

Mobile User-Interface For Music

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ABSTRACT

The present study considers the interface design for music and graphical content in ubiquitous space. Herein, we present a mobile user-interface system for music and visual collaboration in a personal area network (PAN). The system, which is connected to a local area network (LAN; IEEE802.11b), is composed of an agent on a mobile device controller (PDA), a sound engine, and a graphical language environment. We considered the middleware agent that processes the context awareness in media art and game development. The prototype system "Sound Pad" demonstrated here is a musical instrument and the graphical controller of a mobile user-interface.

KEYWORDS

Mobile user-interface, sensor network, tangible user-interface, artificial intelligence, agent, ad-hoc

1. INTRODUCTION

Ubiquitous space consists of numerous micro machines and host computers that are connected by sensors and other devices to electric household appliances and wearable computers. The ubiquitous space in a PAN contains context information from other agents. Thus, the user-interface of this context data must present information without confusing the user. A considerable number of papers have been published regarding this technology.

This project focuses on two points.

(1) The mobile device (PDA) user-interface for a new sound engine.

Software sound engines have been developed for the "art space platform" Max/MSP, Jitter and Jsyn are powerful real-time audio and graphical development environment. Many artists use the environment to create new contents. However, they remain unsuitable for a ubiquitous environment. In the present report we describe a mobile user-interface designed to control a sound engine. We assume that the prototype is a mobile user interface for a musical instrument and contains the functionality to control the sensors in a PAN.

(2) The usability of a computer human interface (CHI)

Many research groups have attempted to develop new interfaces for ubiquitous space. In situations where there is a large amount of context data from sensors and other agents in a PAN, the

interface must process huge volumes of information in real time and display a framework to users. Some reports have taken a graphical user interface (GUI) approach. "Organic Information Design" has also been reported as a solution to this problem [1]. However, many recent reports discuss a tangible user interface (TUI) design [2]. The study assumes the mobile TUI design of sound to deal with hand's information in PAN. The user plays the sound and graphical contents by the complex hand's motion on the PDA board.

"Sound Pad" is a handheld controller for producing score files and graphical content. The user is able to move through ubiquitous space while controlling the Sound Pad and enjoying the artwork made by media artists.

We propose here the Sound Pad mobile device user-interface as a mobile device (PDA) interface, a sound instrument and a visual interface. The Sound Pad user is able to manipulate sounds using the sound engine (Pure Data) [3] as well as the visual contents of the graphical language (Processing) [4] and use sound composers and graphic designers in ubiquitous space.

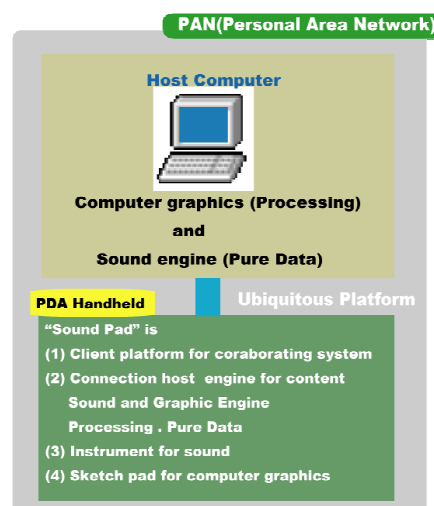
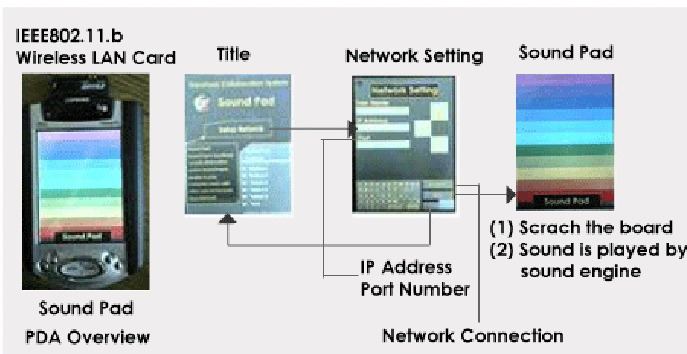


Fig 1: Ubiquitous Platform for host computers and PDAs

SOFTWARE DESIGN

Figure 1 shows the ubiquitous platform system for the present project. The system is composed of a host computer, which includes Pure Data and Processing, and a PDA client user-interface that includes Sound Pad on the WindowsCE operating system. The server and client are connected to a PAN. To put the system into operation, the following implementations are performed.

- (1) A "Sound pad" implementation for client side (PDA).
- (2) A JAVA archive server adaptation for Processing.
- (3) A score file for a TCP/IP network connection to Pure Data.



(1) The Sound Pad implementation for client side (PDA).

Figure 2 shows a Sound Pad overview and screen diagram. Sound Pad displays 12 colors on a sound board. Each color represents a tone. When a user places the pen on a color, the information is sent to the Pure Data sound engine on the host computer via a wireless LAN card. The score from the sound engine is played by the socket information.

Pure Data also sends the information to the graphic software Processing by socket programming. Processing processes the information and displays the contents produced by the artist. Thus the user is able to control both sound and graphical information using Sound Pad on a PDA.

The screen diagram (Figure 2) shows the title screen, the network setting screen, and the main sound board screen. Before beginning to use Sound Pad, the user must input initial information regarding the PDA and TCP network connection to the host computer (host name, IP address, and port number). The user must input these parameters into the network settings using the keyboard. When the user finishes inputting these parameters correctly on the network setting screen, the user can play Sound Pad on the sound board screen. The user starts Sound Pad at the title screen.

If the user wants to stop playing, he or she can return to the title screen by pressing cancel.

Sound Pad is coded using Visual C++ in WindowsCE. To produce the graphical user interface and network interface between the PDA and host computers, GLiB and Winsock libraries were used.

(2) The Java Archive server adaptation for Processing

Processing is a programming language and environment built for the electronic arts and visual design communities. It was created to teach the fundamentals of computer programming within a visual context and to serve as a software sketchbook.

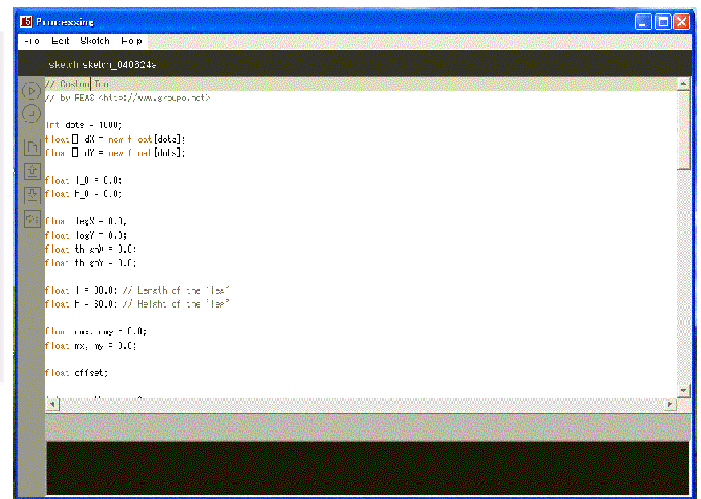


Fig 3 Processing

Figure 3 shows the programming environment of Processing. The user compiles processing code similar to the Java language and constructs exe files on a compiler. The user can then see the graphical content in the environment.

Processing is a graphical environment based on the Java platform. The network environment was designed to connect with mobile devices and host computers in a system. However, the network archive related to socket programming is not provided. In order to create the environment, a Java Archive of the server program was ported into the system. The server program is a thread programming of TCP packet (CLASS).

In the system, the PDA client sends parameters from the sound board to Pure Data on TCP Socket. After Pure Data receives these parameters, they are sent to the Processing server thread. After the thread receives the parameters from Pure Data, they are sent to Processing.

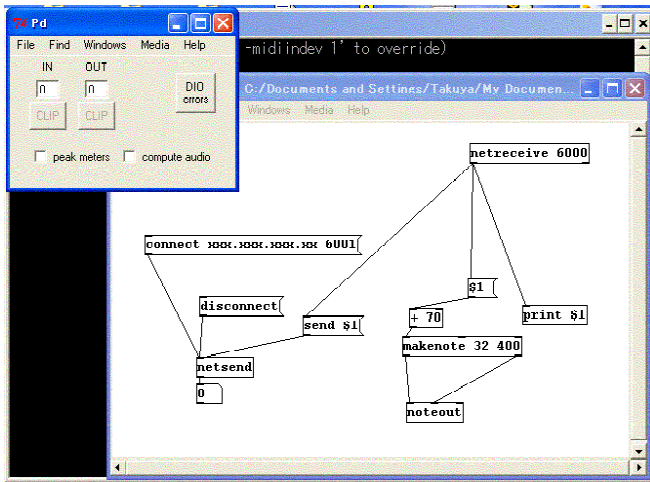


Fig 4: Pure Data Sound engine platform

Figure 4 shows the Pure Data display. Pure Data is composed of a score screen on which artists and composers of computer music record score notes. The score is simply the parameters input into the mobile user-interface (Sound Pad) that are sent to the Processing server thread where the score file plays the tones according to the parameters from the sound board. We consider the system (Sound Pad and Pure Data score files) as a computer instrument.

In the present report we demonstrated the contents of a user-interface system. The graphical contents and sound contents were

successfully controlled using the Sound Pad mobile-device interface.

RESULTS

Composers and artists are able to produce sound designs by creating score files in Pure Data. Interface designers can also develop new user-interfaces using this mobile interface. In addition, graphic designers can produce graphic content in Processing. The system enables the collaboration of these contents and makes it possible to design context for networked sensors and agents in ubiquitous space.

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