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Article

Virtual Instrumentation Approach for Client-Server Interfacing of Bluetooth using LabVIEW

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A B S T R A C T

Bluetooth is one of the most widely wireless ad hoc networks used. Bluetooth devices operate at 2.4GHz, in the globally available, license-free, ISM band and they use FH-CDMA technique because of its inherent interference rejection capability. The problem with Bluetooth is low date rate and distance between the devices is less. In this article we will discuss how the communication is done in lab view with Bluetooth through client server application. As LabVIEW is good for communication between the devices as it has many communications protocol features built in it. When you are actually writing the application, you have more flexibility in choosing a protocol. Factors that affect your protocol choice include the type of machines the processes will run on, the kind of hardware network you have available, and the complexity of the communication that your application will need. Several protocols are built into LabVIEW, some of which are specific to a type of computer.

Keywords: Communication Protocols, Virtual Instrumentation, Bluetooth Client, Bluetooth Server, SDP (Service Discovery Protocol), RFCOMM (Radio Frequency Communication)

Introduction

Bluetooth is the name given to a new technology standard using short-range radio links, intended to replace the cables connecting portable or fixed electronic devices. The standard defines a uniform structure for a wide range of devices to communicate with each other, with minimal user effort. Its key features are robustness, low complexity, low power and low cost.

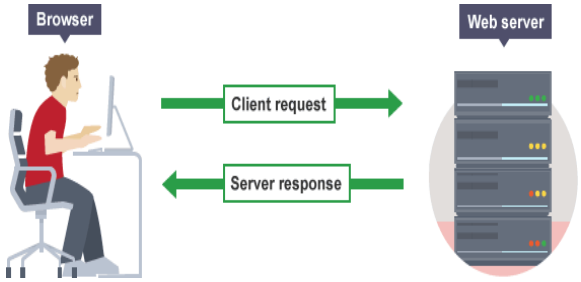

Figure 1.Client-Server Mechanism of Bluetooth

The use of Bluetooth in lab view is easy and can communicate between the devices. It uses the protocols like TCP, UDP, L2CAP (logical link control and adaptation protocol), SDP (service discovery protocol), RFCOMM (radio frequency communication) for communicating and transfer of data. We will discuss about these protocols in detail and the functions used for the communication in lab view. L2CAP, which adapts upper layer protocols over the Baseband, provides data services to the higher layer protocols with protocol multiplexing capability, segmentation and reassembly operations and group abstractions. Device information, services and the characteristics of the services can be queried using the SDP. Like SDP, RFCOMM is layered on top of the L2CAP. As a cable replacement protocol, RFCOMM provides transport capabilities for high-level services that use serial line as the transport mechanism.

Communication Applications in LabVIEW

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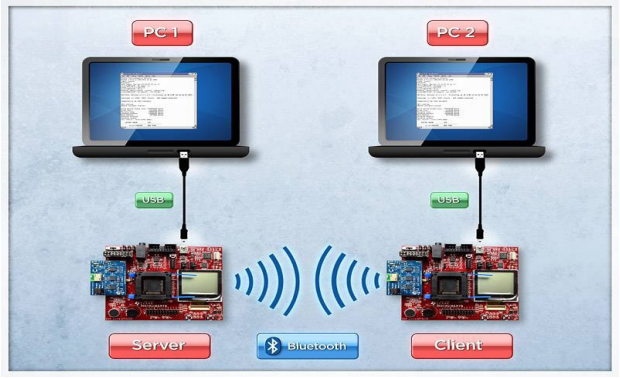

Figure 2.Client-Server Interface of LabVIEW

This article gives an overview of the way LabVIEW handles networking and inter application communications. For the purpose of this discussion, networking refers to communication between multiple processes. The processes can optionally run on separate computers. This communication usually occurs over a hardware network, such as Ethernet. One main use for networking in software applications is to allow one or more applications to use the services of another application. For example, the application providing services (the server) could be either a data collection application running on a dedicated computer, or a database program providing information for other applications. The purpose of this discussion is to introduce you to the terminology used in networking and communication applications, and to give you an overview of how to program networked applications.

Implementation and Result

Server Application

Client-server describes an application architecture in which the client requests an action or service from the provider of service, the server. When developing a client-server application, like the Web browser and Web server, you need to consider how you are going to handle developing your application in a team environment and how you are going to handle long-term maintenance. Developing client-server applications parallels developing modular programs. Modular programming separates large applications into smaller constituent pieces to ease development in teams and provide better maintainability. In a client-server application, a module does not have to be part of the same program or even run on the same computer. Each modular function can run on a different device.

Use the Bluetooth Create Listener function to create a Bluetooth service identified by a Bluetooth uuid. This function returns a listener ID which refers to this server through your LabVIEW application. The Bluetooth Create Listener function also returns a reserved Bluetooth channel that the server can use to listen for inbound connections. A Bluetooth channel is a global resource with only 30 channels available on any Bluetooth device. If no server channel is available the function returns an error. Use the Bluetooth Wait on Listener function to wait for and accept an incoming connection request from a client. This function returns a connection ID that is used to exchange data with the client. Use Bluetooth Read and Bluetooth write functions to exchange data with the client. Use Bluetooth Close Connection function to close connection to the client and to stop listening for incoming connections.

Figure 3.Front panel of server using LabVIEW

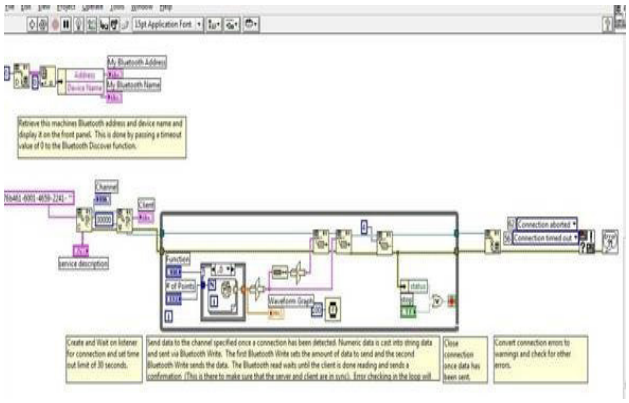

Figure 4.Block diagram of server using LabVIEW

Client Application

Create a Bluetooth service-Use the Bluetooth Create Listener function to create a Bluetooth service identified by a Bluetooth UUID. This function returns a listener ID which refers to this server through your LabVIEW application. The Bluetooth Create Listener function also returns a reserved Bluetooth channel that the server can use to listen for inbound connections. A Bluetooth channel is a global resource with only 30 channels available on any Bluetooth device. If no server channel is available the function returns an error. Use the Bluetooth Wait on Listener function to wait for and accept an incoming connection request from a client. This function returns a connection ID that is used to exchange data with the client. Use Bluetooth read and Bluetooth write functions to exchange data with the client. Use Bluetooth Close Connection function to

close connection to the client and to stop listening for incoming connections. The client will request the server for the connection. Read the channel specified and cast the data into the numeric representation. First Bluetooth read acquires the size of data and second Bluetooth read will read the data and passes it. The Bluetooth will send the confirmation to the server. This is to say that server and client are synchronous.

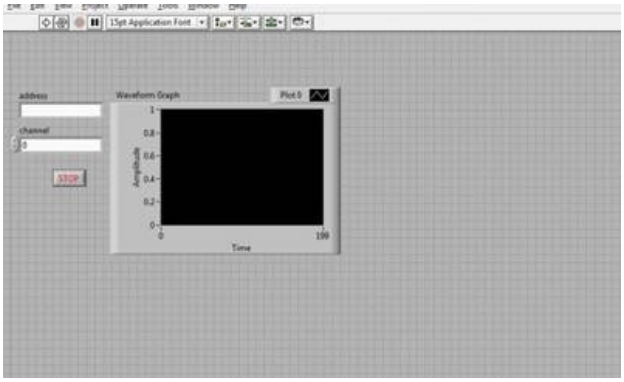

Figure 5.Front panel of client using LabVIEW

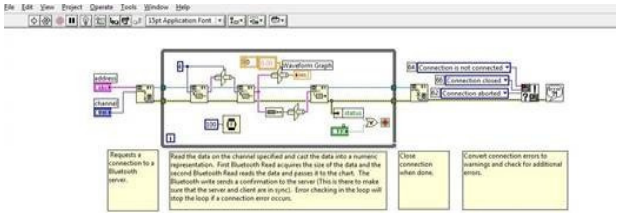

Figure 6.Block diagram of client using LabVIEW

Conclusion

Here we are using LabVIEW as platform for interfacing Bluetooth. It is easy for us to create a server and client with LabVIEW as it is a G language which is easily understood. We have implemented communication between server and client. As we are using the Bluetooth which is inbuilt in the system, we are getting the address of the device and the Bluetooth device. The same we have to give it to the client. Where there will be a communication between the two devices, there is time out [max 30 ms], if the system cannot communicate with the other system. After that again we have to search for the device and make connection. If two systems are connected they said to be synchronous and we transfer the data between them.

Bluetooth technology has been regarded as new wave in IT sector. So at the end we can conclude that it is a very useful technology which has negligible disadvantages and less health hazards.

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