Multiclass VisualRank: Image Ranking Method in Clustered Subsets Based on Visual Features
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Introduction

(A) Google Image Search

Problem: Various image categories and some irrelevant images are mixed up in a single sequence.

(B) VisualRank (Jing et al.)
Input: Results of Google Image Search (see (A))
Output: re-ranked images in a single sequence

Contribution: Irrelevant images are removed.
Problem: The top results tend to be occupied by the same image category.

(C) Multiclass VisualRank (our method)
Input: Results of Google Image Search (see (A))
Output: re-ranked and categorized images in multiple sequences

Contribution: Our method divides images retrieved from search engines into several categories based on distinctive patterns of visual features, and gives ranking within the category.

Obtaining Visual Similarity

The visual similarity between two images is calculated by using SIFT key points that is a method for finding corresponding points between the images.

Clustering and Ranking

The weights between different categories are removed, because clutter images behave like link farm.

Experimental Results

We tested three sets of keywords. Each set includes 10 keywords. For each keyword in each set, top 250 images were downloaded from Google Image Search.

<table>
<thead>
<tr>
<th>Keyword</th>
<th>ANC</th>
<th>Relevant</th>
<th>Irrelevant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sightseeing spots</td>
<td>1.9</td>
<td>1.8 (R:0.6, U:1.2)</td>
<td>0.1</td>
</tr>
<tr>
<td>Artists</td>
<td>3.2</td>
<td>2.9 (R:0.6, U:2.3)</td>
<td>0.3</td>
</tr>
<tr>
<td>Product names</td>
<td>2.3</td>
<td>2.3 (R:0.2, U:2.1)</td>
<td>0.0</td>
</tr>
</tbody>
</table>

ANC: Average Number of Categories per query
Relevant (or Irrelevant): Relevant (or irrelevant) categories per query
R: Redundant categories per query
U: Uniquely identified (non-redundant) categories per query

Contribution: Relevant yet various categories can be automatically extracted, and the images of each categories were sorted by their ranking score at high precision.

Future works: SIFT feature didn’t work well for natural objects such as animals. The alternate visual feature should be applied to the natural object categories.