

## Parking lot with intelligent management system

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### Abstract

**A parking lot equipped with an intelligent management system. It is proposed that the server can quickly and accurately locate the location of the vehicle in the parking lot based on the images collected by each camera. The server will not be interfered by external electromagnetic signals and has a low cost, which can solve the problems of high positioning cost and poor accuracy existing in the existing vehicle positioning technology.**

### Keywords

**Parking management system; server; local area network; detection node.**

### 1. Intelligent garage positioning structure and content

A parking lot equipped with an intelligent management system, including a toll station, a driving channel and a plurality of parking spaces; also including a parking lot management system; the parking lot management system includes a server and a plurality of detection nodes; the detection node includes a toll The detection node and the channel detection node; the toll detection node is set at the toll station of the parking lot and includes a toll controller. The toll controller is connected with a toll camera and communicates with the server; the channel detection node is set in the driving The channel includes a channel controller, which is connected with a channel camera and is in communication with the server; the server is used to position the vehicle according to the signals collected by the toll camera and the channel camera. The technical solution it provides can solve the problems of high positioning cost and poor accuracy of the prior art parking lot intelligent management system for vehicle positioning. The purpose of this project is to provide a parking lot equipped with an intelligent management system to solve the problems of high positioning cost and poor accuracy when the prior art intelligent parking management system locates vehicles.

In order to achieve the above objectives, this project adopts the following technical solutions:

A parking lot equipped with an intelligent management system, including a toll station, a driving channel and a plurality of parking spaces; also including a parking lot management system; the parking lot management system includes a server and a plurality of detection nodes; the detection node includes a toll The detection node and the channel detection node; the toll detection node is set at the toll station of the parking lot and includes a toll controller. The toll controller is connected with a toll camera and communicates with the server; the channel detection node is set in the driving The channel includes a channel controller, which is connected with a channel camera and is in communication with the server; the server is used for positioning the vehicle according to the signals collected by the toll camera and the channel camera.

The parking lot management system also includes a local area network. The structure of the local area network includes a top-level root network node, the top-level root network node is communicatively connected to a plurality of relay network nodes, each relay network node is communicatively connected to a plurality of detection nodes and each detection node communicates Connect a relay network node, and each relay network node is connected to the ring network.

The intelligent management system also includes an upper computer, which is communicatively connected to the root network node.

The detection node further includes a parking space detection node, the parking space detection node includes a parking space controller, and the parking space controller is connected with a ranging sensor.

The parking space controller of the parking space detection node is also connected with an indicator light.

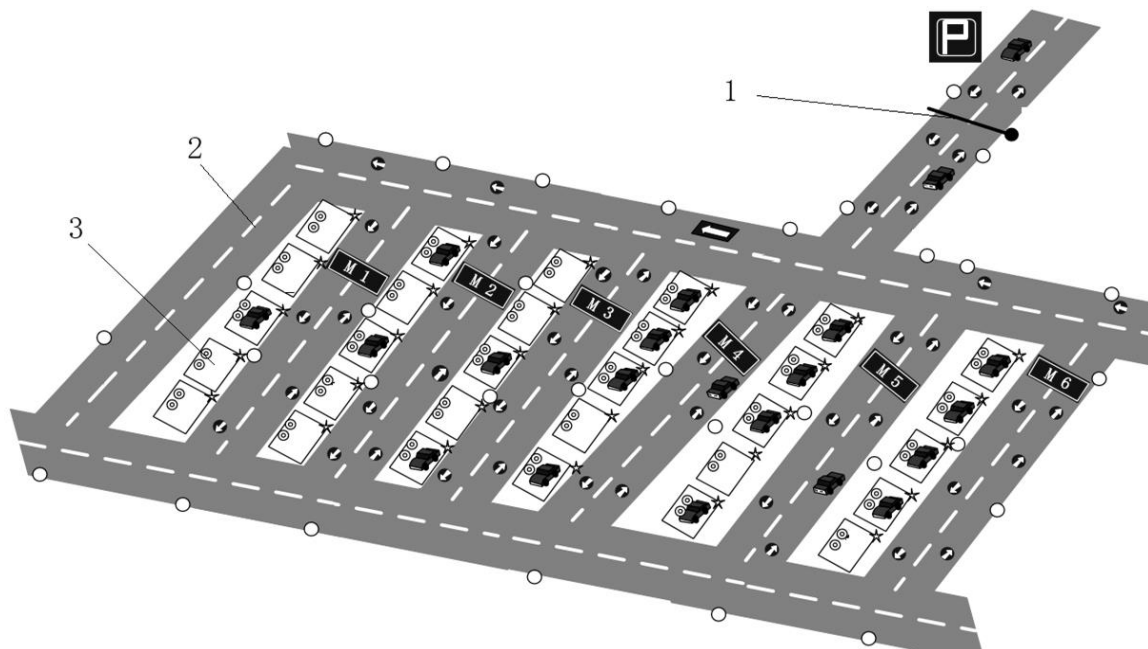
The detection node is wirelessly connected to the corresponding relay network node.

The sub-node also includes a safety indicating node, and the safety indicating node includes a safety controller, and the safety controller is connected with a ranging sensor and a safety indicator.

## 2. Realization of intelligent garage positioningof the Text

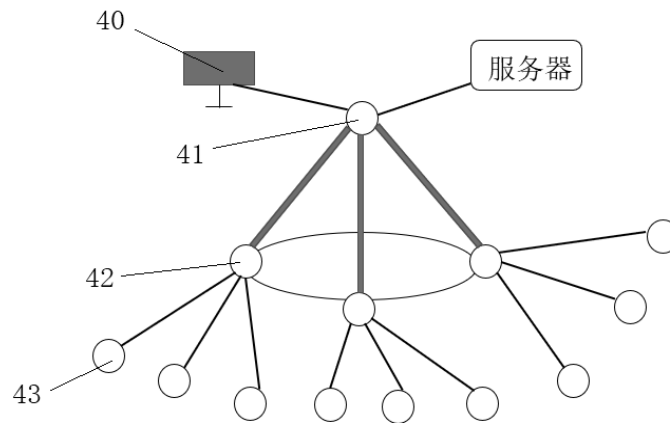
This project provides a parking lot with an intelligent management system, which is used to solve the problems of high positioning cost and poor accuracy when the prior art intelligent parking management system locates vehicles.

The structure of the parking lot with intelligent management system provided by this project is shown in p1. It includes a toll station 1, a driving channel 2 and multiple parking spaces 3, as well as a parking management system.



P1.Schematic diagram of a parking lot with an intelligent management system

The parking management system includes a server, a local area network and multiple detection nodes. The structure of the local area network is shown in p2, including a three-layer network structure. The top layer is provided with a top-level root network node 41. The top-level root network node is connected to the upper computer 40 and is connected to the server communication connection.



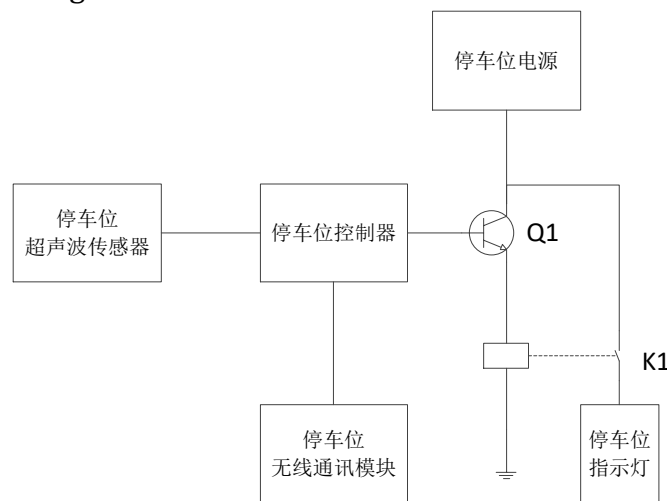
P2. Schematic diagram of LAN structure

The second layer network includes a plurality of relay network nodes 42, each relay network node 42 communicates with the top-level root communication 41 node, and each relay network node 42 communicates with each other to form a communication switching network.

Each relay network node 42 is connected to multiple detection nodes 43, and each detection node 43 is connected to a relay network node 42, that is, each detection node 43 communicates with the top-level root network node 41 through the relay network node 43, and then passes The top-level root network node 41 communicates with the server.

The detection node 43 in this project includes a charging detection node, a passage detection node and a parking space detection node.

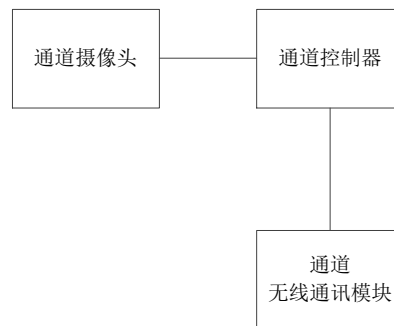
The parking space detection node is set on the parking space. Its structure is shown in p3. It includes a parking space controller. The parking space controller is connected with a parking space ultrasonic sensor, a parking space indicator light and a parking space wireless communication module. The parking space controller Connect the base of the transistor Q1, the collector of the transistor Q1 is connected to the parking space power supply, the emitter is connected to one end of the coil part of the relay K1, and the other end of the relay K1 is grounded; the normally open contact of the relay K1 is set at the stop for the indicator light to connect to the parking space On the power line. When the parking space controller controls the transistor Q1 to trigger the conduction, the coil of the relay K1 is energized, the normally open contact is closed, and the parking space indicator is connected to the parking space power supply and starts to emit light.



P3. Schematic diagram of the structure of the parking space detection node

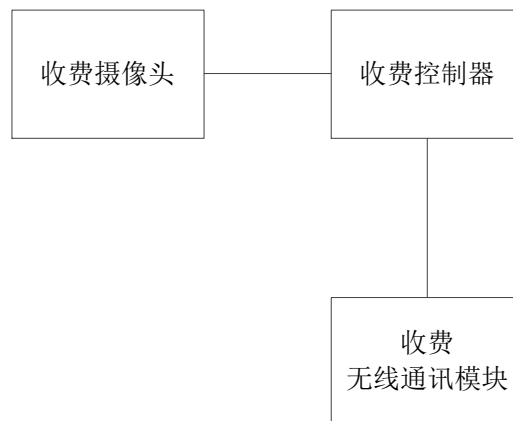
The structure of the channel detection node is shown in p4, including a channel controller, which is connected with a channel camera and a channel wireless communication module, and

the channel controller communicates with the corresponding relay network node through the wireless communication module.



P4. Schematic diagram of the structure of the channel detection node

The structure of the charging detection node is shown in p5, including a charging controller. The charging controller is connected with a charging camera and a charging wireless communication module. The charging controller communicates with the corresponding relay network node through the charging wireless communication module.



P5. Structure diagram of charging node

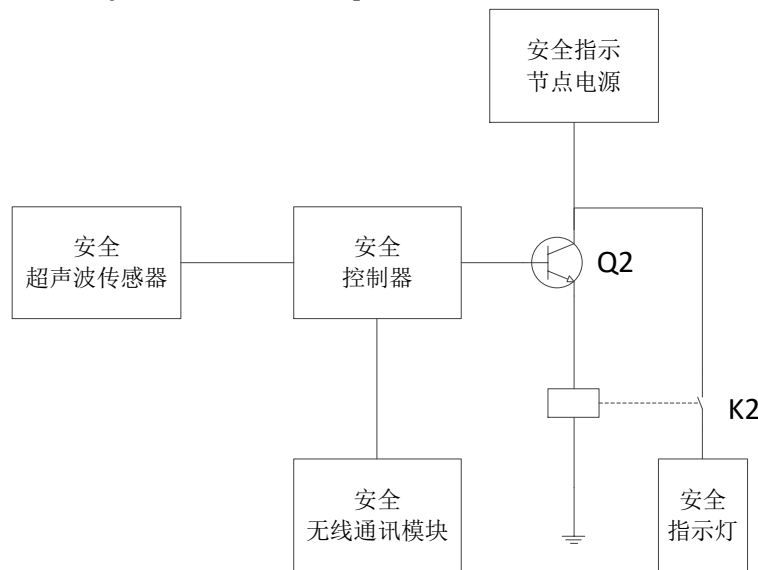
When the vehicle enters the parking lot, the server establishes a communication connection with the owner’s mobile phone and other smart terminals. The toll controller in the toll detection node collects vehicle information through the toll camera and sends it to the server; the server receives the vehicle information sent by the toll camera Then store it, select the parking space and send the electronic map and navigation route to the owner's smart terminal, and start charging after the vehicle is released;

When a vehicle is traveling in a driving channel, when it passes through a channel detection node, the detection controller of the channel detection node obtains the corresponding image information through the corresponding detection camera and sends it to the server; the server according to the received from each channel detection node Determine whether the vehicle deviates from the set navigation route, if it deviates, replan the route;

After the vehicle has passed the last channel detection node in the path planning, the server sends instruction information to the parking space controller on the corresponding parking space detection node; the parking space controller receives the instruction information sent by the server, and controls the parking space indication The light flashes and wakes up the ultrasonic sensor to be ready to detect the vehicle entering the storage; the parking space indicator light goes out after the vehicle is successfully stored;

When the vehicle leaves the parking lot, the toll controller detects the corresponding information through the toll camera and sends it to the server, and the server generates the parking record of the vehicle after receiving the information.

The detection node in the parking lot management system also includes a safety indication node. The safety indication node is set at the turn and U-turn of the parking lot. Its structure is shown in p6, including a safety controller, which is connected with a safety ultrasonic sensor, Safety wireless communication module and alarm indicator. The safety controller is connected to the base of the transistor Q2, the collector of the transistor Q2 is connected to the safety indicator node power supply, the emitter is connected to one end of the coil part of the relay K2, the other end of the coil part of the relay K2 is grounded, and the normally open contact is set at the safety indicator connection Safety indication node power line.



P6. Schematic diagram of the structure of the safety indicator node

The safety controller detects the distance between the vehicle and the position of the safety indication node in the driving channel through the safety ultrasonic sensor. If the distance is less than the set distance, the control transistor Q2 is triggered to conduct, the coil part of the relay K2 is energized, and the contact part When closed, the safety indicator will be energized to remind the personnel on the vehicle to pay attention to safety.

The parking space controller, channel controller, toll controller and safety controller in this project are all 89C52 series single-chip microcomputers. The safety ultrasonic sensor and parking ultrasonic sensor are all ultrasonic sensors of the model HC-SR04. The parking space wireless communication module, channel wireless communication module, toll wireless communication module and safety wireless communication module all use WIFI wireless communication modules.

The top-level root network nodes and relay network nodes in this project all include corresponding node controllers. The node controller is 89C52 series single-chip microcomputer, which is connected with a communication module. The top layer is connected to the network node and each relay network node through RS485 The communication module establishes a communication connection, and each relay network node establishes a ring network communication connection through a wireless corresponding communication module. When the connection between one of the relay network nodes and the top-level root network node is abnormal, other relays can be used The network node communicates with the top-level root network node.

The upper computer in this project is connected to the top-level root network node, and is used to set the parameters of each network node, and it can be repaired when it is abnormal.

The above description is only a good example of the application of this project, the structure of this project can have other changes, not limited to the above structure.

### 3. Summary

- (1) A method is proposed for the server to locate the position of the vehicle in the parking lot based on the images collected by each camera. This method can quickly and accurately complete the positioning.
- (2) The above method will not be interfered by external electromagnetic signals and the cost is low.

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