing and the cyber world of the Internet. Therefore, this study suggests a mobile-based product and shelf life management application that uses barcodes to manage various products and their shelf life. The suggested system implements barcode data identification through a mobile camera device, with product categorizing and expiry date notification service on mobile devices. Compared to the RFID-based solutions of existing systems, the suggested barcode-based mobile application does not need any special hardware and it can capture barcodes directly with a mobile camera system, with very limited computing resources and without the need for keyboard input, so that the focus is on designing an effective product and shelf life management system to ensure that users use the purchased products more efficiently and appropriately.

Keywords: Mobile Application, Product and Self Life Management, Barcode Identification

1. Introduction

The importance of Radio Frequency Identification (RFID) has been emerging since several years ago, with RFID solutions being developed in various areas such as logistics, distribution and security. The RFID technology needs hardware of tags, readers and antennas suitable to the developed solution. The tag consists of antennas and integrated circuits, and it records information in the integrated circuit and sends information to the reader via the antenna. This information is used to identify an object to which the tag is attached. That is, it has similar functions to those of the barcode.

The difference between the RFID system and the barcode system is that the RFID system uses radio wave in decoding instead of light. Therefore, it can read the tag in a remote distance, unlike the barcode reader that works only in a short distance, with the RFID being able to receive information, passing through any objects between the system and the tag.

Nevertheless, current 2D barcode-based mobile applications have been studied in many areas.

2D barcodes in mobile application have caught people's attention for several reasons. First, because the camera phone essentially captures 2D images and directly captures 2D barcode images, it can be used as a 2D barcode scanner unlike the previous laser-based 1D barcode scanners that need hardware modification. Second, it is equally important that 2D codes provide enough high speed to provide a mechanism capable for
bridging between the physical world of printing and the cyber world of the Internet. In particular, the most common purpose of 2D barcodes is to make it easier to access online information about the products and services that have been advertised in print media such as magazines and posters [1].

So far, people have been gradually realizing the importance in the value of the largest application program in M-commerce because of 2D barcodes. 2D barcodes can allow for new effective input channels for mobile customers possessing built-in cameras and mobile devices. The syntax and semantics of 2D barcodes make it a popular method for displaying mobile data. 2D barcodes support an efficient approach with a new interaction between mobile customers and wireless application systems. 2D barcodes have been used for various purposes in mobile commerce [2].

Barcode-based mobile applications [1, 3, 4], digital watermarking [5, 6], mobile commerce barcode applications [2], and identification of information services in museums or zoos [7] have also been suggested by many researchers.

Compared to the RFID-based solutions of existing systems, the suggested barcode-based mobile application does not need any special hardware, and it can also capture barcodes directly with a mobile camera system, with very limited computing resources and without the need for keyboard input, so that the focus is on designing an effective product and shelf life management system to ensure that users use the purchased products more efficiently and appropriately.

Therefore, this paper suggests a commodity management application that uses the mobile-based barcode to manage various products and their expiry dates systematically. The suggested system implements barcode data input, barcode recognition, product category classification and expiry data notice information service through the mobile camera device. In addition, the performance of the framework is evaluated on basic components in the architecture of the suggested barcode-based mobile application suggested in this study.

This study consists of the following: In Section 2, existing barcode-based applications are researched and in Section 3, a mobile application is suggested for managing 2D barcode-based products and shelf life. Section 4 addresses implementation results and analysis and Section 5 presents a conclusion and references.

2. Barcode Application

As barcodes have become widely recognized, the market's need for using barcodes to secure its information storage capability has also increased.

In particular, QR code is categorized as a 2D metrics code and it was a 2D barcode invented by the Japanese corporation, Denso Wave. Barcodes have become popularized due to its reading speed, accuracy, and outstanding features.

QR code can save much more information than 1D barcode. Also, QR code can encode numbers, alphabet letters, Chinese characters, kana, hiragana, characters, binary digits, control codes and many other kinds of letters [5].

The special features of QR code are high-speed reading, high capacity, error correction and structured append. If a symbol is contaminated or damaged, it can recover the symbol with its error correction function [6].

E. Ohbuchi [8] shows the implementation of the restructured image for EAN / QR barcode to a new algorithm and a mobile phone, with the used mobile phone system consisting of a camera, mobile application processor, digital signal processor (DSP) and display device, with the original image captured by the built-in camera device.

Peizhuo Lv et al [9] analyzed in detail with regards to a new mobile computing technology on automated identification of 2D barcodes, an approach important for this study's objective. This technology will ensure that mobile computing on 2D barcodes, the
3rd generation mobile phone's remarkable ability, and powerful operation performance of
the data processing center are capable of being performed anywhere, anytime.

Jinwook Huh [10] solves localization and exploration problems by using 2D barcode.
The suggested method for tracking position has significant benefits in terms of costs and
its appearance. In addition, it suggests navigation algorithms by using phase structure and
errors that may take place on each node that are independent from each other, which can
be accurately compensated for by using barcodes after several searches.

H. Kato et al [3] studied the necessity of global 2D barcode standards for camera phone
applications.

J. Z. Gao et al [2] described the importance of the influence of 2D barcodes in mobile
commerce and with wireless applications, and reviewed existing innovative strategies of
2D barcode activation mobile application program systems. Due to the rapid progress of
2D barcode technology, people have discovered various application programs in M-
commerce [11]. Wireless advertisements and marketing-2D barcodes have since become
one of the most cost-efficient forms of advertisement and marketing tools. By using a
mobile camera phone, the customer can easily enter 2D barcodes from the product
advertisements (posting all) and find more product information from barcodes. 2D
barcodes activate mobile applications that support 2D barcode creation and management
technology, cost-efficient and easy-to-use scanners that can perform their work with
mobile 2D barcode readers and mobile devices, and various mobile application programs
and M-commerce services.

3. Mobile Application to Manage Barcode-based Products and Shelf life

We may have many experiences in throwing away daily necessities because we do not
manage their expiry dates carefully. Therefore, we suggest a commodity management
application that uses the mobile-based barcode to manage various products we purchase
in daily life and their expiry dates systematically.

3.1. System

The overall system structure suggested in this study can be seen in Fig. 1.

To register a product by using mobile phone, the user adds products through UI or
takes a picture of the product's barcode with the mobile camera device and registers
the product through barcode recognition. Barcode recognition is performed through the built-
in SQLite database in Android [12]. In addition, barcodes can be identified by the user's
mobile phone camera, which can capture 1D barcodes and classify them into barcode
types. There are various barcode types including ISBN, UPC-A, UPC-E, EAN-8, EAN-
13, Code 39, Code 93, QR Code, etc. Conversion process from barcode to numbers is
performed and are then saved in the database. After commodity registration, they are
classified by categories. Through this process, the user can systematically manage his/her
products. Based on the registered products, the user can manage their expiry dates. Since
each product has a different expiry date, it is necessary to set up the expiry date for each
category automatically. Before the expiry data elapses, the user is notified through the
notice service.
3.2. Mobile Application Processing

This section describes the system's processing of product registration with a mobile phone and efficient shelf life management.

A camera system and an application processor are essential components for this system. The application processor operates product registration, barcode identification and real-time decoding. With this system, the user can control the camera's position and determine the capture timing. Therefore, mobile application processing for product management is as follows:

Step 1. Product registration or addition is conducted using the following two modes in a mobile environment. In the first mode, the user directly inputs and adds the item names and related information on the products he/she has. In the second mode, the user sets the barcode reader application to the barcode reader mode, captures the products' barcodes and registers products through barcode identification. Barcode identification is performed through the SQLite database embedded in Android. As each barcode has its own unique ID, products can be identified with barcode numbers extracted from it. Therefore, the user can identify barcodes with the smartphone camera and register them quickly. During this process, the user saves each product's information in the database and imports and registers products through barcode numbers.

Step 2. If the registered product's barcode is a 1D barcode, the user finds a barcode location from the captured images and searches for a barcode type. Once a specific barcode type is analyzed and interpreted without any problem, the process to convert from barcode to numbers is completed. The user transmits these converted numbers to the database, receives information from the database and then searches information on the applicable barcode. Through searching, the user receives information on the applicable product (name, manufacturer, category, etc.) from the database. Through this process, the user can register products only through capturing of barcodes and retrieving information saved in the database without the need to directly input information about the applicable product.

Step 3. Registered products will be registered with the application for each category. Various products are categorized according to item so that products owned by the user can be easily searched for.

Step 4. Shelf life is managed for each product type. As each product type has a different shelf life, the system automatically establishes shelf life for each category. As
the user no longer needs to calculate each product's shelf life and input information, the application becomes more convenient to use.

Step 5. If any registered product's shelf life becomes expired, the user will be notified of it due to the notification service that the application supports. As each product has a different shelf life, if a product is registered and its opening date is entered, the system will calculate its shelf life automatically and provide notifications if the shelf life has expired.

4. Implementation Results and Analysis

This paper suggests a product management application that uses mobile-based barcodes to systematically manage various products and their shelf life. In addition, it implements mobile applications such as barcode data input according to mobile camera device, barcode identification, product categorizing and expiry date notification service.

For testing environments, this study used Java Language and Eclipse developmental environments on a Microsoft Windows 7 operating system and Android SDK API 4.4.2, API ZXing-1.6 and an SQLite database. As for smartphones, it was experimented on a Samsung SHW-M250s Galaxy S3.

The user interface of the product management application can be seen in Fig. 2.

Fig. 3 shows the results of product registration, sorting by category and support of an expiry date notification service by using barcodes. (a) In Fig. 3 shows how to input products by the user as a function to register products and (b) in Fig. 3 illustrates how to input using barcode-based identification.

Fig. 4 shows the user interface for barcode filming. Through database interlocking with SQLite, the user's products are divided under each category.

![Figure 2. Interface of the Product Management](image-url)
Fig. 5 shows the user interface for shelf life management. When the user registers a product, each product's expiry date is automatically calculated based on the entered opening date.
5. Conclusion

People increasingly purchase various products throughout their daily life and they now need to manage all those products more efficiently. Therefore, in this paper, we propose a mobile-based application for efficient management of products suitable for the needs of modern society.

Existing RFID-based product management systems need appropriate tags, readers and antennas. But, as this study suggests a barcode-based product management application through use of a mobile camera, the user can manage products and their shelf life efficiently without the need for special hardware.

Through a simple function to add products through barcode recognition, expiry date notification and category classification, and efficient management and economic consumption are all possible. By attempting to become distinguished from existing applications, this system ensures that the user can utilize their purchased products more efficiently and usefully.

References


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