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Bluetooth Wireless Control for Personal Computers

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Abstract:

This paper describes an ingenious way of using Bluetooth-enabled mobile phones to control the PC applications with the help of a software application, which is based on client server architecture.

Introduction:

The objective of this project is to a develop software that will perform basic PC controlling operations and some external device controlling operation using Bluetooth radio signal. PC remote control application that enables you to remotely view and control your computer desktop from a Bluetooth or Wi-Fi enabled mobile phone.

You can remotely control the cursor movement, button, wheel and control the applications like Win-amp, iTunes, MS PowerPoint and Windows Media Player. You can even shutdown, restart and standby your computer remotely. It also supports Windows command line arguments. You can create your own remote profiles for your mobile phone, and even share your profiles with other users.

The project aims to develop a system in which a user has control over the windows applications using the Bluetooth enabled mobile phone. PC Remote Control turns your Bluetooth enabled mobile phone into a universal controller for Window. It will allow you to see Power Point slides directly in the phone, browse/play the songs in ITune and Media player and much more...

PC Remote Control is a true universal remote control that lets the user adds or modifies the controlled programs. Customize simple key maps or for full control over the UI write your own Java and VB scripts. PC remote Control will support the following programs: Support for additional programs can easily be added with simple key maps; VB or Java scripts.

ITunes

· Shows song name, artist & track time
· Browse playlists, songs, artist, & album
· Search for songs
· Rank tracks
· Toggle shuffle
· Repeat track or library
· Play/pause, rewind, fast forward, change

  Volume, previous/next track & Mute

PowerPoint
·Shows next slide and slide notes
· Shows actual slides
· Play/stop presentation, previous/next slide
· Load recently used file
· Browse/Go to all/any slide
· Presentation time
· Scroll slide notes
· Vibrate when time expires

System
· Change system volume
· Start screensaver
· Lock workstation
· Shutdown Windows & Start screensaver.

PC Control Features:

This project aims to provide the
following set of different features

- Control your PC from a Bluetooth enabled mobile phone.
- Supports many programs including Win- amp, iTunes, Microsoft PowerPoint or Windows Media Player.
- Interact with PC applications from your mobile phone.
- Design your own customized remote profiles and skins for your mobile phone.
- Share your profiles with other users.
- Remotely browse playlists and select songs.
- Control the operating system including, volume, mouse, keyboard and system commands.
- Remotely Zoom and pan mouse and cursor commands.
- USB-UIRT support.
- Compatible with popular mobile phones like Nokia, Sony Ericsson, LG, Motorola, Samsung and more…
- One click action execution and scheduling.
- Shutdown, Restart computer & Log-off user.
- Disconnect dialup or VPN connections.

You will use the navigation keys of your mobile to move around the desktop, zoom in, zoom out and control the mouse. It will be compatible with Nokia, Sony Ericsson, LG, Motorola, Samsung, Siemens and Blackberry mobile phones. It uses your mobile as a wireless keyboard to control your PC.

This application will automatically perform various frequently used actions like shutdown or restarts your computer, disconnect your current dial-up connection, lock workstation etc. The automation options let you schedule all operations daily, weekly, at specified time or when PC will become idle.

Software advantages

1. We can explore all the drives and it's subfolders and files.

2. We can see Text file and image file in mobile and play and control song in pc.

3. This software enables user to control various windows applications (ex: Restart, Log off, Turn off) from a remote place and no need to use keyboard or mouse.

What is Bluetooth?
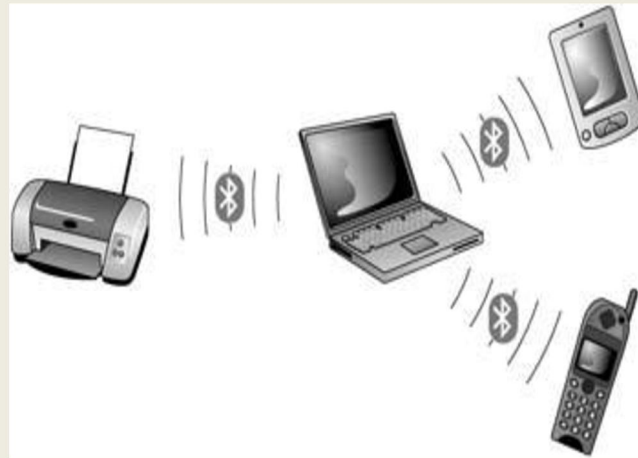
Figure: 1 Bluetooth radio communication

Bluetooth is a wireless communication protocol mainly used for short distance and in devices with low power consumption. Because Bluetooth is capable of communicating in an Omni-directional manner of up to 30 feet at 1 Mb/s it is far superior to infrared. Where infrared requires a distance of a few feet or less and requires a direct line of site for transmissions. The Bluetooth core system consists of a radio frequency (RF) transceiver, baseband, and protocol stack. The system offers services that enable the connection of devices and the exchange of a variety of classes of data between these devices. Actually it's a wireless communication protocol that, like HTTP or FTP, operates in client/server architecture. It uses the 2.4 GHz band. If there are multiple peripherals to be connected to a computer using RS-232 or USB, then Bluetooth is the ideal solution to use those devices wirelessly.

Features of Bluetooth

Strengths

       The following table compares the Bluetooth radio to wireless LAN and infrared. These three technologies are the most commonly used in many of today's wireless applications. Each of them has their own set of advantages and disadvantages, and this makes each of them suitable to certain applications.

Parameter	Bluetooth	Wireless LAN	Infrared
Typical Range	Medium (10m)	Long (100 m)	Short (1 m)
Line-of-sight	No	No	Yes
Bandwidth	1 Mbps shared	11 Mbps shared	115 kbps & 4 Mbps dedicated
Interference	Other RF devices	Other RF devices	None
Power Consumption	High	Very high	Low
Security	Less secure than Infrared	Insecure unless protected	Very secure
Component Cost	About $20	About $25	Less than $2

Table 1: Comparison of Bluetooth, wireless LAN and infra-red technologies.

The main features of Bluetooth that makes it suitable for use with our project are:

• Minimal hardware dimensions.
• Low price of Bluetooth components.
• Low power consumption for Bluetooth
  connections.
• Inherent security features.
• Medium range.

The low cost and small size of the Bluetooth radios means that it can be integrated into many portable devices cheaply. The products offered from companies in the Bluetooth SIG, such as mobile phones, PDAs etc, create a huge market potential for Bluetooth devices and their applications.

Low power consumption is especially important in this project because the software system requires the Bluetooth radio on the mobile phones to be turned on all the time. This helps to prolong battery life, which is scarce in mobile phones.

The inherent security features and medium range of Bluetooth makes Bluetooth relatively secure as compared to other wireless radios such as wireless LAN. The security features makes it hard to listen to the data transmissions. The medium range means that hackers would have to be within close physical range to the Bluetooth radio in order to listen to its traffic. All these are important, because this project deals with access control, in which security plays a very important role.

The Bluetooth protocol stack

The Bluetooth stack and Bluetooth hardware has close relationship. It works as the driver for the Bluetooth hardware. The Bluetooth stack is a controlling agent (it could be software, firmware, hardware, or a combination of all three) that implements the Bluetooth protocol and also allows you to control your Bluetooth device programmatically. The Bluetooth stack allows doing these two things:

1. Communicate with other Bluetooth devices.
2. Control host Bluetooth device.

Layers of the Protocol Stack:

1. Host Controller Interface (HCI)
2. Logical Link Control and Adaptation Protocol
3. Service Discovery Protocol (SDP)
4. RFCOMM (stream data)
5. Wireless Access Protocol (WAP)
6. Object Exchange (OBEX) (object data)
7. Bluetooth Network Encapsulation Protocol
8. Human Interface Device Protocol (HID)

The Java Bluetooth API

To control the Bluetooth device programmatically, we need J2ME optional package JSR 82. JSR-82 can only be implemented on the J2ME platform. The JSR-82 actually consists of two independent packages:

1. **javax.bluetooth** (the 13 classes and interfaces that are needed to perform wireless communication with the Bluetooth protocol)
2. **javax.obex** (the 8 classes that are needed
to send objects between devices, independent of the transport mechanism between them)

Device Management

LocalDevice, RemoteDevice, and DeviceClass are the classes in the Java Bluetooth specification that form the Generic Access Profile and allow you to perform device management. These classes allow you to query some statistical information about your own Bluetooth device (LocalDevice) and also some information on the devices in the area (RemoteDevice). The DeviceClass object gives you information about the official class of device (CoD) as defined in the Bluetooth specification.

A device class is simply a classification of Bluetooth devices. By simply calling the methods of this class, it can be determined what kind of devices are in the area, like computers, laptops, phones, PDAs, access points, etc.

How to make connection between a mobile and a PC?

We used a Bluetooth dongle to make a connection between a Bluetooth enabled mobile and a PC. Unfortunately J2SE doesn't support the java Bluetooth API JSR-82. So we couldn't initialize the Bluetooth stack of the dongle in our way. To make the dongle work we used its driver CD to initialize the stack. We send stream data to PC using its serial port profile over the RFCOMM protocol layer.

The Bluetooth dongle works as a receiver or a server and we developed a program for the mobile which works as the client. The client first discovers the Bluetooth devices around it. Then it discovers what services they contain. If the device is a desktop and supports the serial port profile, out client can interact with it over its RFCOMM protocol layer. The client program sends some stream data as command to PC's virtual communication port. There is a server program in the PC which reads stream data from the communication port and executes those commands.

The client program

We developed a MIDLET for our mobile phone which will work as the client. Our client program contains all the basic components of a Bluetooth application. It can perform the following tasks:

1. Device Discovery
2. Service Discovery
3. Communication with a Desktop computer.
4. Can gain the Bluetooth address of the server to connect.
5. Can gain the Bluetooth information about the host micro device.

This is the basic interface of our client program. From its menu we can choose to discover any Bluetooth device around the host mobile phone or can view the Bluetooth information about the mobile phone. It can discover any device around its Bluetooth range and can show its friendly name.

Basic Parts of the Client program:

Basic components of the client program are

a. Device Discovery
b. Service Discovery
c. Controlling the whole pc

a. <u>Device Discovery</u>

Our client program can discover any Bluetooth devices around it. Whenever the Device discovery option is pressed it starts the discovery agent to discover any remote device.

DiscoveryAgent agent =

                                        device.getDiscoveryAgent ( );

agent.startInquiry (DiscoveryAgent.GIAC,

                                        new Listener ( );

Our client device starts in GIAC mode, which means other remote device also can discover our device. Whenever a device is discovered a discovery **Listener** shows the friendly name of the Bluetooth device.

b. Service Discovery

Our client program is also capable of Discovering Services offered by the remote device. Our program search services with the

UUID 0 x 0003 which is UUID for RFCOMM.

agent. searchServices (null, // attributes to retrieve from remote device new UUID [ ] {new UUID (0x0003)}, /* search criteria, 0x0003 = RFCOMM*/ remote, new Listener ( ));

Whenever a service is found our program stores the service records in a service array.

c. Controlling the PC

The PC controlling part of our program can send command to a connected PC to control some basic component of it. The mobile connects with the PC by obtaining the URL String that is needed to connect to the device from the ServiceRecord object that we get from service discovery.

Our program generates the connecting string automatically by comparing the UUID of Serial Port profile with the UUID of discovered service record objects in the current inquiry. If there is a match then our program saves the connecting string to connect with the remote device.

The PC Controlling interface

If all the requirements were fulfilled then our PC controlling interface appears. Through this interface we can perform the whole PC controlling operation or can connect to our PC.

The Receiver Program

The receiver program is used in the computer which receives command from the client's mobile through serial port and takes necessary steps to perform different actions. It contains all the necessary informations to receive command from the client and to contrtol computer as well as external electric devices.

When the receiver program is run it always waits for a connection from any bluetooth remote device within it's range.

Basic Parts of the Receiver Program

The receiver program in the computer can be discussed according to its basic parts.

It has the following basic parts:

i. Creating the Graphical User Interface (GUI).
ii. Adding action Listener to the buttons.
iii. Writing the current parameters of the port to
a configuration file.

iv. Creating properties object from configuration file.
v. Setting parameters to the property object.
vi. Handling the exception of opening more than one port at a time.
vii. Receiving data sent from the client.
viii. Comparing string and generating commands.
ix. Showing the current status of the receiver.

i. <u>Creating the Graphical User Interface:</u>

The GUI part of the receiver program contains several labels**, buttons, panels, textarea** of javax.awt class. The buttons and textareas are added in panels. The whole GUI part is placed in a constructor. The components are placed to their absolute position by using a function **setBound ( )** As the GUI part is placed in the constructor; whenever the receiver program is run the GUI part becomes visible.

ii. <u>Adding action listener to the buttons:</u>

Here three buttons are used: "Open Port","Close Port" and "EXIT"

The actions to be performed by these buttons are specified in this part of the receiver program. Any exception in performing the specified action is handled here. Now let us discuss about the actions performed by these three buttons

iii. <u>Open Port:</u>

Once the program is started, the appropriate communication port to receive the data from client is selected from the list of available communication ports. Then the button "Open Port" is pressed to open the selected port. After the port is successfully opened, it becomes ready to receive data sent from mobile by the client.

iv. <u>Close Port:</u>

When the function of the opened port come to an end, that port should be closed so that another ports can be opened further. Because in case of serial port only port can be accessed at a time. So after performing action the port should be closed.

v. <u>EXIT:</u>

If the receiver wishes to be disconnected from client, then the receiver program should be closed. This is done by pressing the "EXIT" button. After pressing the "EXIT" button if any port remains opened at that time, then that port is closed and after this the program terminates.

vi. <u>Showing the current status of the receiver</u>

In the text area the current status of the receiver remains shown. When the client sends new commands status of the receiver becomes changed. This helps anyone near the receiver to know the command that is currently being processed by the computer.

CONCLUSION

This software will be very much user-friendly. To make use of it one needs just to press button to control pc operation. User won't have to know the Bluetooth address of the server PC. It will also discover any Bluetooth device and there services around it.

This software will be applicable for all versions of WINDOWS operating system. As maximum computer users feel comfort to use this operating system. We will be look forward to improve our software to make it truly platform independent and to implement the software in two way communication.

FUTUTE SCOPE

The one of the largest demands for applications will be for wireless commercial services. There is expected to be a huge market for wireless systems that provide convenient methods for consumers and organizations to make transactions and conduct business. The following are the application areas where this Pc remote control software system will be applicable.

1. Mobile Financial Applications.

2. Mobile Advertising.

3. Mobile Inventory Management.

4. Product Locating and Shopping.

5. Wireless re-engineering

6. Mobile Entertainment.

7. Chatting & instant messaging between devices

8. Mobile Office & Mobile Education.

9. Wireless Data Centre.

10. Mobile Music etc.

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