LiveCompare: Grocery Bargain Hunting Through Participatory Sensing

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Presented by Kevin Lo
Motivation

• People still prefer purchasing grocery and household items from brick and mortar stores

• No way to easily compare prices between 2 nearby stores
  – Same roll of toilet paper cost twice as much at CVS

• Some price comparison services exist, but mostly for online merchants
Related Work

• Micro-Blog: platform for sharing geotagged multimedia blogs; no incentives for sharing.

• ShopSavvy: rely on online databases so not suitable for items not found online (false now)

• MobiShop: participatory sensing through receipt scanning
  – Receipt scanning: optical character recognition (OCR) error prone & hard to insert into database
  – No incentives
Design

- Uses the camera on the phone to take a picture of the price tag, which also contains the item’s UPC barcode
Design (p2)

- Decode the barcode from the photograph using barcode libraries such as ZXing

- LiveCompare transfers a smaller lower-quality image to the server (faster transfer) for database update
Design (p3)

• It also sends its GPS or GSM cell information to the server for location/store identification

• Presents the raw photographic data to users
  – Optical character recognition (OCR) is bad
  – No manual inputs needed thus better data integrity

• Incentives: users can query for cheaper prices by submitting data at the same time
Design (p4)

• Data Integrity
  – Reduces operator error by submitting product identification and pricing in the same photograph.
  – Users can flag malicious entries for removal

• Limitation
  – Does not scale down well; could use online DBs for small scale deployment
  – Generic-brand products cannot be easily compared
  – Privacy concerns; use pseudonym & anonymity network to hide IP address
Evaluation

- CVS has its own set of barcodes

Table 1: Price ranges of 10 grocery items, each found at 3-5 local stores on October 5, 2008.

<table>
<thead>
<tr>
<th>Item</th>
<th>Price range</th>
<th>Low price store</th>
<th>High price store</th>
<th>Other stores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ben &amp; Jerry’s ice cream</td>
<td>$3.00-$4.49</td>
<td>Food Lion</td>
<td>Harris Teeter</td>
<td>Target, Whole Foods</td>
</tr>
<tr>
<td>Coca-Cola soft drink</td>
<td>$1.11-$1.59</td>
<td>Harris Teeter</td>
<td>Kroger</td>
<td>Kmart, Target</td>
</tr>
<tr>
<td>Colgate toothpaste</td>
<td>$3.99-$4.99</td>
<td>Target</td>
<td>Harris Teeter</td>
<td>CVS</td>
</tr>
<tr>
<td>Cottonelle toilet paper</td>
<td>$5.99-$11.99</td>
<td>Harris Teeter</td>
<td>CVS</td>
<td>Target</td>
</tr>
<tr>
<td>Gillette power razor</td>
<td>$7.94-$11.99</td>
<td>Target</td>
<td>CVS</td>
<td>Harris Teeter</td>
</tr>
<tr>
<td>Herbal Essences shampoo</td>
<td>$2.49-$3.79</td>
<td>Food Lion</td>
<td>Harris Teeter, Kmart</td>
<td>CVS, Target</td>
</tr>
<tr>
<td>Kashi cereal</td>
<td>$2.66-$4.59</td>
<td>Target</td>
<td>CVS</td>
<td>Food Lion, Kroger, Whole Foods</td>
</tr>
<tr>
<td>Kraft cheese slices</td>
<td>$3.59-$4.69</td>
<td>Target</td>
<td>Kroger</td>
<td>Harris Teeter</td>
</tr>
<tr>
<td>Tide laundry detergent</td>
<td>$10.00-$16.49</td>
<td>Target</td>
<td>CVS</td>
<td>Food Lion, Kmart</td>
</tr>
<tr>
<td>Tropicana orange juice</td>
<td>$2.99-$3.99</td>
<td>Kroger, Target</td>
<td>Whole Foods</td>
<td>Food Lion, Harris Teeter</td>
</tr>
</tbody>
</table>
Evaluation (p2)

• 3 thumbnails automatically generated on Nokia N95 8GB; largest one used (320x320)

Table 2: HSDPA transfer rates for uploading 18.3 KB and downloading 71.3 KB across 20 trials.

<table>
<thead>
<tr>
<th></th>
<th>Average</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uploading 18.3 KB image</td>
<td>4.08 s</td>
<td>1.04 s</td>
</tr>
<tr>
<td>Downloading 71.3 KB in images</td>
<td>3.57 s</td>
<td>1.39 s</td>
</tr>
<tr>
<td>Total latency of upload/download operation</td>
<td>7.65 s</td>
<td>1.88 s</td>
</tr>
</tbody>
</table>
Evaluation (p3)

- Feasibility of GPS, Wi-Fi, and GSM localization:
  - Assisted GPS is able to quickly attain accurate coordinates for all of the stores in either the checkout area or just outside the entrance of the store, but useless deep within the store.
  - Wi-Fi localization is not guaranteed, since not all stores have access points.
  - Using GSM is also insufficient at the granularity of single stores if they are close to each other.
  - Best strategy is a hybrid approach.
Questions?