Design of Mobile Bicycle Mobile Phone Application Software

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Abstract

For the current domestic is the rise of the electric bicycle rental market, combined with Bluetooth communications technology, Internet technology and computer software technology, for an electric bike designed a mobile application software. Between the bike and the phone through the Bluetooth data exchange, the design of the mobile phone application software can display the current speed, riding time, riding distance, the average speed and other information. Using the software, the rider can understand the status of riding in real time.

Keywords

Electric Bicycle, Mobile Phone Application Software, Bluetooth Communication, Riding State.

1. Introduction

Traditional bike is driven by manpower, and it is very laborious to ride on bad roads such as mountains and ramps. The advent of electric cars has improved the problem. However, with the popularity of modern social fitness concept and the popularity of the Internet, bicycles as people travel when the choice of transport at the same time, has become a healthy sports lifestyle, widely loved by fitness enthusiasts. Combined with electric vehicles for the advantages of a wide range of environments and inspire people to travel a healthy vision, this paper proposed a mobile bike for mobile phone applications.

In addition to the software can display the current speed, riding time, riding distance and other information, users can also register through the account on the Internet to share their riding experience. More importantly, the software can obtain the calorie value consumed during cycling from the bicycle motor controller and record it, which makes sense for the rider for fitness purposes.

2. System Structure Design

The system design based on the Android platform riding application software program consists of four parts: electric bicycles, small instruments, Android mobile terminals and vehicle monitoring center. The overall framework of the system is shown in Fig. 1. Small instrument is the electronic control unit of electric bicycle. A variety of sensors on the car can be collected electric bicycle parts of the work information, sent to the small instrument, and a variety of signals for analysis and processing. Electric bicycle riding application software through the Bluetooth module and small instrument for data communication, real-time collection of electric bicycle riding data. At the same time, the mobile terminal uploads the riding data to the vehicle monitoring center through the terminal own network.

The mobile phone application software mainly realizes the diagnosis data processing, the data analysis, the data display and the data upload; The vehicle monitoring center can receive the front-end vehicle diagnosis data and analyze the data of the electric vehicle and the data transmission function of the electric bicycle The

Electric bicycle small instrument through the serial port to collect the electric bicycle riding data, mobile platform terminal through the built-in GPS module to collect location information. Data transmission through the Bluetooth module and the mobile terminal comes with the network. Data

processing and analysis using an efficient Android operating system to complete. The data flow is shown in Fig. 2.

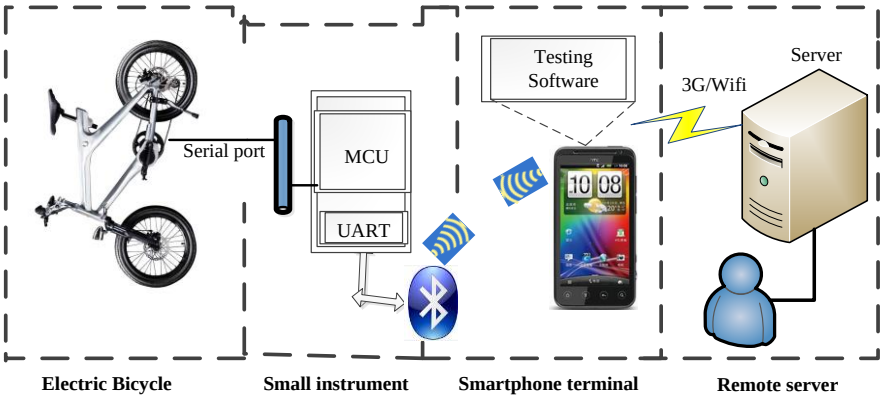

Fig. 1 The overall structure of the body network

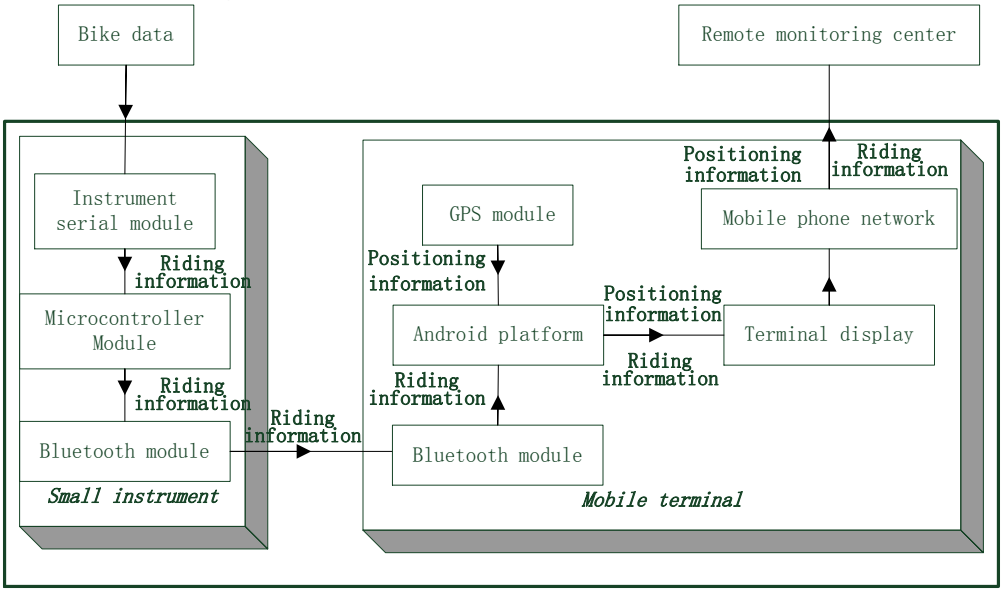

Fig. 2 Electric bicycle mobile application software data flow

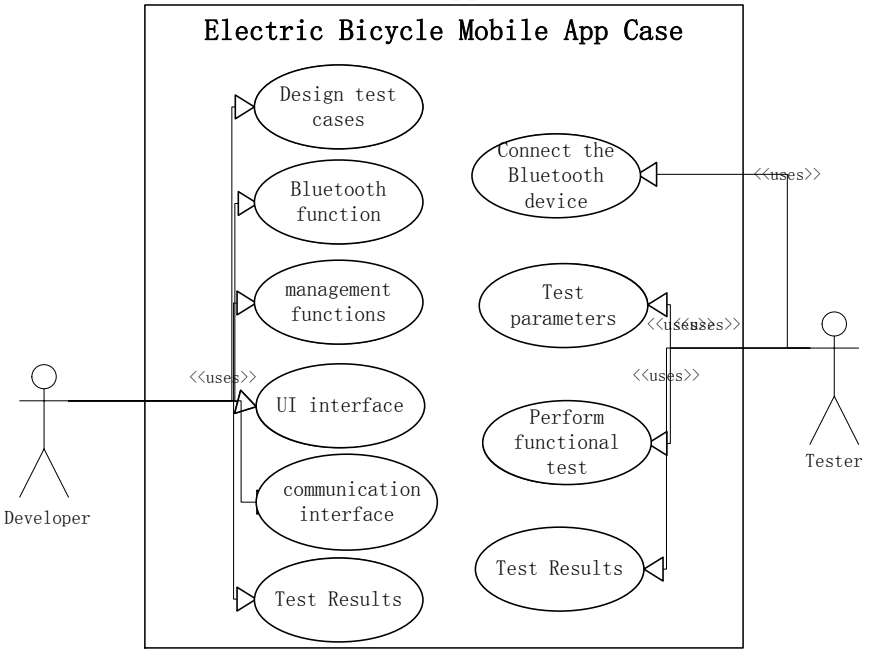

Fig. 3 Test application modeling use case diagram

3. Software Function Modeling

According to the overall design, UML modules are modeled on each function module, and the functions of the test software are shown in Fig. 3

Developers in the test software development process, the need to design test cases, connect the Bluetooth device features, test management functions, design UI interface, the output test results. The tester needs to connect the Bluetooth device, configure the test parameters, perform the test function, observe the test results.

3.1 Test Case Modeling

According to the method of consistency test, combined with the electric bicycle data transmission protocol, this paper models the test cases of the network management protocol. The test cases include the preconditions, the input parameters, the test steps and the expected results. The test case design Fig. 4 shows.

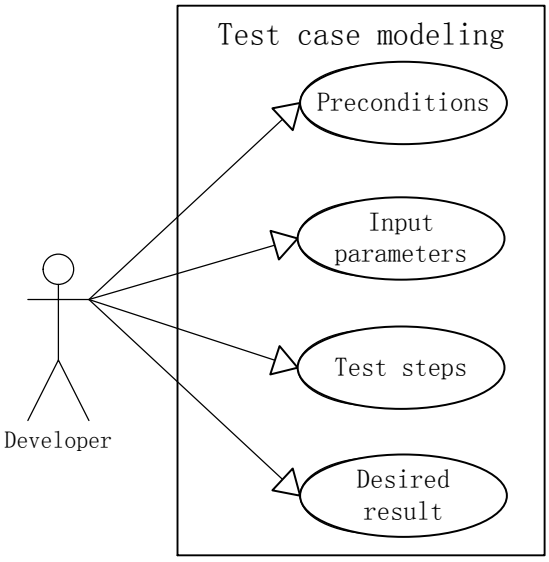

Fig. 4 Test case design modeling

Among them, the precondition is to perform this test to meet the prerequisites, such as the status of the DUT. The input parameters are parameters that need to be configured for the test system, such as ride mileage, time parameters, and so on. The test procedure is related to the test process, such as sending serial data, delay and other operations. The expected result is the result of the expected occurrence of the current test case, that is, the result of the agreement.

3.2 Bluetooth Management Modeling

Bluetooth device management functions mainly include some of the basic functions of Bluetooth devices, such as: open, close, find, connect, match and so on. For different roles, different functions are required. For example: developers need to design and implement the Bluetooth protocol stack, the design of Bluetooth operating UI interface. And the tester will need to connect the specific operation of the Bluetooth, Bluetooth and complete the connection between the two Bluetooth devices.

In view of the different functional requirements of the above analysis, using UML modeling, the use of Bluetooth management module shown in Fig. 5.

3.3 Test Management Modeling

Test management mainly includes parsing the XML file for the test case, the test recording based on the test result generated, encapsulation of serial data, design data communication with the Bluetooth mobile terminal device, the data during the test for analysis and processing. Which UML use case modeling shown in Fig. 6.

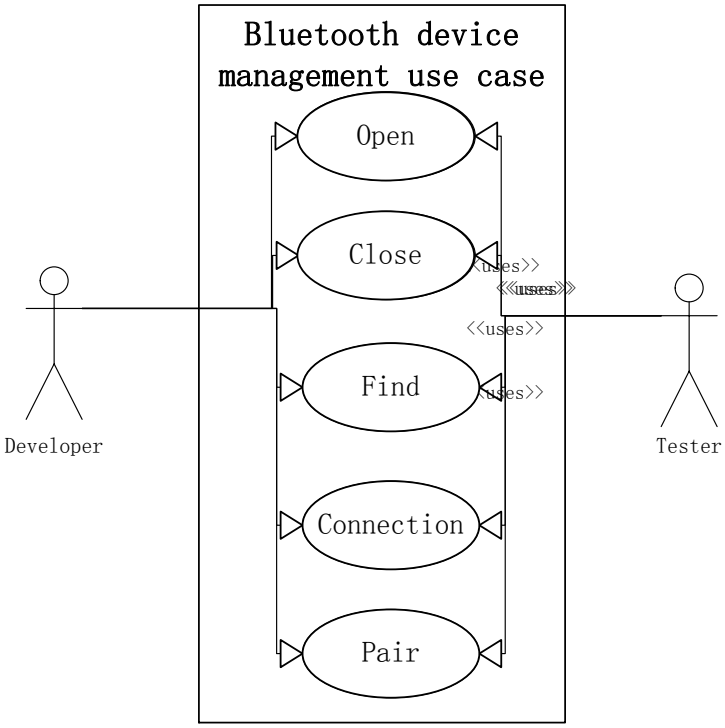

Fig. 5 Bluetooth device management use case

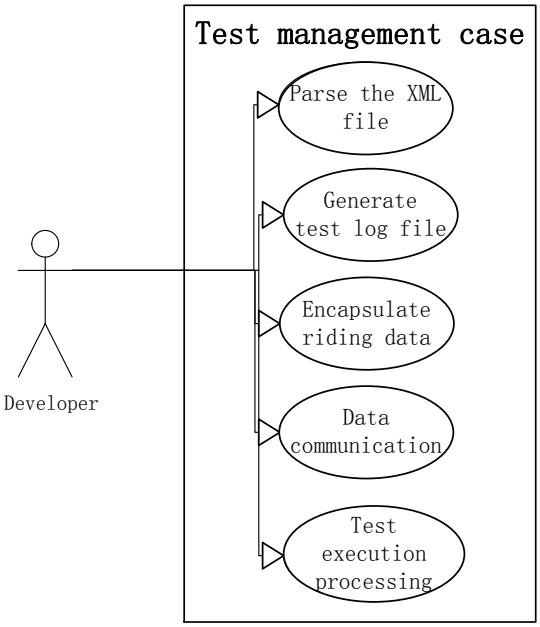

Fig. 6 Test management use case diagram

3.4 UI Interface Design Modeling

UI interface is an important way of human-computer interaction. The UI interface of the test software includes a list of test cases, a message display window during the test, a test parameter configuration interface, a Bluetooth device management control, a test result display interface, and other setting controls. The UML model is shown in Fig. 7.

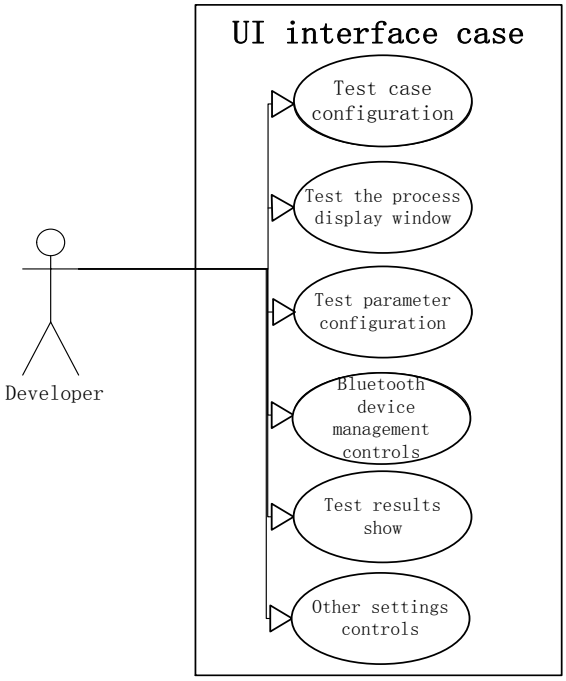

Fig. 7 UI interface modeling use case diagram

4. Software Interface Design

Using Android language for software design, the main interface of the software shown in Fig. 8. The main interface can display information such as current speed, ride distance, ride time, calorie consumption, maximum speed, average speed, current elevation. In the personal information editing interface, the user can make head, nickname, birthday, gender, telephone, height, weight and other information settings.

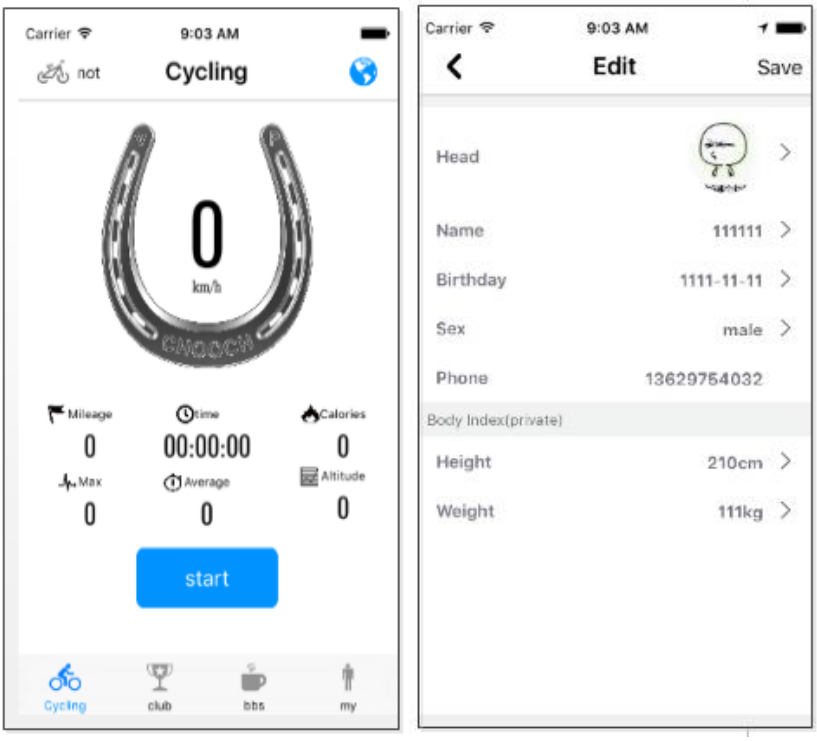

Fig. 8 Software interface design

5. Data Interaction Design

Use the application software to unlock the vehicle, then the phone can be through the Bluetooth and bicycle motor controller to communicate. The phone will be collected to the speed, battery power, gear and GPS and other data displayed in the phone interface.

Mobile phone and bicycle motor data exchange software design process shown in Figure 3. First, the motor is running and the data is sent to the Bluetooth through the serial port, and then Bluetooth to the transmission of the motor data sent to the phone, the phone receives the message after its analysis and processing, according to the length of the message and the first 0 Is 0x64 to determine the legitimacy of the message, and then according to the first message to determine the function of this message, and finally the data will be processed to the phone interface. Electric bicycle mobile application software data exchange process shown in Fig. 9.

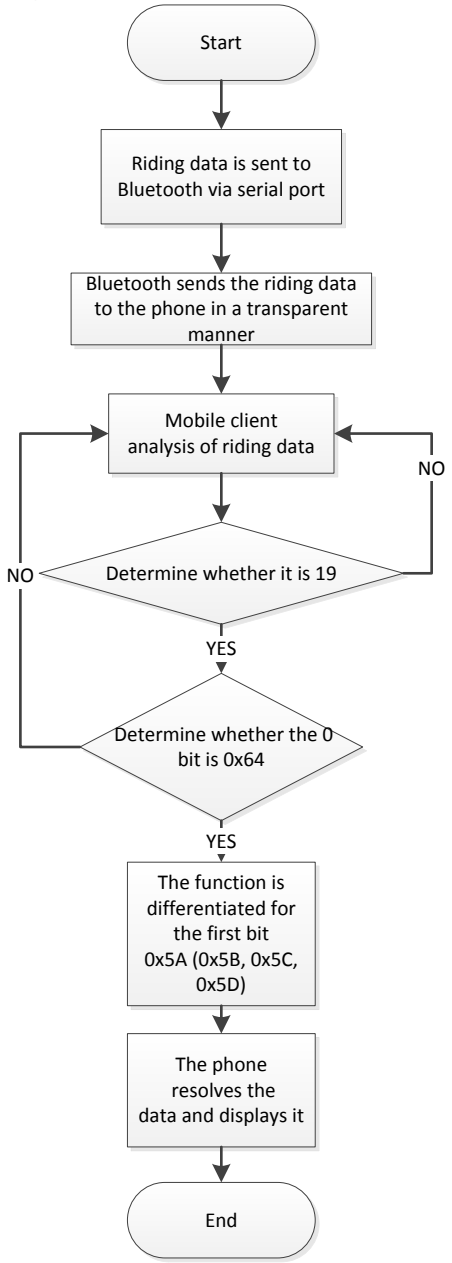

Fig. 9 Data interaction flow chart

In order to ensure that the phone can get the data when the bicycle is running, you need to develop a communication protocol. Bicycle motor controller and mobile phone between the use of Bluetooth for data transmission. Defines the length of the data frame sent by the Bluetooth module of the motor

controller for 11 bytes, sent once every 500ms, and the phone does not respond. The format of the data frame is shown in Table 1.

Table 1. Format of data frames

Data bits	Function	Description
BYTE0	Start character	Fixed value 0x64.
BYTE1	Voltage state	Bit7: voltage undervoltage, 0 for battery, 1 for battery undervoltage. Bit6-0: reserved.
BYTE2	Current state	The operating current of the controller.
BYTE3	Speed information high byte	The wheel rotates one week in milliseconds.
BYTE4	Speed information low byte	
BYTE5	Remaining battery	0-100%.
BYTE6	Power motor stalls	Divided into four files 0x00, 0x04, 0x08, 0x09.
BYTE7	Power switch status, headlight switch status	Bit0: 0 indicates that the headlamp is off and 1 indicates that the headlamp is on. Bit4: 0 means the switch is off, 1 means the switch is on.
BYTE8	Error code	
BYTE9	Checksum	
BYTE10	The end character	Fixed to 0x0E.

6. Conclusion

In this article, the phone and the bike of the motor through the Bluetooth data exchange, the phone will receive the motor data for a certain deal and through the design of the application software to display. Users through the design of the mobile phone software, you can very intuitive understanding of the current riding status and make the appropriate adjustments.

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