TP5 - Image Retrieval

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Exercice based on Michal Muszynski.

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1 Introduction

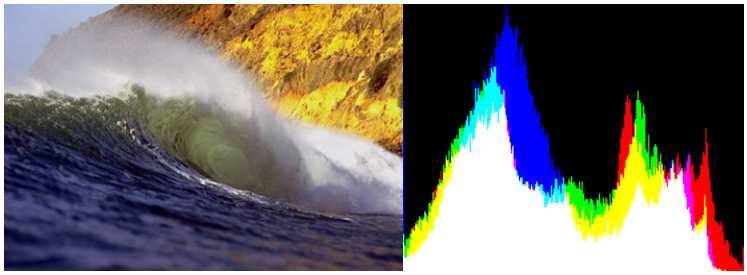
Previous exercises concentrated on text retrieval. The purpose of this TP is to apply the same methods that were already used for text retrieval to image retrieval. We compute precision and recall and apply latent semantic indexing to a small subset of the Corel image database.

2 Preliminaries

In order to apply methods studied before to image retrieval, in the first step we represent images in a form interpretable by the algorithms. More precisely, each image is represented by a high-dimensional vector. We call this vector the *feature vector*. In the case of text, each entry in the vector represents information concerning each specific word/stem that appeared in a text (frequency, tf-idf, normalized tf-idf etc.). In the case of images, multiple representation schemas are possible. We enumerate here the most common ones

- color histogram
- texture histogram
- edge detection
- shape detection

A *color histogram* represents the distribution of colors in an image. We use here the RGB (red-green-blue) model.



3 Tasks

You are given a small subset (300 images) of the Corel image database. Images come from three categories: beverages, tropical plants, waves. Each image has a resolution of 256×384 or 384×256 pixels. The categories are used as ground-truth of relevancy information. Any two images are considered to be relevant if they belong to the same category.

1. Extract the RGB color features for all images in the database. Use 96 bins for each of the three channels (R, G, B). This gives each image a 288-dimensional (96x3) vector. Store the resulting feature vectors in a 300×288 matrix M, so that each row represents one image.

2. For each image, take it as a query, and sort the other images based on their similarities with respect to the query. By picking the top-10, 20, ..., 290, 299 retrieved images, we can draw the precision-recall curve of the retriever. Plot the precision-recall curve for each of the following retrievers: (1) the retriever based on raw features of pixel values. (2) the retriever based on color histograms.

3. Discuss the pros and cons of using color histograms as feature vectors.

4 Assessment

The assessment is based on your report. It should include all experimental results, your answers to all questions, and your analysis and comments of the experimental results. It should be around 5 pages for this assignment. Please try to detail the report by giving examples and conclusions. Please archive your report and codes in "PrenomNomTP5.zip", and upload to `http://moodle.unige.ch` under TP4 before Monday, Mai 27, 2019.