TOWARD REMOTE OBJECT CONTROL BASED ON PYTHON FOR SYMBIAN S60

I Made Murwantara, Fanny Sinthia, Fransiscus Ati Halim
Faculty of Computer Science, Universitas Pelita Harapan
UPH Tower, Lippo Karawaci, Tangerang, Banten, Indonesia 15811
e-mail: {made,frans_ahalim}@uph.edu

ABSTRACT

 Nowadays mobile phones can be used to do various things, such as recording or watching videos, listening to music, and scheduling. With recent developments in communication technology, mobile phones is capable to communicate with another device. A global standard to accomplish is Bluetooth. Using Bluetooth, a mobile phone can communicate with other devices. The exchange of data between compatible devices is handled by the Bluetooth protocol. This makes it easy for the programmer to develop various wireless applications on mobile phones which support Bluetooth. This paper presenting the use of Bluetooth to control the movement of an object in a computer using a mobile phone based on Symbian S60, using Python.

Keywords: Symbian, S60, Bluetooth, Python, Remote Object Control.

1. INTRODUCTION

Mobile phone has an application which is very interesting and useful. For example: Bluetooth media. Bluetooth is very practice media. Bluetooth become a mediator besides infrared. Bluetooth is used for moving a data from mobile phone to another mobile phone or to the computer.

Nowadays presents a new programming language which can be used for mobile phone, it is Python. Python is an open source based on GPL. This language can be installed and executed in mobile phone based on Symbian S60.

Developing a mobile phone go on straightly, until appeared one idea for exploiting to abuse mobile phone which is base on Symbian S60 for the simulation to control a moving object from computer using a Bluetooth media. Mobile phone capable as remote control of objects in the computer.

Simulation by moving object can be use for controlling the minimum system at microcontroller based robot. On this paper we will design a system based on Symbian S60 with emulation Python for moving object which can be running in the computer from mobile phone. Bluetooth media is used until mobile phone which base on Symbian S60 can communicate with the computer when the simulation running, using serial port communication between mobile phone and computer.

2. RELATED WORK

Symbian S60 is an operating system that exist on mobile phone. Now a days Symbian S60 support Python program language. Using Python application, mobile phone can be used for multifunction technology. Python program language is capable to take an input from mobile phone and show an output at computer which connected by Bluetooth.

Python is a script language program which is created by Guido van Rossum from Amsterdam, Netherland [6]. On Python language, there are communications socket that available to implement. Socket have an important role in data transfer process. There are a lot types of socket, i.e.: `sock.connect(address),sock.recv(bufsize,flags,sock.send(string),sock.'AF_BT',sock.'SOCK_STREAM'` and `sock.'Bt_Discover'` [5]. On this type of socket, command of `read()` or `write()` could be replaced by `recv()` and `send()` without argument of flags.

Many application of Graphical User Interface (GUI) available in Python Language. Each GUI has to be adapted for requirement needs. If we want to make a simple application, 'appuifw' command could be implemented. While for a complex application Tkinter is used as GUI. Besides, there are some GUI which can be used, for example: Tkwidgets and of Wxpython.

3. BLUETOOTH MEDIA

Bluetooth is a radio technology with limited reach area which give ease of connection for wireless equipments (without cable). Bluetooth use wireless communications technology that operating in frequency band 2,4 GHZ or precisely is 2.400-2.483MHz which is industrial, scientific and medical (ISM) unlicensed frequency by using a transceiver hopping frequency that capable to provide data communications service and voice at the real-time between Bluetooth host with limited service distance. Besides, Bluetooth do not depend to line-of-sight method. The meaning is Bluetooth modules that is communicating do not have to be in line condition. [4]

There are three physical layer which very important in architecture protocol of Bluetooth, such as:
1. Bluetooth radio, is the lowest layer of Bluetooth specification. This layer define the requirement

that must fulfill by transceiver peripheral which operating on frequency 2, 4 GHZ ISM

2. Baseband, layer that conducive to make connection RF that happened among some units (piconet). RF system of this Bluetooth use spectrum frequency-hopping-spread delivering data in the form of package at slot time and frequency which have been determined

3. Link Manager Protocol (LMP), responsible to set-up link between peripheral of Bluetooth. It is including aspect of security like autentification and encryption with evocation, conversion and inspection package size from baseband layer.

Wireless technology is able to utilized by Bluetooth to remove data through the air using electromagnetic wave. The technology is Spread-Spectrum Technology (SST). With this technology enable some user use at the same frequency bands concurrently. This SST is one of the development Code Division Multiple Access (CDMA) technologies. With unique sequence code, data is delivered into the air and accepted by receiver target with code. With technology of Time Division Multiple Access (TDMA) can also be implemented (there is difference of time sequence). Bluetooth use one of the two frequency type of Spread Spectrums Radio that is used for the wireless requirement. The frequency is Frequency Hopping Spread Spectrum (FHSS), the signal is sent one by one using one MHZ or deeper range selected frequency band which remains to. While the other one is Direct Sequence Spread Spectrum (DSSS), signal is sent in constant frequency band which remain to equal 17 MHZ. Principal of method direct sequence is to transmit signal in wide ribbon (17 MHZ) with usage of layering (multiplex) code/signature to reduce Interferences and noise that is used by IEEE802.11XXX.

Applications which is provided by Bluetooth service, such as: PC to PC file transfer, PC to PC file synch (notebook to desktop), PC to mobile device, PS to PDA, wireless headset, LAN connection via Ethernet point access, etc.

3.1 `MSComm Control` at Visual Basic Program

`MSCOMM` Control is one of the components from Visual Basic which function as regulator of communications and can be added to a selected project. Using `MSCOMM Control`, programmer can make serial port `connection (Commport)` to be able to make a connection among other, such as between modems. `MSCOMM` Control could delivery data process between equipments of communications, monitoring and giving response if there is error during serial connection.

There are two basic commands in `MSCOMM` which is often used and important for data evacuation. Both of command is Mscomm 'Send'

and 'Receive' Data. First Step is to open `COMPORT` and setting Port open property as ' True' as following:

```
MSComm1.PortOpen = True
```

Then to process 'send', the way is typed command '`MSCOMM1.OUTPUT`', hence computer will deliver data. While to process 'receive', the way is typed command '`MSCOMM1.INPUT`', hence computer will accept data. Both of these commands have been adapted with the path of program. After data transfer process take place, hence `COMPORT` have been closed by order of as follows:

```
MSComm1.PortOpen = False
```

4. REMOTE OBJECT CONTROL DESIGN

This research is conduct by designing a simulation system operation of object movement base on Symbian S60, where an object will be controlled from a mobile phone. The command delivered thorough bluetooth media. This command move an object, each step using selected direction (right, left, up, and down).

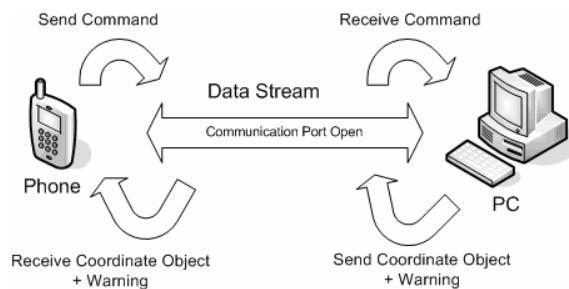This system is consisting of three parts as seen on figure 1.

Figure 1. Communication Design.

First part is software which runs at mobile device, the functioning ness as object control remote in computer. The program in mobile device is written in Python Language. Python Language have been installed and adapted for type mobile device. It is caused by different type of service pack in mobile device different. Python Program is better installed at the first time, kept in external memory (card memory) so that if happened error will not bother system phone seluler as a whole. After Python program successfully have been installed, the next step is to run blue_controller script.

The objects control movement process uses character code U (Up), D (Down), L (Left) and of R (Right). Keypad Number ' 0' is used to exit from Python mode. Keypad ' U' is used to move object above 1 step. Keypad ' L' used to move object to left 1 step. Keypad ' R' used to move object to right 1 step. Keypad ' D' used to move object down 1 step. If other keypad letter besides U, D, L, R is depressed, the object won't move. Visual Basic

Program and Python program will pop up a warning concerning the wrong code.

The second part is the usage of Bluetooth media that used as interfacing between mobile device with computer. This process use basic concept of Bluetooth controller using computer serial port communications. The process of transmit-receive happened continually so that there is an interaction shuffle through between mobile device with computer through Bluetooth media. Bluetooth media for computer at this research is USB Bluetooth Dongle with maximum reach area only ten meters. While Bluetooth media on mobile device is one unity of technology.

The third part is computer as an object that controlled. Data is delivered through Bluetooth received by computer. It is an input code to move object. In Visual Basic, communications process between mobile device and computer exist because of serial port (MSCOMM). All activities of object that happened will be noted and presented by program on computer. As bluetooth standard, computer gives a feedback to mobile device which is an object position co-ordinate, as seen on figure 2.
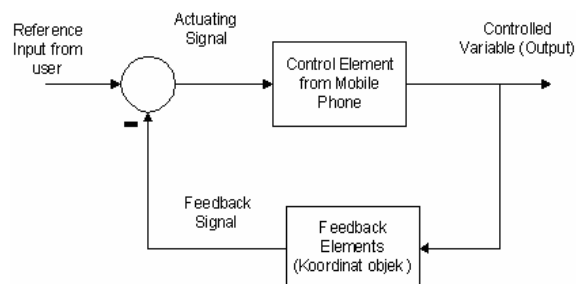

Figure 2. Control System and Feedback

Between the mobile device and the computer occured authentication process before two-way communications direction exist. The system only control the object movement at the program that executed at the computer and delivers warning to mobile device. This system uses three kinds of hardware, which is mobile device, USB Bluetooth Dongle, and PC.

Software which is used consists of three parts. First Software is Python Language program that running at mobile device. The second software is Microsoft Visual Basic 6.0 as interface between mobile device with object that is controlled by user. Visually Basic is created as GUI presenting all codes from user, existing resistance and movement of object can perceive clearly.

5. PERFORMANCE EVALUATION

Program of Blue_Controller divided into three parts. First part is main function of program that has been taken from bt_console program `def_main`. The second part is function for the appearance of GUI at mobile device `bt_typetext(sock def)`. The third part is a

function to terminate from application `Def exit_key_handler`.

First part of function `def_main()`, will make title of simulation program (Bluecontroller) that running at mobile device. The GUI that is used in the program is appuifw. The beginning of program, `script_lock` initialized globally to lock whereas program script of Python. Mobile device could established a connection with PC because of the open communications socket.

```
sock=socket.socket(socket.AF_BT,soc
ket.SOCK_STREAM)
```

Variable `sock` using the same parameter to open communications socket. Later on, to exit from appuifw, function `exit_key_handler()` is called.

```
appuifw.app.exit_key_handler=
exit_key_handler()
```

Then notice the MAC address of active Bluetooth equipments and the service that be given by program to choose Serially Port. MAC Address equipment of Bluetooth (USB) at computer is `11:11:11:11:11:11`. User will choose equipments of Bluetooth and will appear menu pop-up. So, user can choose serially of existing port. The serial port checked as selected by user and present. Then the function `bt_typetext(sock)` is called.

The second part is `bt_typetext(sock)` function to arrange GUI operation of movement object. This function also arranged a delivery process (`send`) and accept (`receive`) data that exist in communications socket, it makes the interaction shuffle between mobile device with computer established.

For the first time will appear query pop-up to type the name of user. Name of the user will be packed into variable `test`, then the user name will be delivered to PC through Bluetooth using `sock.send("N + test)`.

On PC side, it will deliver a data to mobile device as acknowledgment. Mobile device will accept the the data with code of program. The data will be packed into variable `line=sock.recv(1024)`. Then the data is received on the mobile device in the form of character "WELCOME", and the application will display a pop-up 'Selamat datang' on mobile device.

The application will present GUI to control object if the user name found on variable ' test' have been delivered. Process controlling object movement started with the appearance of a query pop-up ' Type Code?'. Afterwards user is able to type codes which is used to move object. In addition, computer will deliver object position coordinate that have been typed by user through the following code

```
line = sock.recv(1024)
print "RECV " + line
```

Moreover, computer will inform mobile device if object bump external wall or perimeter of application by delivering the following character and matching with the condition of the object.

Table 1. Warning Condition

Condition	Warning Display
Bumping right side	"ERR_RIGHT"
Bumping left side	"ERR_LEFT"
Bumping upside	"ERR_UP"
Bumping under side	"ERR_DOWN"

Wheter the command is wrong (besides 'D', 'U', 'L' and ' R') hence the computer will deliver character "WRONG". Delivered Character will be packed into variable `line` then checked over to peep out containing pop-up note "WRONG Code". When user type a number of '0' at mobile device, Python program will deliver character "EXIT" to PC. Python program will call function `exit_key_handler()` and exit from the application.

Third part is `exit_key_handler()` function. This function consist of a comand group to close connection between mobile device and computer using existing signal by ordered of `script_lock.signal()`. Then quit from Python application by order of `appuifw.app.set_exit()`.

The transmit-receive data can only be done between a mobile device and a PC. There are some conditions tested to the application. First condition is related to the distance between Bluetooth equipment. The result of the test in the reality progressively far apart between equipments of Bluetooth, hence process delivery data become slowler and occurred a delay. If the distance between both equipment have exceeded to maximum boundary, the application will closed.. It happened because the default of Bluetooth that use low power.

The second condition that tested is on condition there are two mobile device, for example mobile device A and mobile device B which have application installed, at the time goes, only one connection exist. The other mobile device can not disturb. It is caused by the path of Bluetooth serial connection port of that only served one Bluetooth equipments at the same time.

Third condition, if exist mobile device A which is controlling object, and exist mobile device B wanted to take over communication, hence this process will not bother simulation program (application running without trouble). On the other hand, if mobile device A is controlling the object and user press 'cancel' button. Automatically application will exit on mobile device A. However application on the PC running as well. As a result if mobile device B execute the application, the simulation program operation of movement object can continued directly from last object position by

mobile device B. It occured because of reset process that is done by the application on the PC is not closed. This condition is one of the limitations from this program.

Based on the last development, we found some limitation:
a) Limitation of GUI at mobile device less user friendly because user has to type code to control the object. Besides, Picture Maze that presented at computer cannot be appearing also in mobile device. It is resulted because mobile device unable to save the library from GUI Python larger ones, for example Tkinter.
b) Operation of the movement object can not be done directly at the real time, but there is some delay, because the movement have to wait user put into code which is delivered passed Bluetooth.
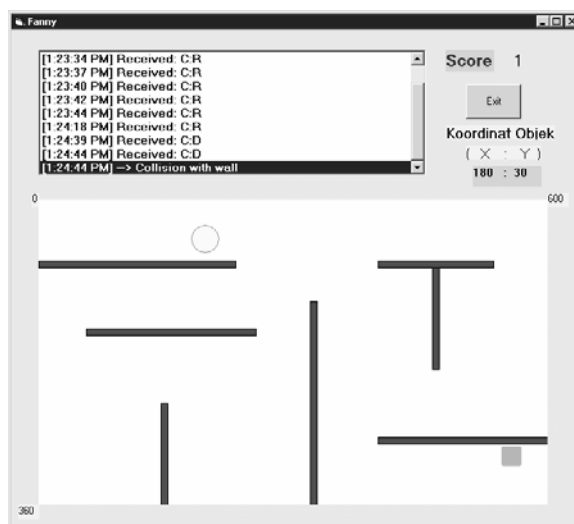

Figure 3. GUI on Windows Application

Figure 4. GUI on Mobiles Device

6. CONCLUSION

This paper presented the result of the simulation of an object movement on PC and mobile device through media of Bluetooth as an alternative to do a remote object control. Object is controlled according to the user command at mobile device. Warning parameter is created if wrong code and object is about to hit the wall and existing perimeter. As conclusion, the result of this paper gives a possibility to control object without any

hardware modification on mobile device within open platform of objects.

7. FUTURE WORKS

Remote robot control device is a challanging issue that raised behind the idea of this research. Mobiles device technology with its features on bluetooth and video stream is a great opportunity to develop a control system for a simple robot, as a wireless controller.

REFERENCES

[1] Cepat Mahir Python at: http://www.IlmuKomputer.com (accessed: 17 November 2006)

[2] Exercise Bluetooth Connection- Mobile to PC at: http://www.mobilenin.com/pys60/resources/ (accessed: 8 September 2006)

[3] Info Pop up Appuifw at: http://www.leninsgodson.com/courses/pys60/resources/popup.py (accessed: 12 September 2006)

[4] Pengantar Teknologi Bluetooth at: http://www.IlmuKomputer.com/yamta-bluetooth.pdf, (accessed: 17 November 2006)

[5] Python Library Reference-Socket Objects at: http://docs.python.org/lib/module-socket.html (accessed: 18 October 2006)

[6] Python Documentation at: http://docs.python.org/lib/module-socket.html (accessed: 17 November 2006)

[7] Sending Data Using MSComm at: http://www.developerfusion.co.uk/ (accessed: 10 November 2006)

[8] Bluetooth Technology at: http://www.mappz.com/bluetooth.pdf (accessed: 9 June 2006)

[9] Wesley J.Chun, Core PYTHON Programming, Prentice Hall , United States, 2001.

[10] Paolo Santi, Topology Control in Wireless Ad Hoc and Sensor Networks, Wiley, England, 2005.