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Nomadic Tangible Music Player with RF-enabled Sticker

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Abstract

We present the Tangible Music Player (TMP) system which allows users to play music by embedded RF tags rather than mouse or keyboard as usual. Users can play music at any networked computer which has the RF tag reader. It offers a simple and intuitive interface for those who are not familiar with computers. The proposed TMP system provides tangible feeling. It can be applied to various applications such as interactive education, entertainment, smart toys, etc.

Key words: Tangible Bits, Tangible User Interface, Sticker, RFID, Tag, Tangible music

1. Introduction

Music has long been an important part of human life. With computer technology developing rapidly, more people start to listen to music via digital media. Manipulating the media player in the computer to play music is inconvenient for people who are not familiar with computers. Interactions between people and cyberspace have been largely confined to traditional Graphical User Interface (GUI). Nowadays, Tangible Bits [1] paves a new way to Tangible User Interface (TUI) which assigns digital information to physical objects or enables to access digital information through the physical objects. The TUI allows easy, aesthetically pleasing and emotionally engaging access to digital information for anyone.

The advantage of TUI is that it bridges the gaps between cyberspace and the physical movement, as well as the foreground and background of human activities. For example, the musicBottle [2], genieBottles [3], and MusiCocktail [4] projects are pioneer applications weaving Tangible Bits into music player. The musicBottle and genieBottles present an interface to access digital information (music or story) using glass bottles. Meanwhile, MusiCocktail allows users to influence certain parameters of a piece of music in the way they mix their beverages. However, all the interactions are focused on the opening and closing of bottles to release virtual contents and the manipulation is taken place only in the special installation table. In addition, the number of music and stories is limited so that users do not have many choices in playing music or listening to the story.

To overcome these disadvantages, we propose a Tangible Music Player (TMP) with RF-enabled stickers. The proposed TMP system, allows users to easily play music in computer or internet without touching the mouse and keyboard. The RF-enabled stickers such as poster cards or CD cases can be used as tangible "Music file" and "Controller" for playing the music. Each tag has an individual ID number stored in its memory which can be read by the RF reader. When the stickers are present in the active field of RF sensor, they can take functions such as 'play' or 'stop' the music as tangible interface. Since each sticker represents one music file in the server, the user can play the music as he or she wants to listen, even though the stickers do not actually store music files internally.

2. Tangible Music Player (TMP)

The system consists of a number of components including stickers embedded with RFID tags, handheld or stationary RFID tag reader, an antenna box, host computer and system software. The tags are the thin and flexible "smart labels" which can be laminated between paper and plastic. (Figure 1. is the System Setup). In addition, RFID tag is more than just an ID code, it can be used as a data carrier, with information being written to and updated on the tag on the fly. Here, we attached the RF tags with the CD case and poster. RF tag antenna is connected with the tag reader, which communicates with the host computer through the RS232 serial port. The frequency transmitted by the antenna is used to supply the tag with the operating energy and to transmit the data from reader to tag. The tag derives the operating energy from the transmitted frequency to response to the reader and returns requested data. The antenna receives the coded signal from the tag and the reader starts to communicate with the host computer. Every tag has unique ID number corresponding to the http address. So when the RF tag-enabled stickers are present inside the antenna working area, the host computer can read the tag's ID number by tag antenna and reader. This system

creates an automatic way to collect tag's information quickly, easily and without human error. It provides a contactless data link, without need for line of sight or concerns about harsh or dirty environments that restrict other auto ID technologies such as bar codes.

The Tag-it Transponder protocol defines communications between the reader and the tags present in the reader's active field. Meanwhile, the Tag-it Host Protocol defines the communication between the host system and the tag Readers. The Host Protocol is designed for point-to-point, half-duplex communications, with the host controller acting as the primary station and the reader as the secondary station. The Host Protocol is a binary, bytecount-oriented protocol. It consists, in most cases, of request/response pairs where the host waits for the response before continuing. The host computer initiates all communications using the Host Protocol. To allow flexibility in controlling the reader, variable length data is passed within a defined frame. The Host Protocol performs two main functions: (i) Handing of data communication between host and reader. (ii) Carrying of requests for commands and responses to those commands from transponders. The commands from the host computer to the reader contain coded instructions and parameters. The responses contain status information and data. For example, when the host computer sends the 'read' command to the reader to request the ID number of tag, this command makes the antenna transmit RF signal to the tag. The tag derives this signal as operating signal, responses to the reader and returns the required data. After the host computer gets the ID number, it can play the different music according to the different ID number by a Java program. In this part, we apply some tags as playing tags which can start the music and one tag as stop tag which can stop the music. (Figure 2. System Flow Diagram)

We attach the RF tags with the physical objects, such as CD cases or posters. The host computer sends the 'read' command to the reader every second so that if tag is present in the reader's active field, the reader can read the tag's ID number and send this number to the host system all the times. Host computer can play the music according to the ID number. When the user puts the stop tag inside the active area, the host computer can read this ID and stop the playing. If the reader can read another playing tag, the host computer can start to play another piece of music. Because the TMP system can support to play the music in the server through Internet, the user can listen to the music in any local computers connected to Internet.

3. Conclusion

While the conventional music playing systems use GUI interface, the proposed TMP system uses physical objects—such as poster cards or CD case as interfaces. It is simple and convenient since users do not need to manipulate the computer. Meanwhile, these interactive interfaces give people tangible feelings and thus immersion. Over a dozen users have experimented with TMP system informally, and initial feedback has been positive. Users enjoy the idea of being able to play music with the different stickers. Theoretically, the TMP system support as many tags as the user has. Furthermore, this interface is easy to make because we just attached the small, thin tag with CD case or poster so that users can attach tags with different beautiful objects according to their fondness. It does not need complicated installation work. As a result, the proposed TMP can be applied to various applications such as interactive education, entertainment, smart toys, etc. Since our TMP currently implements "play" and "stop" command as tangible player, we would like to fulfill more player functions such as "forward", "pause" and so on. Furthermore, we would try to control the time parameter of playing.

References

[1] Ishii, H., and Ullmer, B. Tangible Bits: Toward Seamless Interfaces between People, Bits and Atoms. In Proc. of UIST'97, pp. 173-179.

[2] Ishii, H., Mazalek, A., Lee, J. "Bottles as a Minimal Interface to Access Digital Information" in CHI 2001 Extended Abstract, ACM Press, 2001.

[3] Mazalek, A., Wood, A., Ishii, H. "genieBottles: An Interactive Narrative in Bottles" SIGGRAPH 2001

[4] Mazalek, A., Jehan, Tristan. "Interacting with Music in a Social Setting" in CHI 2000. ACM Press, 2000.

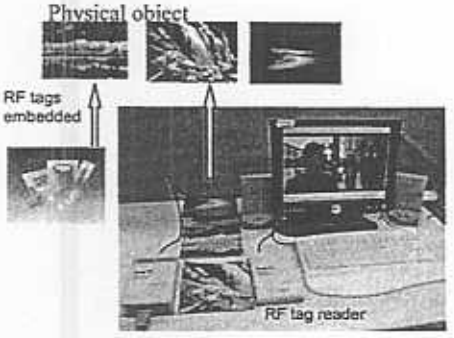

Figure 1: System Setup

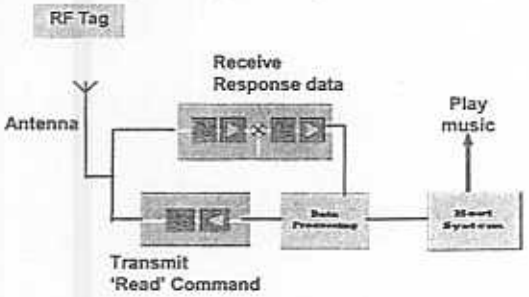

Figure 2: System Flow Diagram