Research on Parking Space Oriented Management System of Parking Lot Based on Internet of Things

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Abstract

This project relates to a parking space guiding management system based on Internet of Things, which comprises a plurality of parking space detectors arranged right above corresponding parking spaces, a parking space master controller, a plurality of parking space controllers, parking space guiding controllers, data processing devices and data transmission networks.The parking space guiding controller is connected with a plurality of parking space guiding screens and parking space indicating lamp boxes arranged at each parking space. The parking space detector detects whether the corresponding parking space stops or not and transmits the corresponding signal to the parking space master controller through the parking space controller, and the parking space master controller obtains the optimal parking space according to this and displays it on the parking space guide screen.And the parking space indicating lamp box of the corresponding parking space is controlled to blink, so that the user can be guided to quickly and accurately park the car in the allocated parking space. Each parking space detector is connected with an alarm, up to eight electronic anti-theft bolts and a parking space lock console, which comprises a parking space lock card reader.When the vehicle in the parking space leaves the parking space in the unlocked state, the alarm will give an alarm, and the safety is strong.

Keywords

Internet of Things; Parking lot; Parking space; Orientation.

1. Preface

In the current parking lot management system, the car owner usually drives himself to find an empty parking space in the parking lot, which is more convenient when the parking lot is relatively small, and does not require the parking lot manager to invest too much manpower and material resources for management. However, with the increasing number of vehicles, the parking lot is also developing towards large scale.In a large parking lot, because there are many parking spaces, it is obviously inconvenient to rely on the previous way of finding parking spaces by car owners themselves. It may take a lot of time to find an empty parking space when the car mainly turns around in the parking lot, which makes the management in the parking lot disorderly and easily causes traffic congestion.It's even worse for car owners to find their own cars quickly when they want to leave the parking lot.

In addition, at present, the anti-theft measures in the parking lot are usually only to install a closed-circuit television monitoring device inside the parking lot to make real-time video recording in order to monitor the situation in the parking lot. However, due to the problems of the installation position and camera angle of the camera, the closed-circuit television monitoring device often has a dead angle, and car thieves can steal the car only by avoiding the camera angle.Without causing system alarm, there is a serious potential safety hazard.

2. Design Content

The technical problem to be solved in this project is to provide a parking space oriented management system based on Internet of Things, which can guide vehicles entering the parking space to stop at the best parking space quickly.

The further technical problem to be solved in this project is to provide a parking space oriented management system based on Internet of Things, which can monitor the safety of vehicles in the parking lot and give an alarm when vehicles are abnormally driven away from parking spaces.

To solve the above technical problems, the project adopts the following technical scheme: to provide a parking space oriented management system based on the Internet of Things,Comprises a plurality of parking space detectors which correspond to the parking spaces in the parking lot one by one and are arranged right above the corresponding parking spaces, a parking space master controller, a plurality of parking space controllers for controlling the parking space detectors, parking space guiding controllers, data processing devices and corresponding data transmission networks,The parking space guiding controller is connected with a plurality of parking space guiding screens in the parking lot and parking space indicating light boxes arranged at each parking space, the parking space detector can detect whether the corresponding parking space stops or not and transmit corresponding signals to the parking space master controller through the parking space controller, and the parking space master controller obtains the best parking space according to the received signals,And display it on the parking space guide screen, and control the parking space indication lamp box at the corresponding parking space to blink.

Each parking space is also provided with an electronic anti-theft bolt connected with a parking space controller, and each parking space controller is also connected with an alarm and a parking space lock console arranged beside the parking space, and the parking space lock console comprises a parking space lock card reader.

The parking space guiding controller is also connected with a parking space simulation display screen located at the entrance of the parking lot.

3. Implementation Mode

As shown in figure. 1, this project provides a parking lot guidance management system based on the internet of things, which includes several parking space detectors, a parking space master controller, several parking space controllers, several electronic anti-theft bolts, several parking space guidance screens, several alarms, a data processing device and corresponding data transmission networks.

Among them, the total number of parking space detectors is the same as the total number of parking spaces in the parking lot, which correspond to parking spaces one by one and are respectively installed right above the parking spaces, which can detect whether there are vehicles parked in the parking spaces, control the parking quantity on each floor or area of the parking lot more accurately, and completely avoid the error caused by the traditional counter.The parking space detector preferably adopts ultrasonic parking space detector, which monitors parking spaces by using advanced ultrasonic detection methods, thus avoiding the problem of false alarm caused by the change or interference of external environment when using infrared and microwave detection methods. The parking space detector emits ultrasonic waves from top to bottom,Then, by receiving the intensity of ultrasonic waves reflected from the ground or the roof, it can be judged whether there are vehicles parked in the parking space. Usually, when there is no parking in this parking space, the reflected wave intensity is weak, while when there is a car parked, the reflected wave intensity is strong. In the working state,

the parking space detector can send the corresponding vehicle presence signal to the parking space controller,So as to provide the parking space controller with corresponding control operation. There is also a set of high-brightness diode indicator lights in the parking space, which can display the detection status and automatically light up when an alarm signal is detected; It goes out when there is no condition at ordinary times.
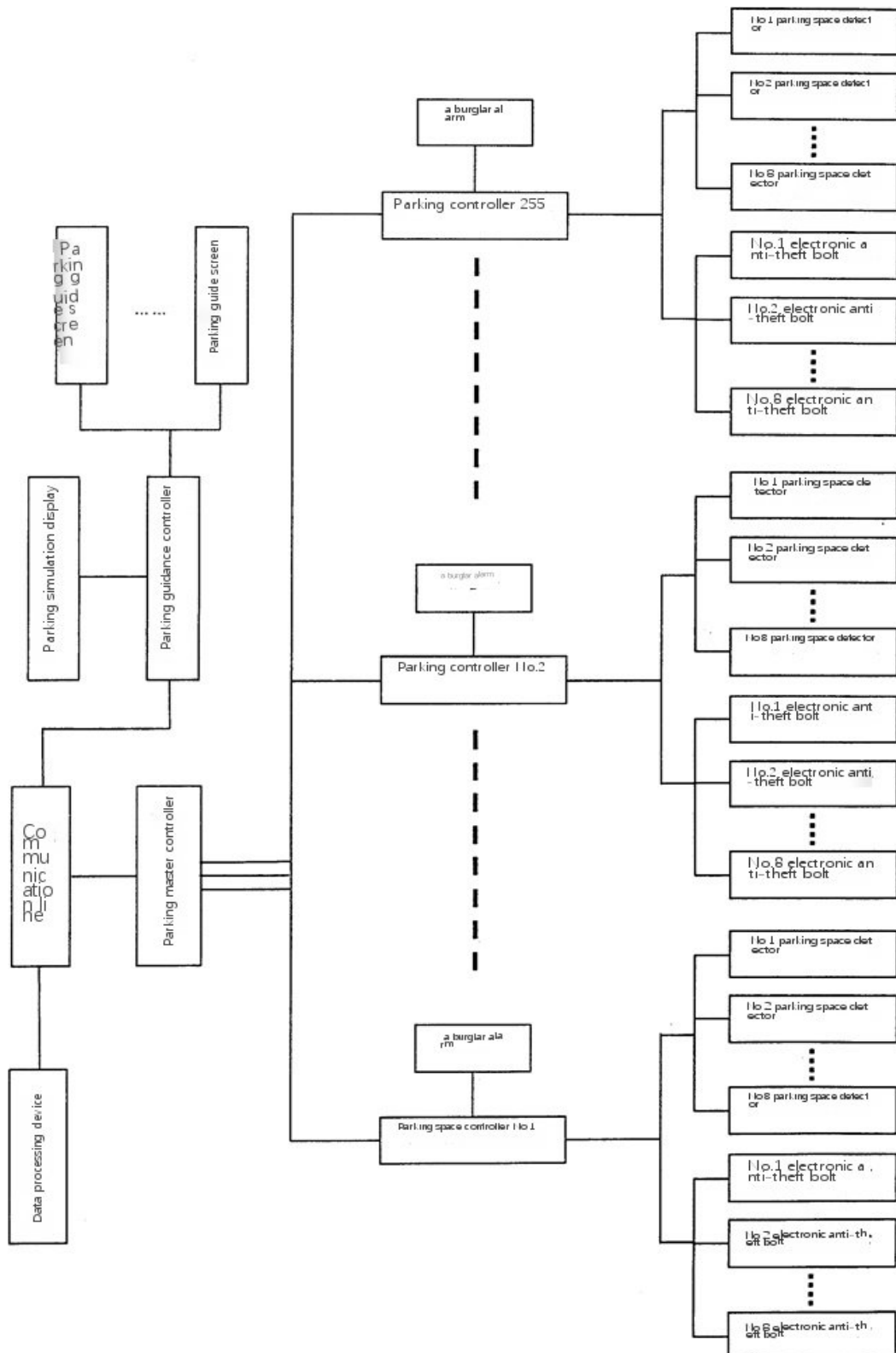

Figure 1. System schematic diagram of parking space oriented management system in parking lot

The parking space detector is internally provided with a rotary switch, and the detection range (0-4m) can be selected in multiple sections by adjusting the rotary switch. Moreover, the parking space detector body is separated from the base and adopts screw-in design, which is convenient and easy to install and maintain.

Each parking space controller can control a certain number of parking space detectors, which can inspect these parking space detectors in real time, process the data of each parking space received from the parking space detectors in real time, and then transmit the processing results to the parking space master controller, thus achieving the function of monitoring the parking space status in real time.Each parking controller is also connected with an electronic anti-theft bolt and a parking lock console, and the parking lock console includes a parking lock card reader, which locks and unlocks the electronic anti-theft bolt of the parking detector through card reading operation. In addition, each parking space controller is also connected with an alarm. If the electronic anti-theft bolt is not unlocked,When the vehicle in this parking space leaves, the alarm will automatically start the alarm device.

In the preferred embodiment of this project, a total of 256 parking space controllers are adopted, and each parking space controller controls 8 parking space detectors, which can even be extended to control 16 parking space detectors. In this way, the parking space-oriented management system of this project based on the Internet of Things has a large management capacity, and can manage large parking lots with up to 4,096 parking spaces at the same time.

The parking space guiding controller is connected with a parking space simulation display screen arranged at the entrance of the parking lot, a plurality of parking space guiding screens arranged at eye-catching positions and forks in the parking lot and parking space indicating lamp boxes arranged at each parking space.

The master parking space controller receives all the parking space controller information, and can analyze and process the data transmitted by the parking space controller, so as to calculate the optimal parking space, display the corresponding information on the parking space simulation display screen and the parking space guidance screen, and control the corresponding parking space indication lamp box to blink, thereby realizing the function of guiding the vehicle owner to find the parking space.When the electronic anti-theft bolt is locked, the signal that the vehicle leaves the parking space transmitted by its corresponding parking space detector is analyzed and processed by the parking space master controller, and the parking space controller controls the alarm to give an alarm. In addition, the data processing device can be a computer or other man-machine interface, and the corresponding information can be stored in the system database for query statistics.It can display the usage status of relevant parking spaces intuitively in the form of parking space simulation diagram in real time, so that the administrator can accurately know how many parking spaces are left in the parking lot and which parking spaces are left.

This data transmission network is mainly responsible for transmitting corresponding data among parking space detector, parking space master controller, parking space controller and data processing device. In this preferred embodiment, it uses standard CAN bus interface, 485 communication adapter and data line to connect all components into a network.

In addition, the parking space oriented management system of the parking lot based on the Internet of Things in this project can also be connected with the closed-circuit television monitoring system in the existing parking lot, so as to start the closed-circuit television monitoring system to record the entry and exit of vehicles and ensure the safety of vehicles. In addition, a vehicle detector, such as an underground vehicle detector, is provided at the entrance of the parking lot.Or there is also a card reading device, which is no different from the existing vehicle detector or card reading device at the entrance of the parking lot. The parking lot guidance management system based on Internet of Things in this project is also connected

with the vehicle detector or card reading device, so as to obtain the vehicle admission information in time to start the parking lot guidance management system. Of course,The activation signal of the parking lot guidance management system based on the Internet of Things can also be manually input by the administrator.

4. Working Principle

The following describes in detail the working principle of the parking lot guidance management system based on the Internet of Things in this project with reference to Figure 2:

1) vehicle approach

When the vehicle enters the entrance of the parking lot, it will get a real-time information and send it to the parking space master controller when passing through the automatic detection range of the buried vehicle detector or reading the card, and then the parking space master controller will calculate and analyze the occupancy of the existing parking spaces and determine the next best parking space number and partition number among the remaining parking spaces;Output the information to the parking space simulation display screen at the entrance, the parking space guidance screens at various conspicuous positions in the parking lot, and the parking space indication light boxes at the corresponding parking spaces. The owner can know the position of the parking space to be parked from the parking space simulation display screen, and park the car to the designated parking space under the guidance of each parking space guide screen and parking space indication light box in the field.
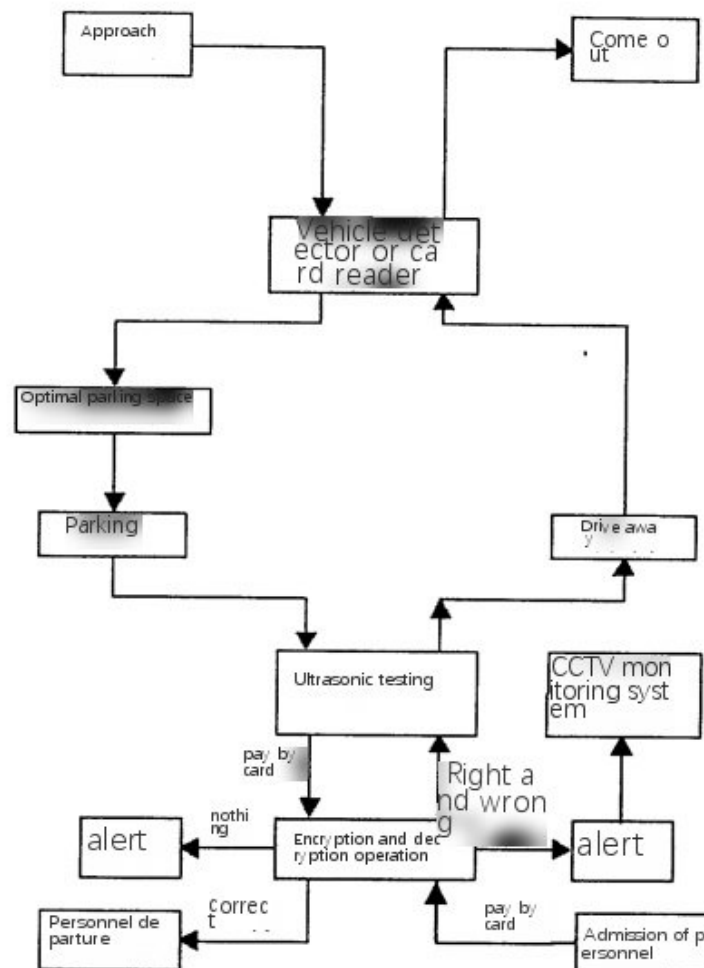

Figure 2. Working principle diagram of parking space oriented management system in parking lot

When a vehicle stops in a parking space, the parking space detector detects the vehicle and sends a signal that the parking space has been occupied to the parking space controller. At this time, the indicator light of the corresponding parking space starts flashing, prompting the user to use the electronic anti-theft bolt to swipe the card and lock the car.The owner swipes the card on the parking lock card reader at the parking lock console next to the parking space, and clicks the confirmation button corresponding to the parking space indicator to confirm the use of electronic anti-theft bolt to lock the car, so as to prevent other people's cars from being locked by mistake when two cars stop at the same time.

In this project, the parking space guidance management system based on the Internet of Things determines whether there is a vehicle in each parking space according to the detection of the parking space detector, and then transmits the parking situation of each parking space to the parking space master controller through the network. After processing, the guidance signal is transmitted to the parking space guidance controller, which is displayed to the vehicle owner very intuitively and guides the user to quickly park the car in the assigned parking space.Eliminate parking troubles for customers and park easily; It also improves the utilization rate of parking lots, manages parking lots better, reduces the operating costs of large and medium-sized parking lots, and greatly improves social and economic benefits.

2) Vehicle appearance

When the parked vehicle is about to exit, the owner should unlock the locking state of the electronic anti-theft bolt: read the user's IC card on the parking lock card reader again, and the corresponding parking light on the parking controller flashes, indicating that the unlocking is successful, and the vehicle can be taken to exit.

After the vehicle is out of position, the parking space detector installed above the parking space detects that the parking space is idle, that is, the signal that there is no car in the parking space is sent to the parking space controller, and then uploaded to the data processing device through the parking space master controller for processing. After the processing is completed,The master parking space controller sends the new parking space usage status to the parking space simulation display screen and the parking space guidance screen for display.

If the electronic anti-theft bolt is not unlocked first, the vehicle is directly driven away from the parking space. After the parking space detector detects that there is no car in the parking space, the signal is transmitted to the parking space controller, which triggers an alarm to give an alarm. At the same time, the closed-circuit television monitoring system in the parking lot is started, and TV tracking and recording are carried out, thus effectively ensuring the safety of the vehicle.

5. Concluding Remarks

The beneficial effects of this project are as follows: the parking space guidance management system of the parking lot based on the Internet of Things determines whether there is a vehicle in each parking space according to the detection of the parking space detector, then transmits the parking situation of each parking space to the parking space master controller, and transmits the guidance signal to the parking space guidance controller after processing to guide the user to quickly park the vehicle in the assigned parking space.Eliminate parking troubles for customers and park easily; On the other hand, it also improves the utilization rate of parking lots, manages parking lots better, reduces the operating costs of large and medium-sized parking lots, and greatly improves social and economic benefits.

In addition, the parking space detector can be connected with up to eight electronic anti-theft bolts, and when the vehicle in the parking space leaves the parking space in an unlocked state, the alarm gives an alarm, thus effectively preventing the vehicle from being stolen and having strong safety.

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