The Design and Implementation of Electric Vehicle Sharing and Charging Scheduling Management System Management System

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Abstract: This design is designed to meet the needs of people for short- and medium-distance travel, and develops and designs a management system to serve the business model of shared electric bikes. This design is designed to meet the needs of people for short- and medium-distance travel, and develops and designs a management system to serve the business model of shared electric bikes. management, damage vehicle information, maintenance vehicle records, site information management and other functional modules, to build a fully functional background management system, through the design of the system. functional background management system, through the design of user login registration, vehicle location display, route search, personal information query, information modification, vehicle site information query, maintenance application, points mall and other functional modules, to achieve the end-user service, Users at the same time through Baidu map API to achieve the display of vehicle location and road map planning. Ultimately, to assist merchants in meeting users short- and medium-distance travel on the basis of intelligent, efficient and controllable management.

Keywords: Shared Electric Bicycle; Safety Management; GPS Positioning; Charging Scheduling

1. Introduction

1.1 Background of the subject

The sharing economy is the sum of economic activities that make use of modern information technology, such as the Internet, to integrate vast quantities of decentralized resources and meet diversified needs, with the sharing of the right to use as the main feature. With the continuous development of the sharing economy, a variety of sharing programs have emerged in countries around the world. The emergence of bicycle sharing not only facilitates people's livelihood and promotes green mobility, but also brings the concept of "sharing economy" advocated by the state into full play, which is widely praised by all sectors of the society. With the emergence of climate change and environmental issues, the popularity of electric vehicles is increasing rapidly. Electric vehicle sharing has become an important way to reduce urban traffic congestion and air pollution. This sharing model allows residents and visitors to conveniently rent electric vehicles in cities, thereby reducing dependence on fuel vehicles.

1.2 Introduction to related technologies

This electric car sharing and charging scheduling management system is mainly written in java, jsp language, using Springboot as the framework of the system, MYSQL as the database of this electric car sharing and charging scheduling management system. Some of the technology used in the system: Baidu Map API is a free application interface based on Baidu map service, which can provide basic map display, search, positioning and route planning functions, and is applicable to a variety of devices, such as PC, mobile and server.

2. System analysis and overall design

2.1 Feasibility analysis

This is an electric bicycle sharing and charging scheduling management system for academic research. It is written in JAVA and JSP,

with a MySQL database to handle the data, and based on the Windows Forms framework to simulate the usage scenarios. The system does not require high computer hardware, the server needs to choose a platform with high security, but does not require high performance hardware. After the feasibility study, there is no problem in the development of the system. In terms of economic feasibility, this graduation design was developed by the students themselves, using free study materials and development tools, so there is no additional cost. The later development and maintenance costs are low and do not require a lot of human and financial resources. It is economically feasible as it is based on the basic knowledge completed in the university and takes little time. [8-12]

2.2 Needs analysis

2.2.1 User requirements:

General user requirements: registration, login, view nearby vehicles, manage personal information, points redemption.

Administrator User Requirements: Administrator Login, Manage Users, Vehicles, Points Merchandise, Site Information.

2.2.2 Performance Requirements:

The system should meet the needs of different users: provide simple and clear functions for ordinary users. The administrator system has a complete and functional interface, which provides basic inquiries and scheduling for users and vehicles.

2.2.3 Functional requirements analysis:

(1) Ordinary user login: enter account password, view location, search route, check vehicle site, points mall exchange.

(2) Administrator user login: Enter the administrator account password to view the vehicle location and manage user, vehicle and site information.[13-16]

2.3 System architecture design

According to the functional analysis of each module of the system, the functional structure of the shared electric bicycle management system can be derived, as shown in Figure 2-2:
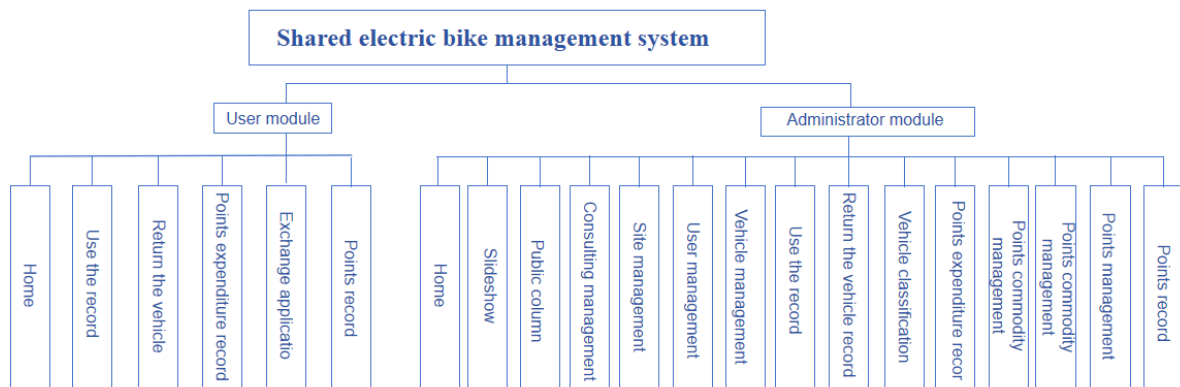

Figure 2-2 System Functional Structure Diagram

2.4 System flow design
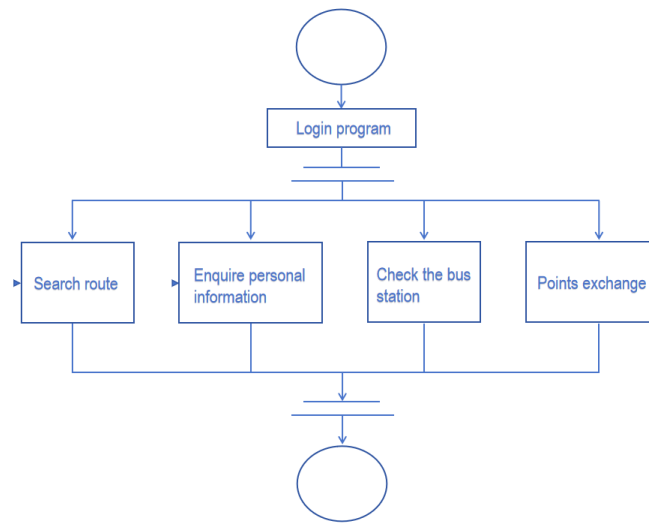
2.4.1 User system process design

Figure 2-3 User System Flowchart

The initial interface after user login is a vehicle location map to search for routes. The personal center button in the bottom bar can query user information: account number, name, ID number, cell phone number. In the personal center, click the button to change password to enter the password change interface, enter the old password and the new password to confirm the change. The Station Information button in the bottom column enters the query interface, which can query the current information of the vehicle station. Points Mall button to enter the exchange interface, displaying personal points and redeemable rewards, with different points to redeem rewards.

2.4.2 Administrator user system process design

After the administrator logs in, he/she enters the initial interface to display the current location of the placed vehicles. User information, vehicle information, site management and points exchange can be selected through the left column. User information management includes managing user information, vehicle information management includes managing vehicle information and user information. Site management can query and modify vehicle site information. Points exchange is in the right column, and vehicle query can query vehicle maintenance records. The administrator system flow is shown in Figure 2-4.
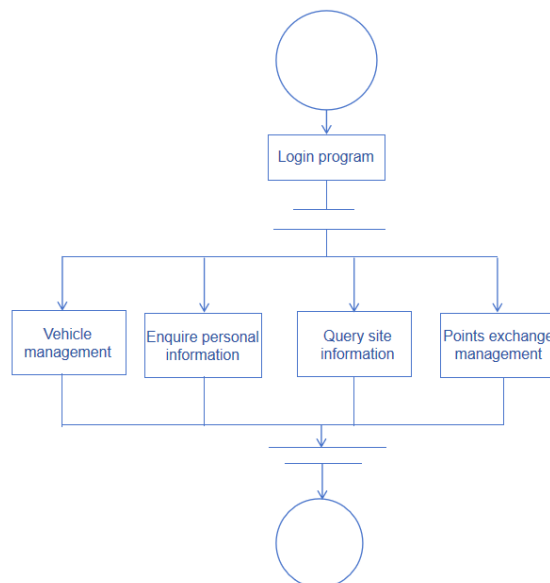

Figure 2-4 Administrator System Flowchart

3. System Detailed Design

3.1 Design of System Logical Relationships

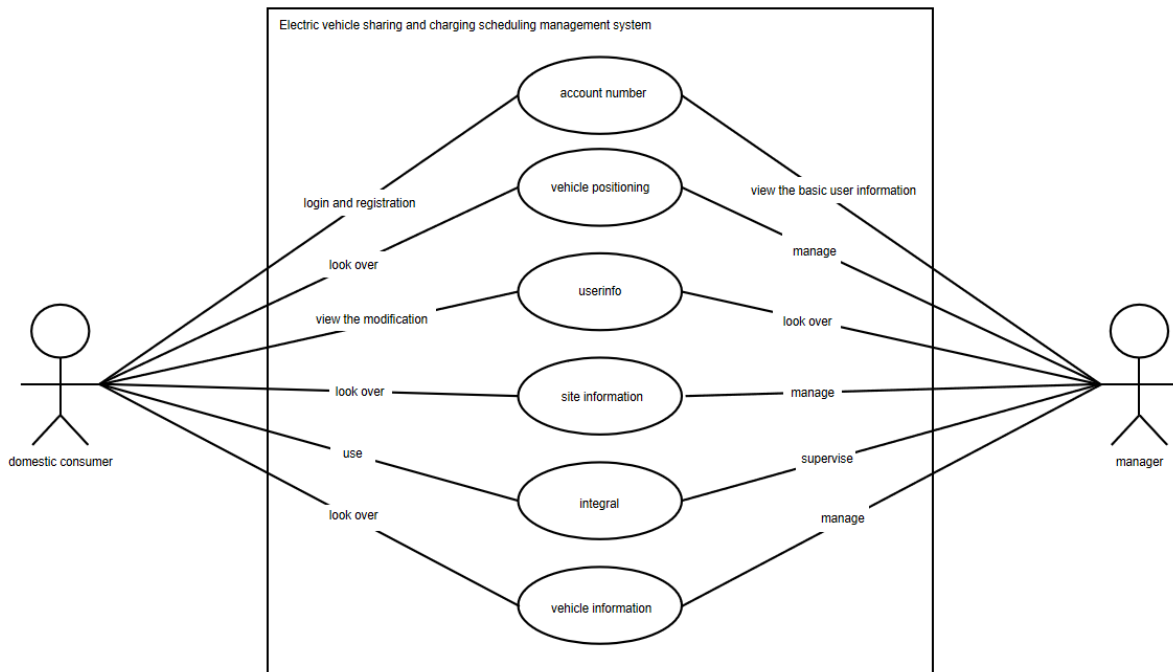An example of the overall use of the system is shown in Figure 3-1:

Figure 3-1 System Use Case Diagram

3.2 Database design

3.2.1 Design of the conceptual structure of the system's database

The system consists of five entities: ordinary users, administrator users, placed vehicles, points merchandise, and sites, each with its own attributes. The entities are related to each other; ordinary users check vehicles, stations, users, and point commodities, and administrators manage users, damaged vehicles, vehicles, and stations. According to the system operation and function, the E-R diagram is shown in Figure 3-2.
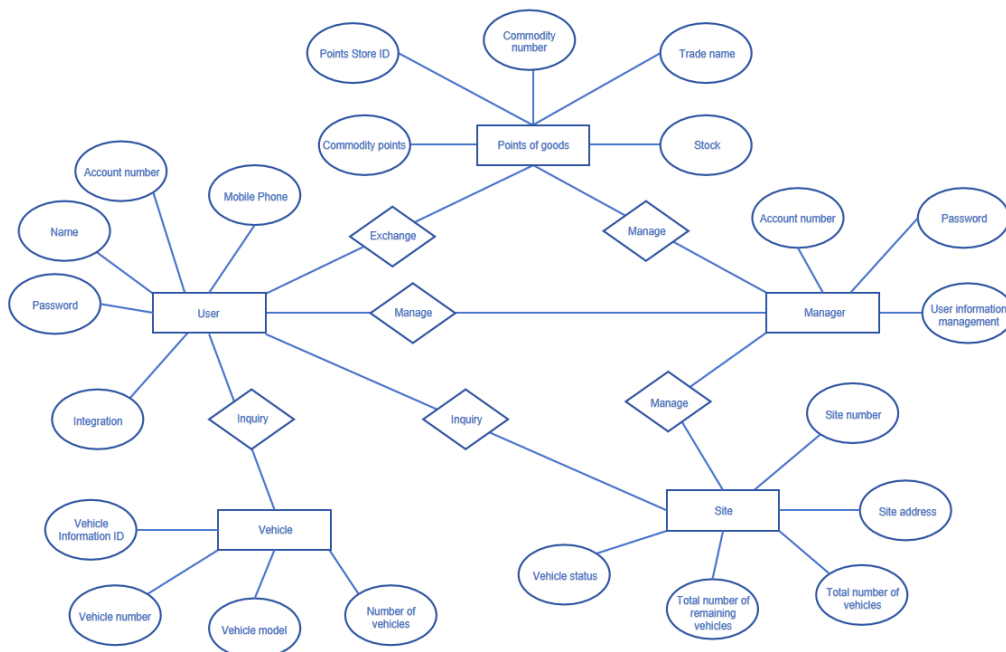

Figure 3-2 Database E-R diagram

4. Future prospects and technical challenges include the following:

1. Smart charging facilities: The future EV sharing system will aim to develop smarter and more efficient charging facilities. This includes faster charging technologies, such as super-fast charging, which can be fully charged in minutes, and wireless charging technology, which allows EVs to be charged while traveling. This will significantly improve the user experience, reducing the time spent waiting to charge and making EVs more convenient.

2. Sustainable energy integration: In order to reduce environmental impacts, the future electric car-sharing system will actively explore the integration of renewable energy sources. Charging stations will use renewable energy sources, such as solar and wind, to lower carbon emissions and reduce energy costs. This will drive the system in a more sustainable and environmentally friendly direction.

3. Autonomous driving and shared mobility: In the future, electric car-sharing systems may be combined with autonomous driving technology to enable self-driving electric vehicles. This will increase the efficiency of the system and reduce operating costs, while providing more convenient and safe shared mobility options. Users can easily summon self-driving electric vehicles through an app, no driving skills required.

5. Summary

The design of shared charging systems for electric vehicles is complex and requires the integration of urban planning, power management and information technology. Collaboration with urban planners is needed to ensure that the layout is in line with sustainable development. Power management needs to effectively manage the supply of electricity, collaborating with electric utilities, smart grids, and energy storage systems to maximize the use of renewable energy. Information technology is key, with users finding electric vehicles, charging sites, and payments through apps or websites. Systems need to be smart and interconnected, with a focus on data security and privacy. These technologies are expected to improve urban mobility, reduce congestion and tailpipe emissions, and drive the transition to sustainable transportation in cities. Complex systems will meet the needs of cities and create a better urban life.

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