

# Chapter 48

## Multi-Platform Bluetooth Remote Control: Implementation and Results

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### ABSTRACT

*Traditionally, mobile devices have come with a set number of functionalities. Even when these have been augmented, this has rarely involved taking advantage of their complementary wireless capabilities (such as Bluetooth and GPS). The main focus of the research described in this chapter was to create an application that takes advantage of the capabilities of Bluetooth to remotely control any computer with Bluetooth connectivity. Bluetooth has several advantages over infrared technology. It has much higher bandwidth, giving the opportunity to send larger amounts of information. Also, it does not need line of sight. The system created includes a very flexible custom map feature, giving the user freedom to custom map most of the buttons on the phone. By supporting multiple platforms we are also able to target a large number of the devices on the market. The proposed solution received positive feedback in the user evaluation.*

### INTRODUCTION

In 1994 Ericsson created the idea of Bluetooth. The name was taken from the Viking king Harald Bluetooth who united Norway and Denmark (Sony Ericsson, 2006). The vision behind Bluetooth was to create a low-power, low-cost radio interface.

One of the main aspects of Bluetooth is that it eliminates cables and interconnects computing and communication devices. One way to describe the idea behind it is that the personal connectivity space is like a communication bubble (Chatschik, 2001). It follows people around and allows them to connect to other devices that enter the bubble. It is not as limited as infrared technology, where you

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need line of sight to connect. Another important feature is that it offers ad hoc connectivity among personal devices. This makes it possible to form groups without the need of any infrastructure.

The main focus of this chapter is on using the capabilities of Bluetooth enabled-devices to control a computer remotely. The next section presents closely related work that uses the Bluetooth technology in different ways.

### **RELATED WORK**

There are a considerable number of research contributions that try to take advantage of the Bluetooth technology. One popular research area is context aware applications, presented by González-Castaño et al. (2005), Cano et al. (2005), Eagle & Pentland (2006) and Kwon et al. (2005), where Bluetooth adds location functionality. Other topics include Bluetooth and marketing, as described by Tsiantar (2009).

Several papers have focused on using the standard functionality in mobile phones, like the possibility to send and receive files that are supported by most mobile phones today. The Moviltooth application, presented by Fernandez et al. (2006), shows a very interesting application that takes advantages of the standard Bluetooth features. It uses push technology to deliver personalized information to the users. The server saves user profiles and only sends information that is interesting according to the profile. Since there are many different display sizes, the server will adapt the content of the message to each user's mobile phone. The fact that it does not need any local installation is a great benefit. Not only will this make it easier for users, it will also attract the attention of more people. They do not need to know about the application to use it.

In related work, Chen et al. (2004) have developed a system that creates a smart meeting room. The idea is to provide relevant services and information to the meeting participants based

on their context. The services include presentation- (displays PowerPoint), lighting control- and greeting service. They use Bluetooth to register the participants that are in the meeting room. A demonstration of a smart meeting room was conducted. The feedback received was positive, however, some of the users were concerned about the privacy and information security in the system.

The next section presents the work on Bluetooth remote control applications. There is also information on remote control applications for iPhone and iPod touch that uses wifi. This is included to show a few of the remote control alternatives available on the market.

### **Bluetooth Remote Control**

The most closely related research topic to the work presented in this chapter is the contributions that have been done on using Bluetooth devices to control computer applications. One example is the work done by Feldbusch et al. (2003) that shows one possible implementation of a Bluetooth remote control. They created a universal remote control system. One of its main purposes was to control consumer devices through the Internet. The system is based on a protocol called BTRC (Bluetooth Remote Control). It is a simple request/response based protocol that aims at providing a simple, uniform and scalable way for information exchange between devices. It also provides services that require a secure connection with an encrypted channel and a certainty that the commands are coming from an authenticated client.

To create a system that uses the Internet to remote control devices has very different requirements from those that only work locally. When registering the service online you are opening it to the public. It therefore becomes available for attacks and the possibility of unauthorised use. Moreover, by using automatic detection of devices you must either broadcast your Bluetooth address or do a continuous search. This makes the Blue-

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