Step 1: Content-based image retrieval system

- **Goal:** Find the best image in our database for a comparison with the query
- **Method:**
  1. Find the 10 most similar images with a dot product using the descriptors explain below. Research is accelerated with a KD-Tree approach
  2. Reorder these 10 candidates in order to find the best candidate. Define an homography between the image query and each candidate in order to found the best homography

Descriptors used based on VGG19 [1]

- Two sizes used: training images size or based on a kernelization step like [2]
- Three vectors are analyzed based on the output of three layers: last convolutional layer $C_5$ with a output lenght of 512 and the fully-connected layers $C_6$ and $C_7$ with a output lenght of 4096 for both
- A mean or max pooling have to be apply in the case of $C_7$ when we used the standard training images size and the three outputs in case of kernelized approach

Datasets

**Queries:** (Total : 2,346 images)

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<tbody>
<tr>
<td>Twitter</td>
<td>23, forged</td>
<td></td>
<td>Holidays</td>
<td>1491, negative queries</td>
<td></td>
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**Database:** (Total : 154,558 images)

- Twitter : 152,754 + 16
- Reddit : 128

Step 2: Homography estimation

- **Goal:** compare the two images and find the forged area if there is one
- **Method:**
  1. Match keypoints from the images by similarity.
  2. Define an homography based on RANSAC [8] and find the outliers which correspond to matching not verifying the homography
  3. Define a density map based on the list of outliers and binarize the map with a known threshold.

Results of the first step

Results of the second step

Outliers map

Density map

Mask predicted

Ground truth mask

Refs


