

BICYCLE MANAGEMENT SYSTEM AND CONTROL METHOD AND APPARATUS THEREOF

FIELD OF THE INVENTION

The present invention relates to art of information service of a bicycle traffic
5 system, particularly relates to a bicycle management system and control method
and apparatus thereof.

BACKGROUND OF THE INVENTION

With the rapid development of our country's economic society and the
continuous improvement of people's living standard, the motorization process of
10 our country has always shown a trend of sustained acceleration. However, it is
followed by problems of huge energy consumption, serious environment pollution
and urban traffic congestion, etc. These problems not only bring lots of
inconvenience to people's life, but also harm people's health constantly. In order to
effectively relieve or avoid the problems, management departments of many cities
15 correspondingly enacted and issued many regulations and/or solutions, for
example, controlling the number of motor vehicles, restricting motor vehicles based
on the last digit of license plate numbers, improving motor vehicle emission
standard, encouraging people to purchase electric cars, developing public
transport facilities such as metro, bus, etc. to guide green commuting, and so on.

20 Our country is a great power in bicycle manufacturing and using. For a long
time, bicycles have been primary means of transport for short distance travels
within a city. Furthermore, since bicycles are cheap, light, energy saving,
environmentally friendly, etc., and particularly concept like green commuting, low
carbon environmental protection, healthy life has continuously been deepened
25 these years, more and more people begin to select green commuting manners
such as riding a bicycle, and so on.

Currently, bicycle management systems appearing on the market mainly set
some places for storing bicycles (for example, at the gates of subway stations and
near the bus stops, etc.) with predetermined distance in certain region of a city, a
30 storage place usually may be placed with more than a dozen bicycles. However,
these bicycles are mostly traditional bicycles, which usually needs to be

maintained and managed by specially-assigned people; communication and information sharing cannot be achieved among a plurality of storage places, storage places and bicycles, bicycles and bicycles, and there is no specialized bicycle management platforms to perform management and allocation of resources for storage places and bicycles in a certain region uniformly, thus, limited bicycle resources cannot be allocated efficiently and reasonably. Besides, when using these bicycles, users sometimes encounter problems, for example, available bicycles in the vicinity of destinations cannot be conveniently found out, bicycles cannot be reserved in advance, bicycles can be used only after relevant formalities are done (such as getting a borrowing card, paying deposit, etc.), bicycles are stolen during the usage, returning manner is relatively single, these problems bring lots of inconvenience to users.

Therefore, a more efficient and more humane bicycle management system and control method and apparatus thereof is required urgently.

SUMMARY OF THE INVENTION

In order to overcome the deficiencies in the prior art, the present invention provides the following technical solution.

In accordance with one aspect of the present invention, a bicycle management system is provided, the system comprises a mobile communication equipment, a cloud, a bicycle and a operation strategy center; wherein, the bicycle comprises a bicycle-mounted electronic equipment; the operation strategy center is connected with the cloud, and is used for providing bicycle management strategies for the cloud; the mobile communication equipment establishes communication with the cloud via a wireless network, the cloud establishes communication with the bicycle-mounted electronic equipment of the bicycle via the wireless network; wherein, the mobile communication equipment controls the bicycle via the cloud; the bicycle reports status information to the cloud regularly.

Preferably, the bicycle further comprises an anti-theft device, which is electronically connected with the bicycle-mounted electronic equipment, and the bicycle-mounted electronic equipment controls unlocking and/or locking of the anti-theft device according to instructions of the mobile communication equipment and/or the cloud.

Preferably, the bicycle-mounted electronic equipment comprises a control unit, a sensor device and a communication interface; the sensor device and the communication interface are respectively connected with the control unit; the control unit performs bi-directional communication with the cloud via the communication interface; the control unit performs bi-directional communication with the mobile communication equipment via the communication interface; the sensor device collects status information of the bicycle in real time, and the control unit processes the status information and transmits to the cloud via the communication interface.

10 Preferably, the bicycle-mounted electronic equipment further comprises an input apparatus, which is connected with the control unit, and instructions or information is input to the control unit via the input apparatus so that the control unit executes content of the instructions or information.

Preferably, the status information comprises unlocking status information, locking status information, location information, riding distance, riding time, riding speed and electric quantity.

In accordance with another aspect of the present invention, a control method for the above bicycle management system is provided, the system comprises: a logging-in step, for enabling the mobile communication equipment to establish connection with the cloud; a picking-up step, for unlocking the bicycle according to an unlocking instruction issued by the mobile communication equipment and/or the cloud to make the bicycle in an available status; a using step, for enabling the bicycle-mounted electronic equipment to collect status information of the bicycle, and to transmit the status information to the mobile communication equipment and/or the cloud; a returning step, for enabling the cloud to confirm a locking status and end the current using of the bicycle after the user's riding finishes.

Preferably, the method further comprises a reserving step, for providing information of available bicycles in the vicinity of the destination input by the user, and enabling the user to reserve a bicycle within the scopes of the available bicycles; a finding step, for assisting the user to find the reserved bicycle when the user reaches the vicinity of the destination.

Preferably, the method further comprises a searching step, for providing the

user with information of available bicycles in the vicinity of the current location according to the user's current location, and guiding the user to find available bicycles in the vicinity of the current location.

Preferably, the using step comprises a suspending step for suspending using
5 the bicycle.

In accordance with another aspect of the present invention, a control device of the above bicycle management system, the device comprises: a logging-in device, for enabling the mobile communication equipment to establish connection with the cloud; a picking-up device, for unlocking the bicycle according to an unlocking
10 instruction issued by the mobile communication equipment and/or the cloud to make the bicycle in an available status; a using device, for enabling the bicycle-mounted electronic equipment to collect status information of the bicycle, and to transmit the status information to the mobile communication equipment and/or the cloud; a returning device, for enabling the cloud to confirm a locking status and
15 end the current using of the bicycle after the user's riding finishes.

Preferably, the device further comprises: a reserving device, for providing information of available bicycles in the vicinity of the destination input by the user, and enabling the user to reserve a bicycle within the scopes of the available bicycles; a finding device, for assisting the user to find the reserved bicycle when
20 the user reaches the vicinity of the destination.

Preferably, the device further comprises: a searching device, for providing the user with information of available bicycles in the vicinity of the current location according to the user's current location, and guiding the user to find available bicycles in the vicinity of the current location.

Preferably, the using device comprises a suspending device for suspending
25 using the bicycle.

In accordance with another aspect of the present invention, a bicycle-mounted electronic equipment is provided, the device comprises: a control unit, a sensor device and a communication interface; the sensor device and the communication
30 interface are respectively connected with the control unit; the control unit performs bi-directional communication with the cloud via the communication interface; the

control unit performs bi-directional communication with the mobile communication equipment via the communication interface; the sensor device bicycle collects data in real time, and transmits the bicycle data to the control unit.

5 Preferably, the bicycle-mounted electronic equipment further comprises an input device, which is connected with the control unit, and instructions or information is input to the control unit via the input device so that the control unit executes content of the instructions or information.

10 In accordance with another aspect of the present invention, a bicycle comprising the bicycle-mounted electronic equipment is provided, the bicycle further comprises further comprises an anti-theft device, wherein, the anti-theft device is electronically connected with the bicycle-mounted electronic equipment, and the bicycle-mounted electronic equipment controls unlocking and/or locking of the anti-theft device according to instructions of the mobile communication equipment and/or the cloud.

15 The technical solution provided in the present invention can formulate optimized strategies according to the bicycles' distribution condition, guide and assist users to implement finding bicycles, reserving bicycles, searching bicycles and returning bicycles through mobile communication equipments, meanwhile enabling users to acquire real-time riding data, location information, etc., which can
20 not only reasonably and efficiently utilize the limited bicycle resources, but also facilitate users' usage and experience.

BRIEF DESCRIPTION OF DRAWINGS

25 In order to better understand each aspect of the present invention, the preferable embodiments illustrated in the drawings may be referred, wherein, the same reference signs in the drawings represent the same steps or components.

FIG. 1 is a module diagram of the bicycle management system provided by the present invention.

FIG. 2 is a function module diagram of the bicycle provided by the present invention.

FIG. 3 is a flowchart of the bicycle management system control method according to an embodiment of the present invention.

FIG. 4 is a flowchart of the bicycle management system control method according to another embodiment of the present invention.

5 FIG. 5 is a flowchart of a logging-in step in the bicycle management system control method provided in the present invention.

FIG. 6 is a flowchart of a reserving step in the bicycle management system control method provided in the present invention.

10 FIG. 7 is a flowchart of a finding step in the bicycle management system control method provided in the present invention.

FIG. 8 is a flowchart of a picking-up step in the bicycle management system control method provided in the present invention.

FIG. 9 is a flowchart of a using step in the bicycle management system control method provided in the present invention.

15 FIG. 10 is a flowchart of a suspending function in the using step shown in FIG. 9.

FIG. 11 is a flowchart of a returning step in the bicycle management system control method provided in the present invention.

20 FIG. 12 is a flowchart of a searching step in the bicycle management system control method provided in the present invention.

DESCRIPTION OF AN EMBODIMENT OF THE INVENTION

Now the present invention is described in detail by referring to some embodiments shown in the drawings. In order to understand the present invention more thoroughly, many specific details are illustrated in the following description.
25 However, a person skilled in the art can understand that the present invention can also be implemented in the case that some or all of the specific details are missing. In other cases, in order to avoid unnecessary unclearness existing in the present invention, the commonly known steps and/or structure is not described in detail. In

addition, although the present invention is described by combining particular embodiments, it shall be understood that the description does not aim to limit the present invention to the described embodiments. On the contrary, the description aims to cover the substitute, improved and equivalent solutions that can be included into the essence and scope of the present invention defined by the attached Claims.

Referring to FIG. 1, FIG. 1 is a module diagram of the bicycle management system provided by the present invention. A person skilled in the art can understand that implementing the present invention does not require all the components, and the types and disposition of these components can be modified without deviation from the essence and scope of the present invention.

As shown in FIG. 1, the present invention provides a bicycle management system; the system comprises a mobile communication equipment 10, a cloud 20, a bicycle 30 and an operation strategy center 40. The bicycle 30 comprises a bicycle-mounted electronic equipment 31 and an anti-theft device 32. The operation strategy center 40 is connected with the cloud 20, and is for providing bicycle management strategies for the cloud. The mobile communication equipment 10 establishes communication with the cloud 20 via a wireless network; the cloud 20 establishes communication with the bicycle-mounted electronic equipment 31 of the bicycle 30 via the wireless network. The mobile communication equipment 10 controls the bicycle 30 via the cloud 20. The bicycle 30 reports status information to the cloud 20 regularly. The status information comprises one or more of unlocking status information, locking status information, location information, riding distance, riding time, riding speed and electric quantity.

In the present invention, the mobile communication equipment may transmit or receive signals via manners such as a wired or wireless network, or may process or store signals as physical storage status in a memory. Each mobile communication equipment may be an electronic device comprising hardware, software or embedded logic components or combinations of two or more of these components, and is capable of executing suitable functions implemented or supported by the mobile communication equipment. For example, the mobile communication equipment may be a smart phone, a tablet, a portable e-mail device, an electronic book, a hand-held game console and/or a game controller, a

laptop, a netbook, a hand-held electronic device, a smart wearable device, and so on. The present invention covers any suitable mobile communication equipment. The mobile communication equipment may enable the user using the mobile communication equipment to access network. The mobile communication
5 equipment may further enable the user thereof to communicate with other users on other mobile communication equipments.

According to some embodiments in the present invention, the mobile communication equipment may comprise: a processing device comprising an application processing section and RF/digital signal processor; a display screen; a
10 pocket keyboard that may comprise physical keys, touchable keys covering on the display screen or a combination of the above; a user identification module card; a memory device that may comprise ROM, RAM, flash memory or any combination of the above; a Wi-Fi and/or Bluetooth interface; a wireless telephone interface; a power management circuit having associated batteries; a USB interface and a
15 connector; an audio management system having an associated microphone, a speaker and an earphone jack; and a variety of optional accessory components like a digital camera, a GPS, an accelerator, etc. In addition, the mobile communication equipment may be installed with various client applications, which may be used for allowing the mobile communication equipment to be used to
20 transfer commands suitable for operation with other devices. These applications may be downloaded from a server and installed in a memory of the mobile communication equipment, or may have been installed in the mobile communication equipment in advance. In the present invention, the mobile communication equipment is installed with a bicycle user terminal application,
25 which may assist the user to implement functions of reserving a bicycle, finding a bicycle, using a bicycle, returning a bicycle and so on. In other embodiments of the present invention, the mobile communication equipment may further be installed with a maintenance personnel application, which may be used to assist the maintenance personnel to implement operation management function to the
30 bicycle, including but not limited to maintenance and anti-theft, etc.

In the present invention, both the cloud and the operation strategy center are servers, the servers referred in the text shall be understood as business points providing processing, data base, communication facilities. For example, a server may refer to a single physical processor having related communication and data

storage and data base facilities, or it may refer to a collection of network connected or collected processors, related network and storage devices, and perform operation to software and one or more data base systems and application software supporting the service provided by the server. Servers may vary greatly in configuration or performance, while servers generally may comprise one or more central processing units and memories. Servers further comprise one or more high-capacity storage devices, one or more power sources, one or more wired or wireless network interfaces, one or more input/output interfaces, or one or more operation systems, such as Windows Server, Mac OS X, Unix, Linux, FreeBSD, etc.

According to some embodiments in the present invention, the cloud or the operation strategy center may be an integral server or a distributed server crossing multiple computers or computer data centers. Servers may be different types, such as but not limited to, network servers, news servers, e-mail servers, message servers, advertisement servers, file servers, application servers, interaction servers, database servers, or agent servers. In some embodiments, each server may comprise hardware, software, or embedded logic components for executing suitable functions supported or implemented by the server or combinations of two or more of these components. In the present invention, servers are used for providing all the functions necessary for supporting bicycle management.

FIG. 2 is a function module diagram of the bicycle provided by the present invention. As shown in FIG. 2, the bicycle 30 comprises the bicycle-mounted electronic equipment 31, the anti-theft device 32 and a power source (not shown). The bicycle-mounted electronic equipment 31 is electronically connected with the anti-theft device 32, and the bicycle-mounted electronic equipment 31 controls locking and unlocking of the anti-theft device 32 according to instructions from the cloud 20 and/or the mobile communication equipment 10 or instructions manually input on the bicycle-mounted electronic equipment by the user. The power source is used for supplying power to each of the components on the bicycle.

According to some embodiments in the present invention, the bicycle-mounted electronic equipment 31 comprises a control unit 311, an input device 312, a display 313 (such as a LED display), a sensor device 314 and a communication interface 315. Wherein, the input device 312, the display 313, the sensor device

314 and the communication interface 315 are communicably connected with the control unit 311 respectively. The control unit 311 comprises a microprocessor for processing data and a memory for storing data. The control unit 311 may perform bi-directional communication with the cloud 20 via the communication interface 315, or perform bi-directional communication with the mobile communication equipment 10 via the communication interface 315. The user may input instructions or information into the control unit 311 through the input device 312, to enable the control unit to execute the content of the instructions or the information. The sensor device 314 may collect status information of the bicycle in real time (such as riding distance, location information and riding speed, etc.), and transfer the status information to the control unit 311. The display 313 may display content desired by the user according to the requirements (for example, riding distance, maps, riding speed, etc.) and/or interface (for example, an interaction interface). Certainly, the display 313 is not an essential component of the bicycle-mounted electronic equipment 31.

According to some embodiments in the present invention, a bicycle management system control method is provided. In some embodiments, the bicycle management system control method comprises part or all of logging-in step, reserving step, finding step, picking-up step, using step and returning step. In some other embodiments, the bicycle management system control method comprises part or all of logging-in step, searching step, picking-up step, using step and returning step. Each of the steps in the control method of the present invention will be described in detail below by referring to the flowchart.

It can be understood that, each frame in the flowchart and combinations of the frames can be implemented via analog or digital hardware and computer program instructions. The flows may be provided to general computers, dedicated computers, ASIC or processors of other programmable data processing devices so as to enable the instructions executed via computers or processors of other programmable data processing devices to implement specific functions/actions in the frames. Each aspect or feature will be presented by a system, the system may comprise a plurality of equipments, components, modules, etc. It can be understood that, each system may comprise additional equipments, components, modules, etc. and/or may not comprise all the equipments, components, modules,

etc. illustrated in the related drawings. Combinations of these manners may also be used.

In some alternative embodiments, functions/operations mentioned in the frames may not occur in the sequence mentioned in the operation diagram. For example, depending on the related functions/operations, two frames shown in succession, in fact, may be executed synchronously in general or the frames sometimes may be executed in a reverse sequence. In addition, the embodiments presented and described in the flowcharts of the present invention are provided in examples, with the aim of providing a more comprehensive understanding to the technology. The method disclosed is not limited to the operations and logic flows presented in the text. The alternative embodiments are expected, wherein a sequence of each operation is modified and wherein sub-operations of a portion described as larger operations are executed separately.

According to a preferable embodiment in the present invention, FIG. 3 shows a flowchart of a control method of the bicycle management system.

As shown in FIG. 3, the method comprises: a logging-in step 100, a reserving step 200, a finding step 300, a picking-up step 400, a using step 500 and a returning step 600. Wherein, the logging-in step 100 is used for enabling the user's mobile communication equipment to establish connection with the cloud; the reserving step 200 is used for providing information of available bicycles in the vicinity of the destination to the user in accordance with the destination input by the user, and enabling the user to reserve a bicycle within the scopes of the available bicycles; the finding step 300 is used for assisting the user to find the reserved bicycle when the user reaches the vicinity of the destination; the picking-up step 400 is used for unlocking the bicycle according to an unlocking instruction issued by the user's mobile communication equipment and/or the cloud to make the bicycle in an available status; the using step 500 is used for transmitting the bicycle-automatically-obtained status information of the bicycle which is ridden by the user to the user's mobile communication equipment and/or the cloud during the user's riding; the returning step 600 is used for transmitting a locking status information of the bicycle to the cloud after the user's riding finishes, after confirming a locking status, the cloud confirms to the mobile communication equipment an end of the current using of the bicycle, the locking status may be

implemented by the user manually locking the bicycle, or may be implemented by the bicycle-mounted electronic equipment automatically locking the bicycle based on a locking instruction issued by the user's mobile communication equipment and/or the cloud.

5 According to another preferable embodiment in the present invention, FIG. 4 shows a flowchart of another control method of the bicycle management system. Different from the control method shown in FIG. 3, the control method shown in FIG. 4 is mainly for the condition that the user directly searches a bicycle (rather than reserving a bicycle).

10 As shown in FIG. 4, the method comprises: a logging-in step 100, a searching step 700, a picking-up step 400, a using step 500 and a returning step 600; wherein, the logging-on step 100 is used for enabling the user's mobile communication equipment to establish connection with the cloud; the searching
15 step 700 is used for providing the user with information of available bicycles in the vicinity of the current location according to the user's current location, and guiding the user to find available bicycles in the vicinity of the current location; the picking-up step 400 is used for unlocking the bicycle according to an unlocking instruction issued by the user's mobile communication equipment and/or the cloud; the using
20 step 500 is used for transmitting the bicycle-automatically-obtained status information of the bicycle which is ridden by the user to the user's mobile communication equipment and/or the cloud during the user's riding; the returning
25 step 600 is used for confirming, by the cloud, a locking status and ending the current using of the bicycle after the user's riding finishes. It needs to be explained herein that the locking operation may be executed by the user manually locking the
bicycle, or by the bicycle-mounted electronic equipment controlling the anti-theft device to lock the bicycle according to a locking instruction issued from the user's mobile communication equipment and/or the cloud.

 According to the requirements of actual condition, the above respective method may further comprise a paying step, which enables the system to calculate
30 the price automatically according to a predetermined billing rule, and enables the user to pay in the manners of network payment (such as Alipay, WeChat), bankcard payment. Certainly, the paying step is not essential, and the system may also provide the user with free bicycle service.

Each of the steps in the control method of the present invention will be described in detail below by combining with the flowchart.

FIG. 5 shows a flowchart of a logging-in step 100 in the bicycle management system control method in the present invention. When using the system for the first time, the user is required to register online and fill in necessary user information. Certainly, the user may download a bicycle user terminal application from the cloud to the mobile communication equipment via the network and install the application locally to the mobile communication equipment, or, the user's mobile communication equipment has been installed with the bicycle user terminal application in advance. In the logging-in step, the user starts up the bicycle user terminal application in the mobile communication equipment and enables the mobile communication equipment to establish connection with the cloud.

As shown in FIG. 5, in step 101, the mobile communication equipment operating the bicycle user terminal application request a verification code to the cloud; in step 102, the cloud performs verification and confirmation after receiving the verification code request transmitted from the user's mobile communication equipment, and transmits a verification code to the mobile communication equipment via the manner of SMS, e-mail, voice call, etc.; in step 103, the user inputs the verification code into the mobile communication equipment after receiving the same from the cloud, and transmits the verification code to the cloud through the mobile communication equipment via the network; in step 104, the cloud transmits logging-in confirmation information to the user's mobile communication equipment after verifying the verification code.

FIG. 6 shows a flowchart of a reserving step 200 in the bicycle management system control method in the present invention. In the reserving step, information of available bicycles (including but not limited to pictures, kinds, configuration of the bicycles, etc.) in the vicinity of the place designated by the user is searched according to the user's input information (for example, destination, region code, etc.), status of each bicycle is displayed on the mobile communication equipment, the user may select a desired bicycle within the scope of available bicycles displayed, the mobile communication equipment transmits the user's confirmation information to the cloud, and the cloud identifies that the bicycle has been reserved by the user and starts a timing of the reservation.

As shown in FIG. 6, in step 201, the user transmits a request for checking bicycles that can be reserved through the mobile communication equipment to the cloud; in step 202, the cloud transmits a request for retrieving a bicycle distribution strategy to the operation strategy center after receiving the request from the user; in step 203, the operation strategy center obtains data on available bicycles through an algorithm after receiving the request from the cloud; in step 204, the operation strategy center transmits the data on available bicycles to the cloud; in step 205, the cloud transmits data of the bicycles that can be reserved to the mobile communication equipment; in step 206, the user reserves a designated bicycle through the mobile communication equipment according to the data of the bicycles that can be reserved transmitted from the cloud and transmits the reserved bicycle to the cloud through the mobile communication equipment; in step 207, the cloud transmits a reservation feedback to the mobile communication equipment after confirming the designated bicycle reserved by the user. The user may accomplish reservation at home, in a vehicle or at other places in advance by executing the above reserving step, so that the efficiency for a user to find a bicycle is improved in general. Meanwhile, when the user uses the mobile communication equipment to find a bicycle, the operation complexity that users scramble for the same bicycle is reduced

FIG. 7 shows a flowchart of a finding step 300 in the bicycle management system control method in the present invention.

As shown in FIG. 7, in step 301, the user's current location is clarified by a positioning function of the mobile communication equipment, and the user's reserved bicycle is searched; in step 302, when the distance between the user and the user's reserved bicycle is within the reserved distance scope, the mobile communication equipment transmits information to the cloud; in step 303, the cloud transmits a command to the bicycle after receiving the information transmitted by the mobile communication equipment; in step 304, after the bicycle receives the command from the cloud, manners, like making the rear lights of the reserved bicycle flash, are taken to make it easy for the user to find the bicycle.

FIG. 8 shows a flowchart of a picking-up step 400 in the bicycle management system control method in the present invention. In the picking-up step, when

arriving at the target location, the user may unlock the reserved bicycle by scanning a QR code or inputting a code on the bicycle frame, etc.

As shown in FIG. 8, in step 401, the user may input a bicycle code into the mobile communication equipment or scan a QR code; in step 402, the mobile communication equipment communicates with the cloud to verify unlocking conditions; in step 403, the cloud returns the verification information to the mobile communication equipment; in step 404, the mobile communication equipment transmits an unlocking request to the cloud; after receiving the unlocking request, the cloud directly transmits an unlocking instruction to the bicycle-mounted electronic equipment of the bicycle to unlock it(step 405), or transmits the unlocking instruction to the user's mobile communication equipment, then the mobile communication equipment forwards or inputs the unlocking instruction to the bicycle to unlock (not shown); in step 406, the bicycle transmits the unlocking status information to the cloud; in step 407, the cloud transmits the unlocking status information feedback to the mobile communication equipment.

FIG. 9 shows a flowchart of a using step 500 in the bicycle management system control method in the present invention. During the user's riding, the system may automatically prompt the bicycle's current status information. The current status information includes but not limited to location information, riding distance, riding time, riding speed, electric quantity and so on.

As shown in FIG. 9, in step 501, the mobile communication equipment updates location information; in step 502, after the user's riding finishes, the mobile communication equipment transmits the status information of the bicycle ridden by the user to the cloud; in step 503, the cloud receives the status information of the bicycle ridden by the user and records it. In the using step, the user may check the status information at any time, and transmit a status check request through the mobile communication equipment. The cloud establishes communication with the bicycle and obtains the status information from the bicycle, and the cloud transmits the information to the mobile communication equipment hereafter and displays it.

In addition, in some embodiments, the user may need to suspend riding due to various reasons during riding, and at this moment, the user may use a suspending function 505. FIG. 10 shows a flowchart of the suspending function. As shown in FIG. 10, in step 506, the user transmits a suspending request to the

cloud through the mobile communication equipment; in step 507, the cloud establishes communication with the bicycle, checks locking status information of the bicycle; in step 508, the bicycle transmits the locking status information to the cloud; in step 509, after confirming that the bicycle has been locked indeed based on the locking status information transmitted from the bicycle, the cloud transmits a suspending notification feedback to the mobile communication equipment. If the user cancels suspending and continues using the bicycle, a resuming request is transmitted to the cloud utilizing the mobile communication equipment (step 510), after receiving the resuming request, the cloud directly transmits the unlocking instruction to the bicycle-mounted electronic equipment of the bicycle to unlock it(step 511), or transmits the unlocking instruction to the user's mobile communication equipment, then the mobile communication equipment forwards or inputs the unlocking instruction to the bicycle to unlock it (not shown); in step 512, the bicycle-mounted electronic equipment transmits the unlocking status information to the cloud; in step 513, the cloud transmits the unlocking status information feedback to the mobile communication equipment, the user may continue using the bicycle.

A returning step 600 will be explained below. As shown in FIG. 11, when the user finishes the riding and locks the bicycle, a returning request is transmitted to the cloud through the mobile communication equipment (step 601); after receiving the returning request, the cloud transmits an instruction for checking locking status information to the bicycle-mounted electronic equipment (step 602); after receiving the instruction, the bicycle-mounted electronic equipment transmits the locking status information of the bicycle to the cloud (step 603); after confirming that the bicycle has been locked indeed based on the locking status information, the cloud transmits information confirming a successful returning to the mobile communication equipment to end the current using of the bicycle (step 604). Meanwhile, the cloud reports to the operation strategy center that the current using of the bicycle has been finished; the operation strategy center updates the status of the bicycle to make it in an available status again.

It needs to be explained herein that the locking status in the present invention may be implemented by the user manually locking, or may be implemented by the bicycle-mounted electronic equipment controlling the anti-thief device to lock the

bicycle based on a locking instruction issued by the user's mobile communication equipment and/or the cloud.

FIG. 12 shows a flowchart of a searching step 700 in the bicycle management system control method according to another embodiment in the present invention.

5 In the searching step, the user starts up a positioning function of the mobile communication equipment to determine his or her location, and the user is guided to find a target location by a navigation function of the mobile communication equipment.

As shown in FIG. 12, in step 701, the user's current location is determined by
10 utilizing the positioning function of the mobile communication equipment; in step 702, the mobile communication equipment is made to search for bicycles in the vicinity and transmits the searched data to the cloud; in step 703, the cloud calculates bicycle display operation strategies, and transmits the operation strategy to the operation strategy center; in step 704, the operation strategy center
15 determines the strategies, and delivers the finally determined strategy to the cloud; in step 705, the cloud transmits the bicycle location information to the mobile communication equipment; in step 706, the navigation function of the mobile communication equipment is started up.

In addition, it is not shown that the bicycle management system control
20 method provided in the present invention may further comprise a canceling step, which may enable the user to cancel a reserved bicycle or give up searching a bicycle according to the actual requirements, and which may occur during any period in the above control method. Furthermore, the operation strategy center may also cancel initiatives so as to enable the operation strategy center to cancel
25 or terminate the current using through the cloud when the system determines that the user is not eligible for specific conditions or the user still does not start up locking when a predetermined time has elapsed.

Although a variety of concept has been described in detail, a person skilled in the art may understand that various modification and substitutes of the concept
30 can be implemented in the general teaching disclosed in the present invention.

In addition, although the present invention is described in the background of function modules and is illustrated in the manner of adopting frames, it shall be

understood that unless there exists an opposite explanation otherwise, one or more of the functions and/or features may be integrated into a single physical device and/or software module, or one or more functions and/or features may be implemented in a single physical device and/or software module. It may also be

5 understood that detailed discussion related to the actual implementation of each of the modules is not necessary for understanding the present invention. More precisely, taking into consideration of attributes, functions and internal relationship of each of the function modules in the system disclosed in the text, the actual implementation of the modules will be understood in a customary technology for an

10 engineer. Therefore, a person skilled in the art is capable of implementing the present invention illustrated in the Claims by applying common technology without excessive tests. It may also be understood that the specific concept disclosed is merely illustrative, and does not aim to limit the scope of the present invention, which is determined by the whole scope of the attached Claims and its equivalent

15 solutions.

CLAIMS

What is claimed is:

1. A control method for a bicycle management system, characterized in that the method is executed by a mobile communication apparatus and comprises:

- 5 a logon step (100) for establishing a connection with a cloud end;
- a booking step (200) for acquiring the information from the cloud end about available bicycles near the user's designated destination so that the user can book a bicycle within the scope of the available bicycles;
- a bicycle seeking step (300) for triggering the cloud end to send a command to a bicycle
10 booked by the user to help the user find the booked bicycle when the user gets close to the designated destination;
- a bicycle pickup step (400) for communicating with the cloud end to trigger the same to authenticate an unlocking condition and to return a verification information; and sending an unlocking request to the cloud end to trigger the same to send an unlocking instruction to a
15 bicycle-mounted electronic apparatus of the bicycle, or to receive the unlocking instruction sent by the cloud end to transfer the same to the bicycle-mounted electronic apparatus of the bicycle, thereby unlocking the bicycle; and
- a bicycle return step (600) for triggering the cloud end to confirm a bicycle locking state and to terminate the bicycle use after a user's ride ends.

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2. The method according to claim 1, characterized in further comprising: a bicycle search step (700) for determining the user's current position, acquiring the information from the cloud end about available bicycles near the user's current position to provide the same to the user, and guiding the user to find an available bicycle near the user's current position.

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3. The method according to claim 1 or 2, characterized in further comprising: a bicycle use step (500) for acquiring the state information of the bicycle from the cloud end and/or the bicycle to provide the same to the user.

4. The method according to claim 3, characterized in that the bicycle use step includes a pause step for pausing the use of the bicycle, and the pause step includes:

during the use of the bicycle, sending a pausing request to the cloud end to lock the bicycle and to send bicycle use pause notification feedback, thereby pausing the use of the bicycle; and

after pausing the use of the bicycle, sending a bicycle continuation use request to the cloud end to unlock the bicycle and to send unlocking state information feedback, thereby cancelling the pause and realizing bicycle continuation use.

5. A mobile communication apparatus (10) for executing the method of any one of claims 1 to 4 and characterized in comprising:

a communication device configured to send or receive a signal via a wired or wireless network;

a processing device including an application processing part and a radio frequency/digital signal processor; and

a memory configured to process the signal or store the signal in a physical storage state.

6. A control method for a bicycle management system, the method being executed by a cloud end and characterized in comprising:

a logon step (100) for establishing a connection with a mobile communication apparatus;

a booking step for acquiring information about available bicycles near the user's designated destination according to the user's designated destination provided by the mobile communication apparatus, so that the user can book a bicycle within the scope of the available bicycles;

a bicycle seeking step of sending a command to a bicycle booked by the user upon receiving a request from the mobile communication apparatus to help the user find the booked bicycle when the user gets close to the designated destination;

a bicycle pickup step (400) for communicating with the mobile communication apparatus so as to be triggered to authenticate an unlocking condition and to return a verification information; and receiving an unlocking request sent by the mobile communication apparatus, and

sending an unlocking instruction to a bicycle-mounted electronic apparatus of the bicycle or the mobile communication apparatus, thereby unlocking the bicycle; and

a bicycle return step (600) for being triggered by the mobile communication apparatus to confirm a bicycle locking state and to terminate the bicycle use after a user's ride ends.

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7. The method according to claim 6, characterized in further comprising: a bicycle search step for acquiring information about available bicycles near the user's current position according to the user's current position provided by the mobile communication apparatus, and sending the same to the mobile communication apparatus.

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8. The method according to claim 6 or 7, characterized in further comprising: a bicycle use step for acquiring state information of the bicycle from the bicycle-mounted electronic apparatus of the bicycle and/or the mobile communication apparatus.

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9. The method according to claim 8, characterized in that the bicycle use step includes a pause step of pausing the use of the bicycle, and the pause step includes:

during the use of the bicycle, locking the bicycle according to a received pause request sent by the mobile communication apparatus, and sending bicycle use pause notification feedback to the mobile communication apparatus, thereby pausing the use of the bicycle; and

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after pausing the use of the bicycle, unlocking the bicycle according to a received bicycle continuation use request sent by the mobile communication apparatus, and sending unlocking state information feedback to the mobile communication apparatus, thereby cancelling the pause and realizing bicycle continuation use.

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10. A cloud end (20) for executing the method of any one of claims 6 to 9 and characterized in comprising:

one or more central processing units;

one or more memories and/or large capacity storage devices; and

one or more wired or wireless network interfaces.

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