Multimedia Analysis and Indexing – Fall 2017

HW#1 (DUE: noon, Tuesday, 21 Nov, 2017)

Note:
1) If you have any questions regarding the homework, send e-mail to the TA at <r03944039@ntu.edu.tw>.
2) Submit a soft copy of your write-up (in PDF) and programs to TA **before the due**.
3) The mail subject should start with "*[mmai_hw1]*."
4) The dataset is available in the course webpage.
5) You are highly encouraged to write the homework in English.
6) Please DO write appropriate comments along with your codes.

The goal of the homework is to design and implement important components of a content-based image retrieval (CBIR) system. Please evaluate your CBIR system by **mean average precision (MAP)** on the 25 queries (topics). For each query, you have to calculate the MAP for each modality (or method). Note that the database contains 25 topics (500 images). Those images in the same directory (i.e., the same category) are actually ground truth for each query. Hence, for each query, you can get the MAP over the 20 APs in a leave-one-out manner. Please also report the system MAPs for each modality (or method) by averaging the 25 queries' MAPs. We are also interested in how the hashed features will affect the retrieval performance. Summarize the results in the table(s) – a sample in the following. The 4 methods (setups) are described below.

Also remember to visualize your query results (at your own and not needed to be submitted) and see if it matches the AP calculation.

You will choose **one texture/shape feature and one color feature**, decide a similarity or distance metric (e.g., L1 distance, L2 distance, cosine similarity, etc.), and utilize random projection on one of color or textual (shape) features. Please brief the features and the similarity (distance) metric you adopt.

1) Color similarity. You can refer to the color features introduced in the lectures, chapter 11 of [Castelli'01] (available in the course webpage), or other relevant papers. Suggestions for color features are (but not limited to): *global color histogram, regional color histogram, grid color moments, means in each color channel, color (auto-) correlogram*. **You need to implement the color feature by yourself.**
2) Texture/shape similarity. You can choose any texture or shape features. Suggestions for such features are (but not limited to): *Fourier features, Laws' texture measures, co-occurrence matrix metrics, Tamura's textures, Gabor texture, PHOG, gradient histogram, edge histogram, etc*. You are encouraged to implement on your own or can find other open source tools for texture or shape features; however, you have to acknowledge the source of the tools.
3) Performance for fusing the both features in (1) and (2). There are many fusing methods mentioned in the lecture. Do take care of the normalization mechanisms before the fusion. Also report the performance over 25 MAPs and the overall MAP.
4) *Random projection* on color or texture (shape) feature; pick up one you prefer. Please show the retrieval performance (25 MAPs and the mean of MAPs) for the hashed features with 25% and 50% of the original feature dimensions.

Setups	aloe_vera_gel	baby_shoes	bicycle	**…**	**…**	skirt	trousers	women_clothes	**Mean MAP**
Color									
Texture (or Edge)									
Fusion									
RP (25%)									
RP (50%)									