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EcoCard

僅此一卡

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作品摘要

現代人的錢包裡總有裝不完的卡片，悠遊卡、金融卡、信用卡、集點卡、門禁卡等等，大量的卡片不僅占用空間，對管理上也是一大負擔。於是我們便提出「 僅此一卡」（EcoCard）。

EcoCard 包含微處理機、BLE 通訊模組、指紋辨識感測器、省電顯示幕、薄膜電池和無線充電模組。我們利用此卡片可實現智慧家電控制、門鎖控制、線上授權、電子交易等等功能。以 Bluetooth Low energy（BLE）為其通訊介面，並使用省電的顯示幕與按鈕呈現出友善的使用者介面。安全性方面我們使用指紋辨識來驗證使用者身分。且 EcoCard 以 BLE 為通訊介面，使整個系統裝置能維持電力半年以上，並支援無線充電。

Why BLE? 目前很多廠商使用 NFC（Near Field Communication）技術來研發金融卡等卡片，但是 BLE 和 NFC 相較起來，NFC 耗電、只支援短距離且只能一對一，加上一定要有一定面積的線圈當作通訊媒介，占空間。最重要的它是必須搭配作業系統才能運作，這顯然與物聯網的理念大相逕庭。故我們提出以 BLE 做為通訊介面的 EcoCard ，不僅省電且能達到之功能更多，且安全性不亞於 NFC。

EcoCard 主打兩大功能 ：「家電控制」與「電子交易」。

「家電控制」

目前的智慧家電，均需以手機 APP 進入配對，並且選取欲操控設備，並給予指令設定，這十分麻煩，而 EcoCard 只要預先設定好配對與對應手勢，便可以使用手勢辨識功能來開關門鎖與燈具甚至其他家電。

- 藍芽門鎖
  使用者可在藍芽支援的傳輸距離內利用特定手勢去打開或關閉門鎖，免去匆忙翻包找鑰匙的窘境。
- 藍芽燈控
  使用者可在藍芽支援的傳輸距離內利用特定手勢去開關燈，當進門卡還拿在手上時就可以順便打開室內的燈，不需在黑暗中摸索開關的位置，避開不必要的風險。

「電子交易」

- 一般交易（似悠遊卡）
  店家透過條碼機辨認消費者購買之物品，透過電腦連接資料庫進行扣款，再透過裝置使用 BLE 與使用者持有之 EcoCard 進行金額同步。
- 卡對卡交易
  雙方皆持有 EcoCard 的狀況，兩張卡進行連結認證之後，可藉由卡上之按鈕輸入欲交易之金額，金額會顯示顯示幕上面，接著透過 BLE 進行卡對卡轉帳。

「其他」

- 無線充電
  EcoCard 採用薄膜電池，輕薄且不須透過額外線材就可以充電。
- 指紋辨識
  EcoCard 裝有指紋辨識 sensor，大大提高了安全性。

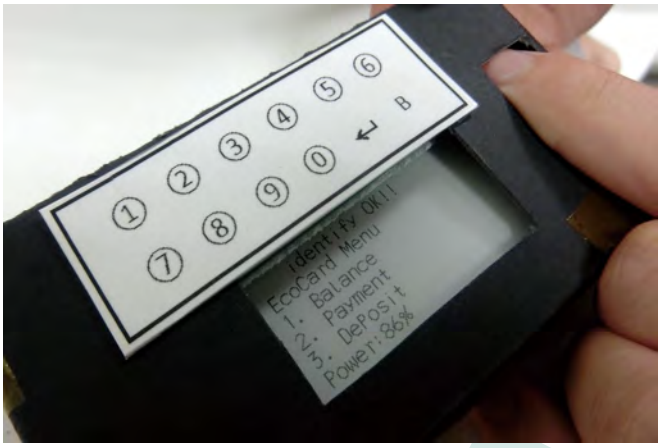

圖 1 / 實物展示

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1993 年於華盛頓大學取得 Computer Science and Engineering 碩士學位，1998 年於同系取得博士學位。1999 年起任教於美國加州大學 Irvine 分校，並於 2005 年獲得 NSF CAREER Award。2008 年至 2010 年期間擔任 IEEE 副主編，2013 年擔任 ISLPED 主席。現任清華大學電機資訊學院副教授。

研究領域

無線嵌入式感應系統與低功率平臺。

Abstract

Modern wallets always have plenty of cards, Easy card for transportation, credit card for shopping, ID card for pass, even points cards for different shops. Amount numbers of cards stay a big room in the wallet, and cause a problem of management. Thus, we build the " EcoCard ", which could solve this problem.

EcoCard includes MCU, BLE module, fingerprint identity sensor, gray scale screen, thin film battery, and wireless charge module. We can use EcoCard to achieve Smart home control, door lock control, online authorization, electronic businesses, etc. Bluetooth Low Energy (BLE) is used as communication interface, and EcoCard also integrates low power screen and buttons to user interface. For security, we use fingerprint to check user identity. Because of using BLE as communication interface, system device, supporting wireless charging, can preserve power for half year without recharging.

Why is BLE? Many products use NFC(Near Field Communication) tech to design IC card, etc. Nevertheless, compared to BLE, NFC has high power consumption, short distance transmission, and only supplies one to one connection, moreover, NFC costs more space for coil used as communication media. The worst defect is that it must work with operating system, this is different from the spirit of IoT. Base on above factors, we choose BLE as the communication for EcoCard, not only for power saving, but for more functions achievement with strong security as NFC.

EcoCard functions for two characteristics: Appliances control and electronic businesses.

Appliances control

Current smart appliances should be controlled by pairing with phone APPs, and be operated by APPs. This annoys the users. However, EcoCard only need to be paired at first time using, and then users can use gesture recognition function to open the doors, turn on the lights, and operate other appliances.

- Bluetooth door lock
  Users can open or lock the door by specific gestures in the limit transmission distance, which eliminates the upset on finding keys.
- Bluetooth light control
  Users can turn on or off light by specific gestures in the limit transmission distance. Users won't risk danger to find the light switch in the dark with an EcoCard in their hand.

Electronic businesses

- Common deal(like easy card)
  Stores can use barcode scanner to scan the items, and charge at the server, finally synchronize the balance with EcoCard.
- Card to Card deal
  Both user keep the EcoCards to connect with each other. After identification, by pressing buttons to key the deal price, and the price will show on the screen, finally, pay the money credit by BLE.

Other things

- Wireless charging
  EcoCard equipped with thin-film battery, thinned, without any wire connection.
- Fingerprint identity
  EcoCard built with fingerprint identity sensor, arising the security level.