Retraction

Retraction: Cloud Intelligent Parking Management System Based on Internet of Things Technology (J. Phys.: Conf. Ser. 1865 042025)

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This article has been retracted by IOP Publishing following an allegation that raises concerns this article may have been created, manipulated, and/or sold by a commercial entity. In addition, IOP Publishing has seen no evidence that reliable peer review was conducted on this article, despite the clear standards expected of and communicated to conference organisers.

The authors of the article have been given opportunity to present evidence that they were the original and genuine creators of the work, however at the time of publication of this notice, IOP Publishing has not received any response. IOP Publishing has analysed the article and agrees there are enough indicators to cause serious doubts over the legitimacy of the work and agree this article should be retracted. The authors are encouraged to contact IOP Publishing Limited if they have any comments on this retraction.

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Cloud Intelligent Parking Management System Based on Internet of Things Technology

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Abstract. In recent years, with the rapid development of the national economy, the penetration rate of domestic private cars has risen rapidly. There are too many cars with fewer parking spaces, so many people choose to park their cars on roads. It has caused traffic jams and brought security risks, finally it puts a huge pressure on vehicle management. It requires more parking lots and more effective and convenient parking management and operation methods to improve the service level of parking lots [6]. It is necessary to design an intelligent parking system based on the Internet of Things technology and cloud platform to achieve the highest utilization of space resources and the largest allocation rate of personnel deployment. The intelligent parking lot management system of the Internet of Things is designed and developed to meet the goals of enterprise informatization management and efficient operation and implementation. The web platform conducts the joint operation of users and administrators to realize online reservation, parking at any time, and online payment for car pickup at any time.

1. Introduction
As the pace of informatization at home and abroad continues to accelerate, the demand for information is getting higher and higher in the information age, which promotes the rapid development of information of parking lot access vehicle and toll collection. In order to adapt to the ever-changing market and the high requirements for the accuracy and timeliness of information, the parking lot management needs to be more efficient, safe, practical and informatized. The parking lot management system integrates the network, personnel and users, it realizes the informationization of garages, users, vehicles, etc., also it realizes functions such as online reservation and online order settlement, which greatly facilitates managers and users. It brings a more convenient and efficient work mode to garage managers, and provides users with a more efficient and effective platform, which greatly saves users a lot of time for searching and booking parking spaces, thereby it promotes the development of the entire industry and social civilization. This is the significance of the development of the parking lot management system.
2. Key technology

2.1. JavaEE technology
JavaEE (J2EE) Java Platform Enterprise Edition. It can be said to be a specification, a Java development standard, or a framework, which is the most widely used part of Java.

JavaEE uses Java to simplify the development, deployment, and management of complex issues related to enterprise solutions. It has good portability, scalability which has been widely used. JavaEE is currently the most widely used web application development technology [8].

2.2. SSM technology
SSM framework set is a Java framework set integrated by Spring, SpringMVC and MyBatis. It is often used to develop simple web projects.

2.3. Cloud computing data mining technology
Cloud computing is a computing method based on the Internet. The shared software and hardware resources and information can be provided to computers and other devices on demand by this computing method. The “cloud” of cloud computing refers to the resources that exist on the server clusters on the Internet. It includes hardware resources (for example, servers, storage, CPU, etc.) and software resources (for example, application software, integrated development environment, etc.). The local computer only needs to send a demand message through the Internet, and there will be thousands of computers on the remote end to provide you with the resources you need and return the results to the local computer [6].

![SpringMVC work flow chart](image)

Figure. 1 SpringMVC work flow chart

3. System design

3.1. System structure analysis
This system is designed to solve the parking problems in many cities. The system designs and manages the various functions of the entire system through the separation of front and back ends and unified cloud data, which realizes the unified management of the system while the administrators and users display different interface modes.

(1) First of all, the registration and login of the user only need one data table and one entity class. The registration of user is the addition operation of the data in this data table; the login of user is the query operation of the data table data. The registration and login of administrator are similar to user registration and login operations.

(2) The personal data module needs to implement data table query and data update operations.
3. The realization of the parking space reservation module, first of all, the customer should be able to view the real-time status of all parking spaces which whether they have been occupied. The order will be generated immediately after clicking the reservation, so it needs to add data in the order table.

4. The realization of the user pick-up module, which is mainly to delete the order and restore the status of the parking space from occupied 1 to unoccupied 0.

5. Because users will encounter problems when using the system, or they have certain feedback after using the system, it should set the user's message function to facilitate timely feedback to the system and facilitate the update and optimization of system functions in the future.

6. Design and implementation of the administrator system. Most of them are operations such as querying and deleting data in the data table.

There may be a series of problems in the development and design process of each of the above functions. The existing problems need to be repaired and changed. The system should handle certain objectively existing exceptions uniformly, so a unified exception handling mechanism should be designed. For example, in the user registration function module, there may be exceptions such as duplicate user names, non-existent user names, and parking space numbers when booking parking spaces. We will use the unified exception handling mechanism in SpringBoot to solve these problems.

4. System design

The main functions of this system include two parts: the administrator conducts unified, intelligent and networked management of parking spaces, users, vehicles, messages, orders and other information; the client has functions such as checking the real-time situation of parking spaces, booking parking spaces, picking up cars, and leaving messages.

(1) Structure diagram of user terminal function module

(2) Structural diagram of the function module of the administrator

Figure 2 The structure diagram of the system client function module
5. System implementation

To provide a more intelligent, convenient and accurate parking service for car owners is the core goal of this system. The car owner can query the parking lot information near the destination through the mobile terminal of the intelligent cloud parking management platform while he is ready to set off. By learning about the parking lot information near the destination in advance, the car owner selects the most suitable parking lot as the final destination, and then plans the shortest path through the path planning module of the platform. To avoid the problem of parking spaces, the users can bind their vehicle information to the platform account through the mobile terminal, and they can reserve parking spaces in advance by paying a small reservation fee through the parking reservation function. And for information security, this system encrypts the user password through the MD5 encryption algorithm to obtain the password that is finally stored in the database.

Mathematical model

When the degree of vehicle congestion is established, the mathematical model of a single planning is as follows:

\[
\begin{align*}
\max z_1 &= \sum_{i=1}^{n-1} \sum_{j=2}^{n} e'_i (T_j) X_{ij} \\
\max z_1 &= \sum_{i=1}^{n-1} \sum_{j=2}^{n} e'_i p_j X_{ij} \\
S \cdot T \cdot \sum_{j=2}^{n} x_{ij} &= \sum_{i=1}^{n-1} X_{in} = 1 \\
\sum_{i=2}^{n-1} X_{ik} &= \sum_{j=2}^{1} X_{kj} \leq 1, \ k \in [2, n - 1]
\end{align*}
\]
\[
\sum_{j=1}^{n-1} (T_i + TV_i + Tij)X_{ij} = T_i, j \in [2, n] \tag{5}
\]

\[
X_{ij} \in [0,1], i, j \in (1,n) \tag{6}
\]

\[
0 \leq T_i \leq T_{max}, i \in [1, n] \tag{7}
\]

among them:
Equation (1) is one of the objective functions, which requires the maximum vehicle idleness or minimum congestion;
Equation (2) is one of the objective functions, which requires the maximum utility of vehicle space;
Equation (3) means that node 1 is the starting point and node n is the end point;
Equation (4) means that each node can be visited at most once except the start point and the end point;
Equation (5) expresses the constraint relationship satisfied by \( T_j \) and \( T_i \) when passing through \((i, j)\), and \( TV_i \) obeys equation (3);
Equation (6) is a decision variable, which means whether to pass \((i, j)\), 1 means pass, 0 means fail;
Equation (7) represents the range of time.

6. System test
The fundamental purpose of system testing is to test each function before the system is formally put into use, so as to find out in time the problems that have been missed by the developers during the use process or the system operation process, and then to solve and improve them.

6.1. User registration test

| Test number | Test data | Expected result | Test result |
|-------------|-----------|----------------|------------|
| 1           | User name: user Password: 123 | The user does not exist in the database, the registration is successful | Consistent with expected results |
| 2           | User name: user Password: 123 | Duplicate username, registration failed | Consistent with expected results |
| 3           | User name: user Password: 123 | Username does not exist, registration is successful | Consistent with expected results |
6.2. Parking space reservation test

Table 2. Parking space reservation tests

| Test number | Test data                                                                 | Expected result                                                                 | Test result                           |
|-------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------------|---------------------------------------|
| 1           | License plate number: YUNXX1001 Parking space number: P001                | The license plate number is duplicated and the parking space number is already occupied. Booking failed | Consistent with expected results       |
| 2           | License plate number: YUNXX1002 Parking space number: P001                | Duplicate parking lot number. Booking failed                                      | Consistent with expected results       |
| 3           | License plate number: YUNXX1001 Parking space number: P002                | Duplicate license plate number. Booking failed                                    | Consistent with expected results       |
| 4           | License plate number: YUNXX1002 Parking space number: P002                | Do not repeat. The booking is successful and will be displayed in the order list  | Consistent with expected results       |

Table 3. Parking space display tests

| Test number | Test data                                                                 | Expected result                                                                 | Test result                           |
|-------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------------|---------------------------------------|
| 1           | Parking space number: P001                                                | The parking space is occupied. Red is displayed in the table of occupied parking spaces | Consistent with expected results       |
| 2           | Parking space number: P001                                                | Parking spaces are unoccupied, shown in green, shown in the unoccupied table    | Consistent with expected results       |

7. Conclusions
The intelligent parking management cloud platform adopts a distributed architecture design of three subsystems, and realizes the following innovations: (1) Parking space reservation (2) Online payment (3) This article designs an intelligent parking system that integrates sensors, cloud computing, ZigBee technology, data interaction, RFID, mobile internet terminals and other technologies, which intelligently realizes Many functions such as the management of vehicles entering and exiting the parking lot and parking space charging, parking standard management and user terminal management. The intelligent parking system adopts the method of license plate scanning, which saves the time of entering and exiting the parking lot. The mobile phone quickly pays the fee, and solves the problem of users traveling without cash and time-consuming when queue up.

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