The Implementation of Wireless Guided-View System for the Digital Museum

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ABSTRACT

Keywords: Bluetooth, Microcontroller, Man-machine interface, Mobile navigation system

A mobile navigation system is designed and implemented in this paper. This system can be applied to the digital libraries to make a real time query in the library. The information provided for this system includes data and voice. The major functions of this system include information access and destination guidance. Other value-added functions can also be finished easily. There are three major parts in this system. Mobile navigation device is designed for the visitors of the libraries. In this device, wireless equipments such as bluetooth technology and IrDA device are employed to finish the major function. Man-machine interface is designed to receive the information from the mobile navigation device. Besides, man-machine interface also process the function of destination guidance. As for the information access, interface PC will pass data to the host computer to get the queried data and then pass the information to the mobile device via wireless module. The third part of the system is host computer with SQL database. The prototype of this system had been almost finished. Now, The test work is in progress. Evidences display that there is a nice effect.

1. INTRODUCTION

Bluetooth technology will be widely used in the IA field such as PDA in this year. In this paper, we will extend the application of bluetooth technology to the navigation system in the digital libraries. Most of the current digital libraries provide useful information via Internet or Intranet. However, if we enter into a library to search or access information such as search of books, papers, or magazines, we only can use PC to finish the above work. This will incur several shortcomings. First, a bottleneck is created at the PC end. Visitors will wait the PC to query their information in sequence. Second, after query, visitor needs to write down all information on the paper. This will squander the paper resource. Besides, it is in inconvenient to communicate with librarian. Therefore, if the navigation system is exploited, the above shortcomings will be resolved.

The remained topics in this paper are organized as follows: The overall structure of mobile navigation system is constructed in Section 2. Mobile navigation device is described in Section 3. And man-machine interface is listed in Section 4. Layout design for wireless devices in a museum is discussed in Section 5 Finally, a conclusion is made in Section 6.

2. THE OVERALL STRUCTURE OF MOBILE NAVIGATION SYSTEM

In this section, all hardware related topics will be discussed and designed. The system

framework is shown in Fig. 1. In this figure, mobile navigation device is designed for the visitor to query the information from the server of digital library.

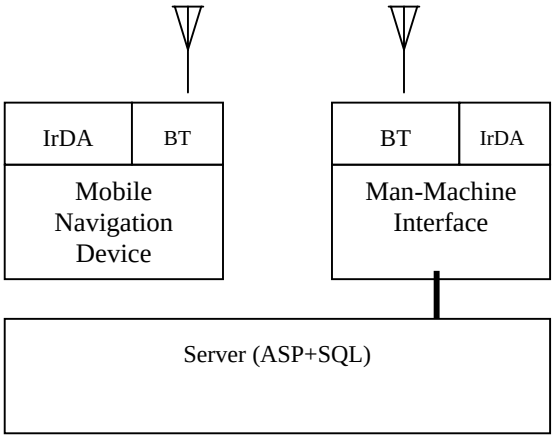

Fig. 1 The wireless navigation framework

Two wireless components are used in the mobile device. Bluetooth module is employed to execute information exchange between mobile device and server. Because of the directionless of bluetooth, visitor can execute the information exchange at any time and corner in the library. IrDA component is designed for guiding visitor to the destination of information. Man-machine interface always know where the queried visitor is via the IrDA. By checking the library local map in the system, man-machine interface PC can guide the visitor to the information destination. Similarly, These two wireless components can also be used in the man-machine interface to finish the following works. 1) Receiving queried information provided by bluetooth module and visitor location provided by IrDA transceiver/receiver. 2) Packaging the information into formal queried data and sending it to the server. 3) Guiding visitor to the destination via the help of library map. As for the server, including ASP+SQL, this is the basic function of the current digital libraries. Therefore, we do not intend to discuss it in detail.

3. MOBILE NAVIGATION DEVICES

The block diagram of the mobile navigation device is shown in Fig. 2. The major components for devices include microcontroller, LCD display, keyboard, bluetooth module, and IrDA component. The major work of microcontroller is to receive the queried information from keyboard and display the input information to the LCD. After that, the information is passed to the bluetooth module via serial transfer. In this system, PIC 16F877 is selected as the microcontroller. PIC is a RISC-style single chip. In our application, the data amount is not so large, so PIC is a nice choice.

As for the bluetooth module, 2.4 GHz ISM open band, frequency hopping, and time division duplex are adopted. The transmission distance is in 10 to 100 meter range. In this module, voice and data can be transferred simultaneously. Each piconet can support 7 simultaneous full duplex data transmission. From the discussion above, bluetooth technology is very suitable for the navigation environment.

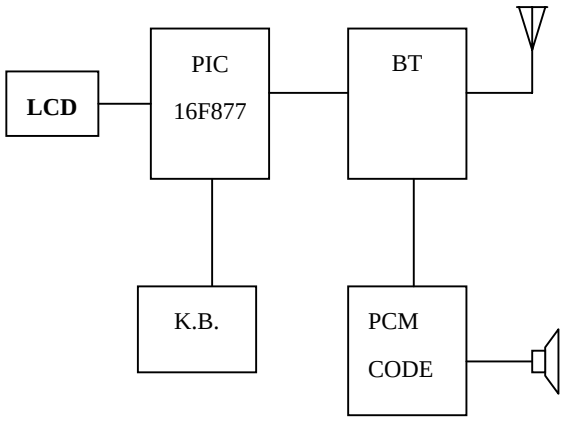

Fig. 2 The block diagram of mobile navigation device

The flowchart of mobile navigation device is shown in Fig. 3. Some initializations are executed. These include PIC initialization, LCD display initialization, and bluetooth device initialization. After that, system is entered into the waiting state to wait for the operation of user. The operations are as follows: First, data connection is executed for searching the near bluetooth device. In such case, mobile navigation system will connect a bluetooth device automatically. After connection, LCD

will display “Please input the query 1) Title, 2) Author”. Visitor can select one of the items to search the queried data. Then, the man-machine interface PC will response the matched information on the LCD screen. At this time, visitor can select one of the matched information and navigation system will guide visitor to the destination via the location of IrDA and guidance algorithm.

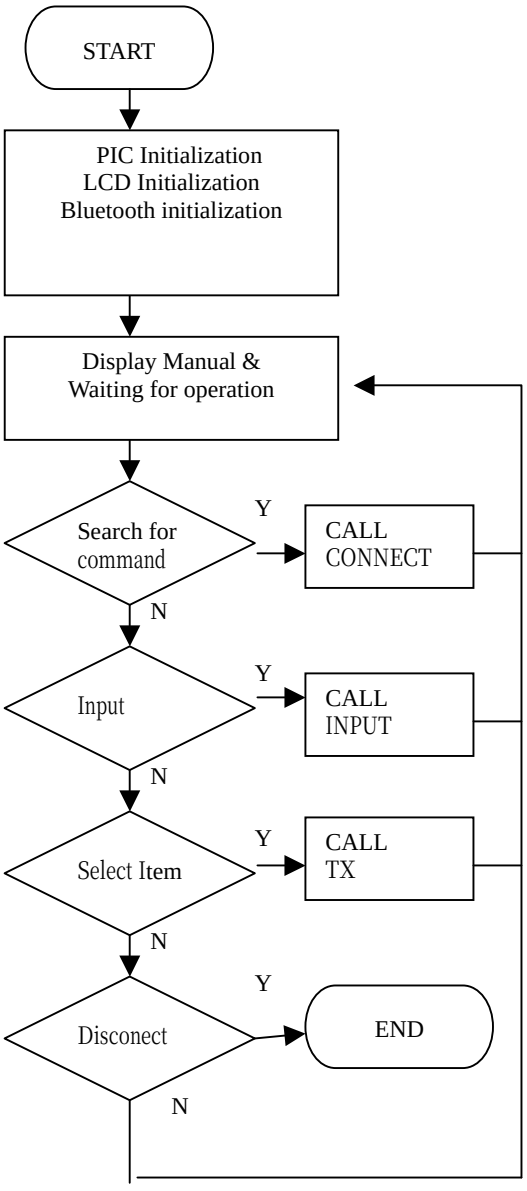

Fig. 3 Flowchart of mobile naviga

4. MAN-MACHINE INTERFACE

The block diagram of man-machine interface is shown in Fig. 4. Basically, three major parts exist in the interface. Bluetooth module and PIC microcontroller are also used as the information transmission. The development language of man-machine interface is Visual Basic 6.0. This interface PC provides a user-friendly interface to operate and maintain the system. The transmission media between microcontroller and interface is used with COM port. The format of man-machine interface is shown in Fig. 5.

Their operation steps for the interface are as follows.

Step 1: select COM port: The default COM port is COM1. On changing to port COM2, operator only needs to click the push button of COM2.

Step 2: Bluetooth Initialization: This step will initialize the bluetooth module. After initialization, the identifier of the bluetooth will be shown in the display window of the initialization.

Step 3: Search device: When we push the search button, bluetooth will search the other modules to prepare for data link.

Step 4: Select communicated device: We can select the device found in the above steps. Basically, there are two types of links defined in the Bluetooth Specification”: 1) ACL- Asynchronous Connection Link, 2) SCO- Synchronous Connection Oriented Link. An ACL link transfers a certain type of packet and is reliable packet delivery link up to the point where a packet can’t be transferred, then a timeout will occur. And an SCO link transfers a certain type of packet and is not a reliable link. Instead packets are sent on a guaranteed time base.

Step 5: Start data transmission: Bluetooth module executes data transmission via ACL link connection. The transmitted-data and received-data will be shown in “Transmission-Data” and “Receive-Data” window respectively.

Step 6: Voice connection: After constructing ACL, we can construct the voice connection via SCO link. On

constructing the SCO link, the voice transmission is in progress.

5. LAYOUT DESIGN FOR WIRELESS DEVICES

As discussion above, information query and destination guidance are two major functions in the navigation system. For the information querying function, bluetooth modules are used to finish data transmission between mobile device and man-machine interface. In order to make a perfect data transmission, the layout design of library is very important. In this section, we will discuss how to make a layout for information querying and destination guidance.

In order to plan the layout design, the layout exhibit of bluetooth module is assumed as in Fig. 6. In this figure, Each article is attached with an IrDA devices to identify the article's name. The guided information can be extracted from the guided-View database and pass to the user.

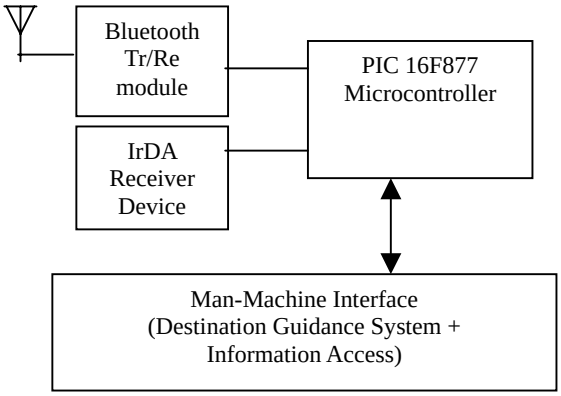

Fig. 4 The block diagram of man-machine interface

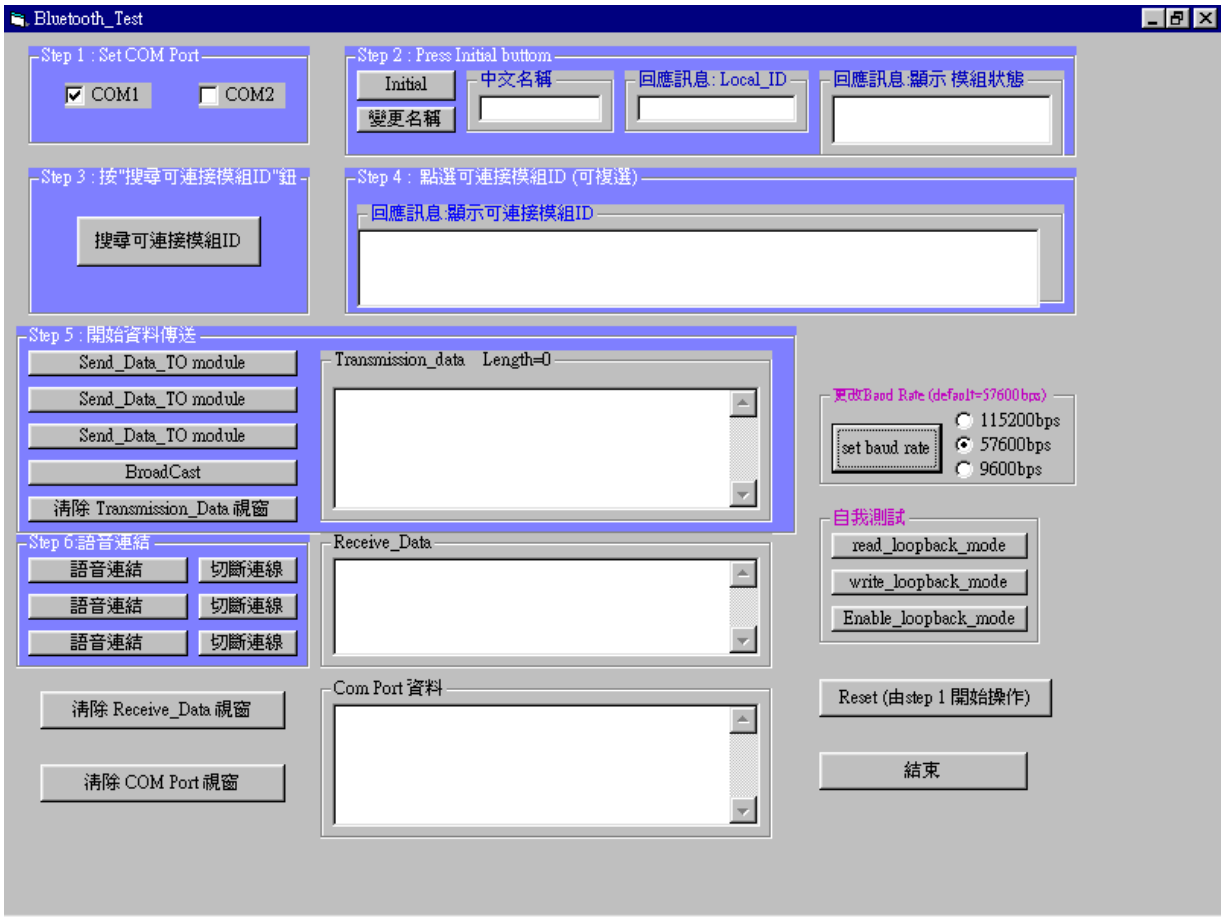

Fig. 5 The format of man-machine interface

6. CONCLUSION AND FUTURE DIRECTION

We had finished the design of digital navigation system. Some important techniques such as bluetooth module, IrDA, and Man-machine interface had been implemented.

In the future, a more elegant guided-view system will be developed. Now, we are developing a powerful guided-view system. This system can support multimedia guided-view information.

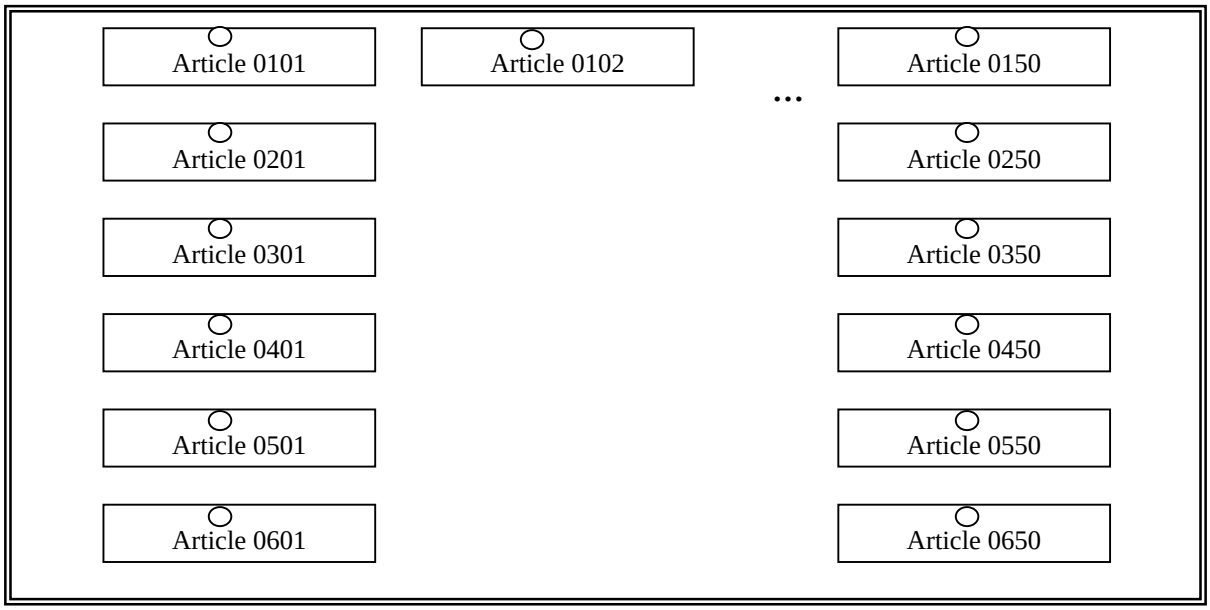

Fig. 6 The exhibit of Bluetooth module in a Museum

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