Tile:

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Introduction

Most of us keep a lot of cards in our wallets, and it may take a while to find the card we need. For visually impaired people (VIPs), this is an even bigger problem. Therefore, we designed a card reader to help VIPs identify cards more easily.

About the Card Reader

Our card reader is an application of Near Field Communication (NFC) technology. When a card with an NFC tag is placed near the sensor, the sensor can read information (e.g. the tag ID, words) stored on the NFC tag. The on-board computer then matches the tag ID with the corresponding saved audio track and plays it back, telling the user what card it is.

If the tag cannot be matched, it is treated as an unregistered card, and users will be directed to a registration process. After placing the new card on the sensor, VIP can press the record button and start to make a sound record of the name of the card with on-board microphone by themselves without assistance from others. If pervious sound record is not clear or no longer use, VIP can reuse old NFC tag and re-record a new sound track to replace old one.

We designed the device with accessibility in mind, added braille labels on the device surface. Which help VIPs locate buttons and micro-phone much easier. The front covers also have a square with rough texture, that tells VIPS where is the location of the NFC sensor, minimize the time for finding the NFC sensor. There are no sharp edges on the device, it is light in weight and as thin as a box of playing cards, making it safe to hold and operate with single hand. Also, a large capacity re-chargeable battery with charging module is embed in the device, which can operate up to 11 hours.

Computer Vision (CV) vs. Near Field Communication (NFC)

Both CV and NFC are valid approaches for identifying cards. We chose NFC because for VIPs, placing an object right on a sensor is easier than taking a good photo. If we used the CV solution, users would have to take a near-perfect picture of the card, which would be compared with the pictures we took and stored in the database. But it is not easy for VIPs to take a clear picture of the target card, so CV was not the best option. With NFC, all they need to do is to place the NFC tag near to the sensor. This is much more convenient for VIPs.

Applications

NFC tags can be attached to many places and objects. As they are stickers, they can be placed on any surface they can adhere to. Therefore, our device can identify not only cards, but also objects like DVDs and books. Users can even attach a tag on a letter and record a message, using it like an audio diary or memo taker. This can potentially help people with dementia (腦退化症).

TITLE: TBC

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背景

不少人的錢包中都放置了各種不同的卡片，如信用卡、八達通及會員卡等。每當我們需要使用其中一張時，往往需要花一點時間才能從錢包中取出。這對視障人士（Visually-Impaired Person, VIP）而言尤為困擾。因此，我們設計了這個讀卡器，以幫助他們解決這個問題。

關於讀卡器

我們的讀卡器應用了近場通信（NFC）技術，當用家將貼有NFC標籤的卡放在內置為讀卡器的傳感器上時，傳感器就可以從NFC標籤中讀取信息（例如標籤內記錄的訊息編號）。然後，內置的微型電腦再將這個訊息編號與存儲卡內相應的保存音軌配對並播放，以語音提示用家該卡的名稱。

如果標籤尚未有對應的音軌，系統就會將其認定為「未註冊標籤」，再將用家定向到「註冊過程」。只要用家將新標籤放置在傳感器上，系統將要求他們使用內置的麥克風以記錄卡的名稱，並保存音軌信息。

讀卡器的易用程度亦是我們設計時的重要考慮元素。讀卡器上印有點字標籤，以便用家可以更輕鬆地辨識開關按鈕的位置。同時，我們在機面上使用了透明物料，與外殼的其他部分相比，讀卡位置具有不同的紋理，以方便用家在機上放置標籤。讀卡器採用圓角平滑的外形設計，可避免用家使用時被意外割傷。另外，讀卡器輕巧便攜，與現代智能手機尺寸相近，亦可以通過USB充電。

電腦視覺（Computer Vision, CV）與近場通信（NFC）的選擇

要解決識別問題，利用「電腦視覺」(Computer Vision, CV)和近場通信(NFC)技術都是可行的方法。在深入了解用家的習慣及行為後，最終我們選擇了以NFC作識別技術。因為對於用家而言，將物件放在傳感器上比起拍攝清晰的照片更容易。如使用CV作為解決方案，用家每次都要拍攝完整的卡片圖片，再將其與之前在數據庫中拍攝的圖片比較以茲識別。由於每次拍攝完整清晰的照片並不容易，因此CV不是分辨物件用家的最佳選擇。所以我們選用NFC技術，用家只需將NFC標籤放置在傳感器附近即可作辨識。

讀卡器的應用

由於NFC標籤的材質是貼紙，所以只要有可以黏附的表面，就可以放置NFC標籤。因此我們的設備不僅可以識別卡片，還可以識別CD和書籍等外表相近但難以分辨的物品。用家甚至可以在不同物件上附加標籤並記錄訊息，就像使用音頻日記 ∕ 備忘錄一樣。這可以幫助腦退化症患者建立資料庫，因應他們的家居環境作出溫馨提示。