

## **Features and Applications of QR Codes**

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### **Abstract**

*QR code refers to the expansion of another one-dimensional readable bar code based on one-dimensional bar code, which uses black-and-white rectangular pattern to represent binary data, and the information contained in it can be obtained after being scanned by the equipment. Like the previous one-dimensional bar code, two-dimensional bar code is widely used in commercial activities, especially in high-tech industry, storage and transportation industry, wholesale and retail industry and other industries that need cheap and fast labeling information for goods.*

**Keywords:** QR code, characteristic, application.

### **1. Overview of QR code**

The concept of bar code originated in the United States in the 1940s. It is a milestone in the research of human image information carrier in modern times. From the earliest use in supermarket commodity records to the marking and data tracking of various items. However, the information carrier form of one-dimensional bar code through bar and empty arrangement and combination has great limitations in the content and quantity of stored information due to the length identification limitation of bar code, so it cannot store a large amount of information at one time. Therefore, with the development of technology, two-dimensional code, which skillfully uses the concepts of "0" and "1" bit streams that form the internal logic basis of the computer in coding, uses several geometric shapes corresponding to binary to represent literal and numerical information, The type of bar code that can automatically read through image input equipment or photoelectric scanning equipment to realize automatic information processing has become the mainstream of image information carrier in today's information age [1].

### **2. Characteristics of QR code**

#### **2.1 High-density characteristics**

The QR code increases the information density of the bar code by using the horizontal and vertical combination arrangement [2], so that the information density can reach tens to hundreds of times that of the one-dimensional code to accommodate 1100-3800 bytes and 500-1800 Chinese characters. It can also encode text, graphics, sound and other information without relying on the establishment of a database in advance. People can store all or most of the information of things in QR code, which realizes the storage and reprint of information with bar code to a great extent.

#### **2.2 Damage resistance and error correction capability**

The QR code may be missing in various ways in various situations, but due to the error correction function of the QR code, the QR code will randomly generate error correction words when it is generated, so even if there is partial damage or missing, the QR code can still complete the operation. The number of error-correcting words can range from 2 to over 89% of the total number of code words. Therefore, the information can still be restored in the case of a missing QR code as long as it is 49%. In addition, the life span of the printing medium seriously affects the life span of the QR code.

### ***2.3 Prevention of copying and forgery***

The dot matrix arrangement in the QR code graphics cannot be changed after being made, so the QR code on most important documents or articles has uniqueness and anti-counterfeiting, which greatly improves the security and anti-tampering ability of data reproduction. At the same time, in the preparation process of QR code, encryption can be completed by changing the dot matrix arrangement and combination of a certain part, so that producers and visitors without keys cannot correctly read or forge the same type of QR code, which can fundamentally protect the internal information security of QR code and protect the use rights and privacy of users and producers.

### ***2.4 Low cost and easy to produce***

As the QR code is a graphic data file area directly exposed graphic information storage code, can be printed on any printing or printing materials, play a role in the automatic transmission of information, carry and anti-counterfeiting. At the same time, the production of two-dimensional code is very simple as long as the printer can print the media will be able to produce two-dimensional code and its production costs are significantly lower than other ways.

## **3. Application of QR code**

### ***3.1 Anti-counterfeiting field***

#### ***3.1.1 Residence permit***

The official use of two-dimensional code can be high-density, high information content carrying a large amount of data characteristics, so that the machine automatically identifies the authenticity of the residence permit [3]. By entering image information, such as dynamic photos, scanned photos, text, etc., it will be aggregated and verified to create a residence permit unique to each individual. Finally, the data will be compressed and encrypted to produce a QR code for easy identification and portability. The application of the QR code to the residence permit not only makes it easier for the user to carry and not easily lost, but also reduces the human cost of detection and the risk of identification by official personnel. However, a dedicated machine to identify the QR code residence permit is required.

#### ***3.1.2 Railway tickets***

When a railway ticket is sold, the QR code anti-counterfeiting system will combine XSTL software to integrate and encrypt the information of the train number, price and destination ordered by the customer into a QR code and print it on the ticket [4]. When checking in, the ticket inspector only needs to scan the QR code on the ticket with the software identifying the QR code to determine the authenticity. It greatly reduces the tedious workload of ticket personnel and avoids the mistake of thinking. This application will not change the original railway ticket purchase and inspection system, but a convenient and fast way to improve the accuracy, speed up the efficiency of ticket inspection and avoid human errors.

#### ***3.1.3 Cotton inspection***

China has piloted the "CTS-808 two-dimensional bar code system" for recording the inspection data of

different batches of cotton and its data certificate [5]. In this way, when each batch of cotton is circulated to different departments for testing, it is only necessary to scan the two-dimensional code on the batch to know its test results, without repeating the test. This greatly reduces the cost of re-inspection and the consumption of human and material resources, as well as the duplication of data entry and increases the speed of data processing.

### **3.2 Application of the product industry**

#### **3.2.1 Inbound and outbound management**

The new inbound goods are registered to make exclusive labels, and then the terminal management system is used to scan the labels on each goods [6]. When out of the warehouse when the label is scanned again, registered out of the warehouse.

#### **3.2.2 Inventory management**

QR codes can be used to record the inventory of products.

#### **3.2.3 Distribution management**

QR code can be scanned when goods are distributed to obtain details of customer orders, and then the QR code on the goods can be scanned to check the information of the goods and prevent distribution errors.

### **3.3 Application of vehicle management**

#### **3.3.1 Driving license management**

Develop a special driving license two-dimensional code, the vehicle model, color and other basic information saved in the two-dimensional code, easy to access, anti-counterfeiting [7].

#### **3.3.2 The vehicle's annual audit document**

Vehicle audit from the original signature audit to the use of two-dimensional code automated records, to prevent cheating situation.

#### **3.3.3 The vehicle's accompanying information**

The vehicle's annual inspection time, the agency auditor and other information printed on the annual inspection sign, at any time verification.

#### **3.3.4 Vehicle violation punishment**

Traffic police enforcement found vehicle violations, can be used on the palm of the device on the offender's license to read the two-dimensional code, and the violation information registered.

## **4. Development prospect of QR code**

In recent years, with the support of equipment and the improvement of core technology, two-dimensional code in all walks of life is widely used, popular to all aspects of human life, bringing a lot of convenience. From its birth to its continuous growth, QR code technology has been expected in various fields around the world, and the development of QR code presents a prosperous scene.

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