

Design and Implementation of Controlling PC Wirelessly by Android Mobile Based on C/S Mode

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Abstract

In order to adapt to the development of the mobile Internet, intelligent small mobile terminal will be the future trend of development. This paper describes the implementation of data communication between the Android operating system and PC. Besides, this paper also presents some solutions of key issues, including the event processing of mouse movement area involved in Android mobile client, the event processing of command button and mouse movement involved in PC server; etc. To meet the needs of schools and educational institutions, an Android wireless mouse and keyboard software based on C / S mode is developed, hoping to replace similar electronic pointer and achieve long-range wireless control.

Keywords: *Android; wireless mouse and keyboard; event handling; Wi-Fi; PC*

1. Introduction

In recent years, with the popularity of smart phones, people's daily life has been tremendously changed. Today, mobile phone is more than a communication tool, but an intelligent terminal which is able to handle various events. Among these intelligent terminals, Android is an open system. Because of which, it is widely used in major mobile phone brands, becoming the highest market-share occupied operating system. Its superiority is self-evident.

Android smart phone, widespread and accessible, provides a good background, helping to design the application in this paper. The traditional PC has advantages of a large screen, fast processing speed and superior performance, but the user must carry out the operation with a mouse sitting in front of PC, which makes the scope of the operation is too restrictive. For example, when using the PPT to teach in the multimedia classroom, too limited operating range affects the richness of the teacher lectures, making teachers rarely interact with the students

To solve these problems, a wireless mouse and keyboard control system is designed, which allows Android phone to be your PC's mouse and keyboard instantly,

so users can easily control over the PC through the phone. Figure 1 shows the physical structure of the system. Hardware needed includes: Android phones, Wi-Fi and PC. System's software uses PC as a server and C / S mode to process the instruction data from the client, and uses Android phone as a client to provide an interactive interface of simulated mouse and keyboard and transmit the data command to the server via a wireless network.



Figure 1. The Physical Structure of the System

2. Key Technologies

2.1. Android Platform

The design is achieved in the Android platform. Android platform uses Software Stack, also known as software stack architecture. As shown in Figure 2, from low to high is divided into four parts. The detailed contents of four parts are as follows:

- (1).Linux kernel layer: This layer is the basis, including various drivers and providing basic operating system functions;
- (2).Middle layer: including Libraries and Android runtime environment;
- (3).Application Framework: This layer is used as the API framework when writing the core application, developers can use the framework to develop their own applications, but must comply with the principles of the framework development;
- (4).Application layer: This layer is the variety of applications, including calls, SMS, calendar, maps, browser and other core applications, these applications are written in Java.

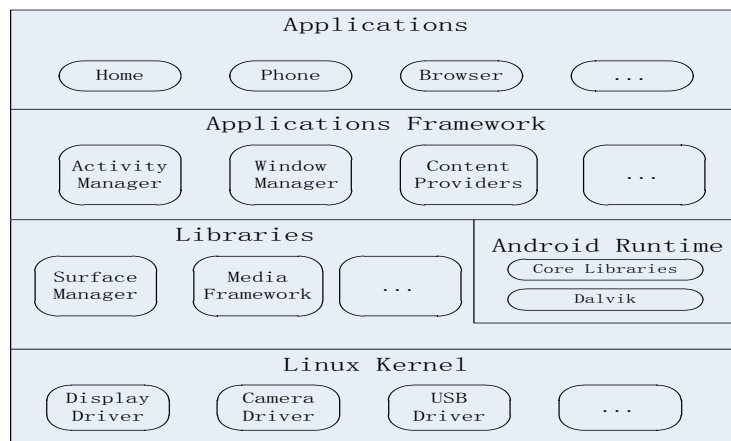


Figure 2. The Structure of Software Stack

2.2. Ways to Provide Network Service

This design uses Socket to provide network service. Socket, often called "socket", is used to describe the handle of the communications link. Use the inter-socket applications to transmit information, solving the data communication between Android operating system and PC. In this design, the command data is transmitted. The process of socket connection is divided into four steps: the monitor of PC server, requests from Android mobile client, connection confirmation, handling instructions from Android mobile client. Figure 3 shows it's flow chart. The detailed contents of four steps are as follows:

- (1).the monitor of PC server: The socket of PC server in the status of waiting for a connection and real-time monitoring network;
- (2).requests from Android mobile client: The client's socket points out the server's address and port number, and then sends a connection request to the server;
- (3).connection confirmation: When the server's socket listening the connection requests from client, it responds to the request of the client's socket and send the description of the server's socket to client. Once client confirms this description, the connection is established, and then the server's sockets start monitoring the instruction from client.
- (4)handling instructions from Android mobile client: When the server's socket listening to the instruction from client, the instruction is executed and then waiting for the next instruction.

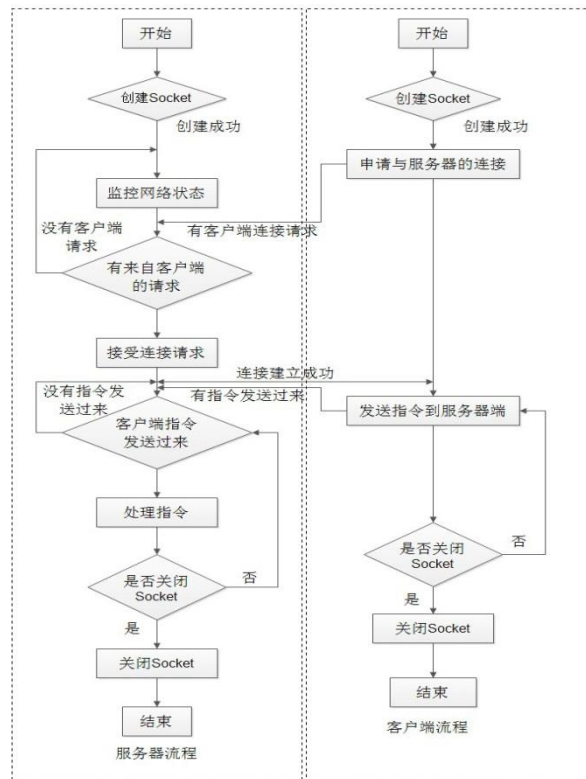


Figure 3. Socket's Workflow

2.3. Ways to Transmit Instruction

Currently, most phones in the market support two short-range transmission mode, that is Bluetooth and Wi-Fi (Wlan).The communication distance of Bluetooth is 10m and its transmission rate is 3Mbps.While the communication distance of Wi-Fi is 100m and its transmission rate is 54Mbps[1].It can be seen that Wi-Fi has greater coverage and higher transmission rate, so the Wi-Fi is more suitable for the design. Wifi on handheld devices is used more widely, and smart phones is one part of it.

3. System Implementation

Development Environment: Use Win7 Ultimate as the system platform, Eclipse4.2.0 as the development tool, the version number of Android SDK is 1.7.

3.1. Android Mobile Client

Figure 4 shows the main interface of Android mobile client. In this interface, users need to enter the IP of wireless LAN that the PC is connecting and click on the "click and experience" button to jump to the operating interface. The way to get IP is running cmd on the PC and entering ipconfig, and then the IP address of the wireless LAN can be viewed.

Figure 5 shows the operating interface of Android mobile client. The upper half of the interface is the part of simulated mouse, users can slide their finger in the area that mouse can be moved or click on the left and right buttons on the interface to control the PC's mouse movement and clicks. The lower half is the part of simulated keyboard, users can click on the relative button to control the PC's keyboard input. The Structure and layout of simulated mouse imitates the touch mouse of general laptop. Simulated keyboard basically covers the usual keys of PC's keyboard while adding a shortcut key to switch the input method. Putting the simulated mouse and keyboard into the same interface is convenient and flexible for users to control PC to a greater extent.



Figure 4. Main Interface



Figure 5. Operating Interface

3.1.1. Android Event Processing of Mouse Movement Area

Call `setOnTouchListener()` to register a listener for `mousedraw` (`mousedraw` is a component of `TextView`) to capture the event of finger movement. Send the obtained `disx` (the distance of finger movement in the horizontal direction) and `disy` (the distance of finger movement in the vertical direction) to the PC server. The key code is as follows:

```
mousedraw.setOnTouchListener(new OnTouchListener(){
public boolean onTouch(View arg0, MotionEvent event) {
switch(event.getAction()){
case MotionEvent.ACTION_DOWN:
initx=event.getX();
inity=event.getY();
break;
case MotionEvent.ACTION_MOVE:
disx=event.getX()-initx; //Moving distance in x direction
disy=event.getY()-inity; //Moving distance in y direction
initx=event.getX();
inity=event.getY();
if(disx!=0||disy!=0){
String msg="a"+disx+" "+disy+b;//Obtaining string according to the custom format
if(socket.isConnected()) {
printWriter.println(msg);
}
}
break;
}
return true;
}
});
```

3.1.2. Android Event Processing of Command Button

Call `setOnClickListener ()` to register a listener for `buttonx` (`buttonx` is a component whose instruction is `x` of `Button`).Click on the relative command button to send the command message to the PC server. For example, "switching input method" button:

```
buttonqiehuan.setOnClickListener(new Button.OnClickListener() {  
    public void onClick(View view) {  
        String msg=KEY_QIEHUAN;"  
        if (socket.isConnected()) {  
            printWriter.println(msg);  
        }  
    }  
});
```

3.2. PC Server

Figure 6 shows the initial interface of PC server. Since most functions achieved by server are in the background, so this design uses a relatively simple interface. Users click on the "Start Server" button, the server will be in a listening state, waiting for the client sending connection requests. Once the connection succeed, the server status will display "client has been connected ",as shown in Figure 7.

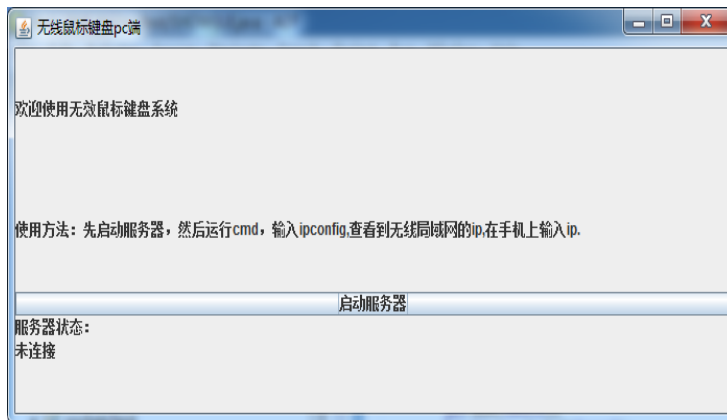


Figure 6. The Initial Interface of PC Server



Figure 7. Server Status is "Client has Been Connected"

Server handles a series of instructions from the Android mobile client by calling the class of Java.awt.Robot. This class is used to test automation, self-running demos, and other applications that need to control the mouse and keyboard to generate native system input events. The main purpose of Robot is to facilitate Java platform to achieve automated test. Table 1 shows some methods and commands of Robot.

Table 1. Methods and Commands of Robot

| methods | functions |
|---------------------------------|--|
| robot.mouseMove(int x,int y) | Move mouse to the coordinates (x, y) |
| robot.mousePress(int keycode) | Use mouse to press the specified button |
| robot.mouseRelease(int keycode) | Use mouse to release the specified button |
| robot.keyPress(int keycode) | Use keyboard to press the specified button |
| robot.keyRelease(int keycode) | Use keyboard to release the specified button |

3.2.1. The Event Processing of Mouse Movement

First, the server get the horizontal direction and the vertical direction. Then get the current mouse position, calculate the coordinates after moving. Finally, use robot.mouseMove (int x, int y) to move the current mouse to specified position. The key code is as follows:

```

if(message.contains("a")){
movex_str=message.substring(message.indexOf("a")+1,message.indexOf(";")); //Intercept string to
obtain the moving distance in x direction
movey_str=message.substring(message.indexOf(";")+1,message.indexOf("b")); //Intercept string to
obtain the moving distance in y direction
movex=Float.parseFloat(movex_str);
movey=Float.parseFloat(movey_str);
Point point = MouseInfo.getPointerInfo().getLocation(); //Get the current mouse position
nowx=point.x;
nowy=point.y;
robot.mouseMove((int)(nowx+movex),(int)(nowy+movey)); //Move the mouse to the current
location
}

```

3.2.2. The Event Processing of Command Button

After sever receiving the command , use robot.keyPress () and robot.keyRelease ().to complete the corresponding input event. Such as receiving the "switching input method" command:

```

if(message.equals(KEY_qiehuan))
{
robot.keyPress(KeyEvent.VK_SHIFT);
robot.keyPress(KeyEvent.VK_CONTROL);
robot.keyRelease(KeyEvent.VK_CONTROL);
robot.keyRelease(KeyEvent.VK_SHIFT);
}

```

4. System Test

Test environment: Use Android virtual machine and the real machine to test. The

version of Android virtual machine is system 2.1. The model of Real machine is Motorola Xt502 and its system version is 2.1. Server-side program running on a Dell laptop whose version is System Inspiron N4110, while client program running on a real machine, Wi-Fi is turned on.

Test content: operating tests of button and touch. The moving area of mouse and all command button are valid after many tests. During the operation, unresponsive cases are not found.

Test results show that: In the wireless LAN coverage, wireless mouse and keyboard system designed in this paper can effectively complete the operation of moving mouse and keyboard input, and achieve the synchronous execution between PC and Android phone client. The desired requests are achieved successfully.

5. Conclusions and Future Work

The wireless mouse and keyboard system designed in this paper changes the traditional operation of the PC users, which makes users interact with PC more easier and faster. The system has many advantages such as easy to install and operate, low cost, out of the box, *etc.* In the next stage of research, the control of human-computer interaction will be strengthened, such as adding voice control, calling the cell phone camera to perceive limb, which makes users control PC more conveniently.

Acknowledgements

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