

代表著作

智慧型手持裝置之無線嵌入式系統應用

**Wireless Embedded System Application for
Smart Handheld Device**

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相關創新應用技術合併為代表著作之關聯性說明

近年來吾人致力無線嵌入式系統與智慧手持裝置之應用開發技術，而目前所開發出較具代表性之創新成果為『智慧型手持裝置之無線嵌入式系統應用技術』，命名為『無線 USB 音效與人性化介面複合式裝置』與『多模體感無線影像遙控車』等兩項創新應用技術。以上兩項之創作應用技術，皆與無線嵌入式系統之創新應用技術相關，這兩項創新技術皆需進行硬體、韌體與軟體等技術開發，以進行三度空間之系統實作整合。除進行硬體、韌體與軟體等應用技術開發外，在這兩項創新技術之系統內部亦須開發核心演算法來進行系統整合，其中在『無線 USB 音效與人性化介面複合式裝置』之核心演算法為『無線等時封包傳輸技術』，而在『多模體感無線影像遙控車』之核心演算法為『Wi-Fi+藍芽整合影音無線操控技術』。

在代表作所提出兩項創作應用技術皆為 2.4G 無線頻段之應用，在無線 USB 音效與人性化介面複合式裝置之創作應用技術，利用 2.4GHz 無線頻段，自行定義通訊協定與五合一裝置的封包格式來與 PC 端進行互動；隨著智慧型手機與平板電腦的蓬勃發展，在多模體感無線影像遙控車之創作應用技術，採用標準 2.4GHz 的 Wi-Fi 與藍芽傳輸之無線應用技術，利用手持裝置之智能手機與平板電腦來進行影像傳輸與控制指令的互動。在智慧型手持裝置之無線嵌入式系統應用基礎上，針對這兩項創新應用技術所開發出之硬體、韌體、軟體與核心演算法分別列述於下：

1、硬體：

- Wireless USB Dongle 電路板。
- FPGA Based Wireless handheld Devices 5 in 1 之 Verilog IP。
- Bluetooth 4.0 Module for 4WD Car 電路板。

2、韌體：

- Wireless USB Dongle 讓 PC 端列舉出 5 合 1 裝置與 2.4G 無線傳輸。
- FPGA Based Wireless handheld Devices 5 in 1，讓手持端可控制 5 合 1 裝置與 2.4G 無線傳輸。
- Bluetooth 4.0 Module for 4WD Car 之驅動 2 Channels PWM 以分別控制

前進後退與左右轉。

3、軟體：

- iOS App for 4WD Video Car。
- Android App for 4WD Video Car。

4、核心演算法：

- 無線等時封包傳輸技術。
- Wi-Fi 影像與藍芽遙控整合單一 App 之應用技術。

代表著作 1

無線 USB 音效與人性化介面複合式裝置

Wireless USB Dongle for Audio & HID System

無線 USB 音效與人性化介面複合式裝置

Wireless USB Dongle for Audio & HID System

摘 要

本技術所實現 2.4GHz 為基礎之無線錄、放音與人性化介面控制平台，主要的創作特點在於使用者，可透過無線的方式來對遠端的電腦進行錄音、放音、鍵盤、滑鼠與娛樂鍵的 5 合一控制，且使用者與電腦間的無線傳輸距離，可長達 30M 以上，達到操作電腦不受連接線束縛的優勢。在實際操作本技術的過程中，不但可達到即時性反應的效果，亦即在進行錄音與放音時，皆不發生有延遲與失真之現象，且鍵盤與滑鼠的動作，亦皆能達到即時反應的動作。本技術開發具有 5 項電腦週邊功能的無線傳輸平台，而這 5 項電腦週邊功能分別如下：

- (1) 無線音樂播放(Audio Out)。
- (2) 無線錄音(REC In)。
- (3) 無線電腦鍵盤操控(Keyboard)。
- (4) 無線電腦滑鼠操控(Mouse)。
- (5) 無線娛樂鍵操控(Entertainment)。

本技術主要研發與設計以數位家庭娛樂為基礎之 PC Wireless USB Audio/HID 原型平台，此原型平台與電腦間，僅使用單一個 USB Dongle，即可實現傳輸 5 大資料之功能，並自行研發 USB Dongle，具備 2.4GHz 的資料傳輸能力。由於平台使用低成本的 2.4G 無線傳輸 IC (nRF24101+ 為美金 2 元以下/單顆)，作為傳輸之無線 USB Audio/HID 解決方案，具低成本與低功率消耗之優勢，因此相當適合朝向商品化發展。本技術能夠將人機介面操作請求資料、放音請求資料與錄音請求資料，全部合併成單一無線封包，以傳送具無線等時傳輸功能之裝置。在技術設計方面，可分成 USB Dongle 端與無線音樂鍵盤端等兩個部分，且這兩部分彼此間透過無線 2.4GHz 傳輸，以進行溝通 USB HID/Audio 命令與資料。

本技術所發展無線音樂鍵盤的傳輸技術之情境，係結合 Wireless USB Dongle 連接在家中客廳的電腦之 USB[1]接頭，實現使用者坐在客廳的沙發上透

過無線音樂鍵盤的操控，即可操控遠端 PC，以傳送 HID 的動作給電腦與接收來自遠端 PC 的音樂，且可錄音回遠端 PC 之情境應用的數位家庭娛樂實施範例，以實現遠端無線控制 PC 與錄音不受線的束縛之優點。

Abstract

This technology realizes 2.4GHz-based wireless sound recording, music playing, and humanization interface control platform. Main creative features including users can carry out sound recording, music playing, keyboard, mouse, and entertainment key five-in-one control on a remote computer through wireless transmission, and the wireless transmission distance between a user and a computer can be longer than 30M. The advantage is that the computer is not limited by connecting line. In actual operation, the device not only demonstrate instant response, but also has no delay or distortion phenomenon at the time of sound recording and music playing, in addition, the actions of keyboard and mouse can also demonstrate instant response. The device develops a wireless transmission platform possessing five functions of computer peripheral functions, which are:

- (1) Wireless music playing (Audio Out).
- (2) Wireless sound recording (REC In).
- (3) Wireless computer keyboard control (Keyboard).
- (4) Wireless computer mouse control (Mouse).
- (5) Wireless entertainment key control (Entertainment).

The main research & development and design of device are digital-family-entertainment-based PC Wireless USB Audio/HID prototype platform. Only one USB Dongle is used between the prototype platform and a computer to realize the function of transmitting five kinds of data; the self-developed USB Dongle has 2.4GHz data transmission capacity. The platform uses low cost 2.4G wireless transmission IC (nRF24101+ below USD \$ 2 /one) as a transmission solution of wireless Audio/HID. It has the advantages of low cost and low power consumption. Therefore, it is suitable for developing toward commercialization. The device can combine the request data of human-computer interface operation, the request data of sound playing, and request data of sound recording into a single wireless package to be used as a device with wireless

isochronous transmission function. In the respect of device design, it can be divided into two parts of USB Dongle end and wireless music keyboard end. The wireless 2.4GHz transmission is realized between the two parts to communicate USB HID/Audio orders and data.

The scenario of wireless music keyboard transmission technology developed by this device is a scenario application implementation example of digital family entertainment, in which wireless USB Dongle connects to the USB interface of a living room computer so that a user who sits sofa in living room can remote-control the PC through wireless music keyboard operation, transmitting HID actions to the computer, receiving music from remote PC, and recording sound back to remote PC, so as to realize remote wireless PC control with the advantage that sound recording playing is not limited by line.

代表著作 2

多模體感無線影像遙控車

**Multiple Somatosensory Technology for
Wireless Video Car**

多模體感無線影像遙控車

Multiple Somatosensory Technology for Wireless Video Car

摘要

由於 3C 產品之蓬勃發展，採用體感技術的產品越來越多，諸如遊戲機上盒 Wii、體感 Kicnet 遊戲與智慧型電視之體感滑鼠搖控器產品，這讓體感技術受到重視，相繼投入體感相關技術之開發，因此本技術突發奇想設計使用智慧型手機或平板電腦等裝置，以體感或觸控方式來控制藍芽車移動，並能回傳藍芽車行經路徑的影像回到智慧型手機或平板電腦，以提供操控者監看藍芽車移動路線之影像。本技術使用 Keyfob、Android 與 iOS 智慧型手機等 3 套裝置，以體感或觸控方式來操控藍芽車與回傳影音，為達到不同的操控效果，設計按鈕操控、體感直式操作、汽車方向盤體感橫式操作、觸控拖拉操作、走黑線與自走避障等 6 種不同藍芽車操控模式，並於藍芽車上架設業界體積最小的 Wi-Fi Camera(Ai-Ball)來實現影音回傳之效果。本技術以目前業界最新的藍芽 4.0 為基礎，在藍芽車上安裝藍芽 4.0 模組，另在遙控器端亦開發藍芽 4.0 模組，並加上 G-Sensor 來實現遙控器之體感控制功能。

本技術的創意性在於將 6 種操控模式整合在一個 APP(市面上皆為單一功能)，並在藍芽車上架設 Wi-Fi Camera，讓在操控藍芽車移動時，亦能透過 Wi-Fi Camera 將藍芽車行經路徑之影像回傳到手機或電腦，未來亦考慮將影像與聲音同時整合至本技術，讓手機或平板電腦可同時接收到藍芽車行經路徑之影像與聲音，便可將藍芽車使用於探測與監控方面之應用。本技術設計之 6 種操控藍芽車模式中，所採用 G-Sensor 體感模式，亦可用於停車駕駛之功能，即走黑線功能可應用於工廠自動化；而避障模式可整合至其他應用模式中，諸如自動閃避障礙物與掃地機器人等方面之應用。

本技術的遙控端裝置可支援 Keyfob、Android 與 iOS 等 3 種裝置，並使用藍芽 4.0 做為與藍芽車的無線傳輸介面，而 Android 與 iOS 端亦支援 Wi-Fi 影像傳輸整合到 APP 上，讓 Android 與 iOS 等雙作業系統均可使用。本技術在整體實作可行性方面，依設計目標為而言為相當可行的技術，只要開發 Keyfob 韌體

程式、APP 程式、藍芽 4.0 傳輸技術與 Wi-Fi 影像擷取來加以整合即可，且目前已接洽廠商投入先期開發經費，希望有機會將本技術朝商品化發展。

Abstract

Due to the booming 3C products , the use of somatosensory technology more and more products , such as game consoles on the box Wii, games and somatosensory Kicnet mouse, somatosensory Smart TV's remote control product , which makes technology somatosensory attention , have been put into the development of related works of somatosensory , so this works designed to use your smartphone or tablet PC and other devices to somatosensory , or touch way to control Bluetooth car moving , and can return path via the Bluetooth car image back to your smartphone or tablet PC to provide video monitoring manipulators to move the route of the Bluetooth car . Of this work keyfob, Android and iOS smartphones and other three sets of devices to somatosensory ways to operate or touch Bluetooth car audio and return . To achieve different effects operation, Portrait, Landscape, Driver, Touch, Go black line and Anti collision modes from six different Bluetooth car control mode , and in the erection industry's smallest car Wi-Fi Camera (Ai-Ball) to achieve the effect of the return of the video . This works with the industry's latest Bluetooth 4.0 , based on the Bluetooth 4.0 module installed Bluetooth car at the other end of the remote control is also developing a Bluetooth 4.0 module , plus G-Sensor to achieve remote control of the body a sense of function.

This technology is the integration of the six kinds of control mode in an APP (available in the market are single function) and Bluetooth car erection Wi-Fi Camera, Bluetooth allows the operation of the car moves, can also via Wi-Fi Camera, Bluetooth car dealers by image paths back to the phone or computer. Also consider the future of video and audio simultaneously integrated into the work, let the phone or tablet can receive the video and audio via Bluetooth dealers paths, you can use the Bluetooth car used in the detection and monitoring aspects. The winning design six kinds of operation Bluetooth car model, used G-Sensor somatosensory mode, the driver can be used for parking function, that function can take the black lines used in factory automation; and obstacle avoidance mode can be integrated into other applications mode, such as the application of the automatic dodge obstacles and sweeping robot.

Remote client device can support this technology and other keyfob, Android and iOS 3 such a device, and uses Bluetooth 4.0 and Bluetooth car as a wireless transmission interface, and Android and iOS client also supports Wi-Fi image transfer into the APP so and so Android and iOS operating systems can use the double. This work is implemented in the overall feasibility, according to the design goal is quite feasible in terms of technology, as long as you want to develop Keyfob firmware program, APP program, Bluetooth 4.0 transmission technology to be integrated with Wi-Fi can capture images and has approached manufacturers put early development funds, hoping the opportunity to work toward the commercialization of development.