Data Entry Card A07b-05
Contact Management System

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Technology Overview

The advance technology applied in the entire system is watermarking. Watermarking is imperceptible insertion of information, such as a number or text, into multimedia data through tiny modification of the image.

Print-and-scan watermarking is designed for printing and scanning with high imperceptibility and robustness to resist distortion during printing and scanning processes.

Project Overview

Sharing business card is an essential activity in a commercial society like Hong Kong. Regardless of the way to manage these great numbers of business cards, it is difficult to digitalize or search a contact in these cards. Although there are many business card scanning products on the market, their accuracies of matching scanned content and expected field had greatly perplexed the user.

A smart contact management system - "Data Entry Card" (DEC) system is developed to embed a hidden key to the input business card image using print-and-scan visible watermarking algorithm and output a watermarked business card image for printing. Regardless of the alignment and contents of the printed business card, the DEC also has the ability to extract the visible watermark from watermarked business card through typical scanners and regenerate the hidden key for retrieval of card information from database server via the internet. Not only the card information, but also additional information not included in the business card. The entire system is developed by project groups AO7a and AO7b.
System Flow Chart

1. Create Watermarked card
   Input: Card image + Card info.
   Output: Watermarked card image

2a. Insert record
   Input: Card info. + unique key
   Output: Card info.

2b. Embed watermark (unique key)
   Output: Watermarked card image

3. Print cards by Laser Printer or Printing company

4. Share cards

5. Scan watermarked card by DEC
   Input: Embedded card
   Output: DEC

6. Extract key and Retrieve record
   Output: Embedded key + Card info.

7. Manage contacts
   Output: Outlook, vCard, SMS and etc.

Local database

Database server

Partner(s) General scanner

System Features

*Scanner Driver
  - Support WIA (Windows image acquisition) and TWAIN
*Print-and-scan Watermarking Algorithm
  - Embedding Algorithm
  - Extraction Algorithm
*Data Handling
  - Client and Server database manipulation and synchronization
  - FTP upload and download
*Other components
  - Synchronize with outlook
  - Short Message Service (SMS)
  - Export XML, HTML, vCard 3.0 and CSV files
Imperceptibility

They look the same

Original business card
Enlarged 300%

Watermarked business card
Enlarged 300%

The PSNR obtained from the original and watermarked business card image is 79.48. The original and watermarked business card looks almost the same.

Robustness

Under normal card condition (business card contains dust attack and card rotation smaller than 45 degree), the DEC system can recognize watermarked business card at a successful rate greater than 95%.

Under special condition like hand writing on card surface, card rotation greater than 90 degree or physical damage of card, the successful rate is greater than 60%.

Comparison with market products

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<thead>
<tr>
<th></th>
<th>DEC system (Watermarking)</th>
<th>Market products (OCR)</th>
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</thead>
<tbody>
<tr>
<td>Multiple cards scanning</td>
<td>✔</td>
<td>✗</td>
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<tr>
<td>Accurate information retrieving</td>
<td>✔</td>
<td>✗</td>
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<tr>
<td>Extra information retrieving</td>
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<td>✗</td>
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<tr>
<td>Automatic information updating</td>
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<td>Card rotation tolerant</td>
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