

Sub-image Searching Through Intersection of Local Descriptors

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■ Problem

- Searching for database images that contain an object in the query image.

Query Answer:



■ Examples

- Image retrieval by a partial image
- Identification of what is the query image

■ Applications

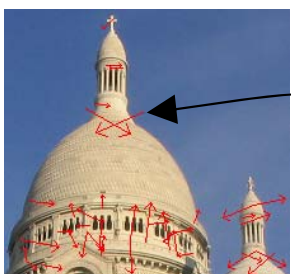
- Criminalistics
- Automatic annotation
- Object categorization

■ Properties

- Content-based retrieval
- Local information extraction

■ Solution

- Local image features
 - Scale Invariant Feature Transform (SIFT):
 - Descriptor – content of small neighborhood
 - Locator – coordinates of the neighborhood
 - Scale – importance of the descriptor
- Describe objects by a set of features



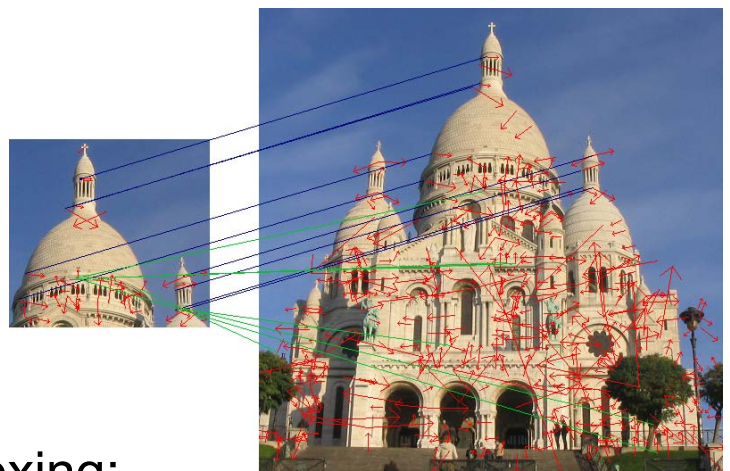
X: 0.484641779463 Y: 0.381903317484,
Scale: 8.03043612

Descriptor: 6,15,32,0,0,0,0,0,131,131,6,0,0,0,0,0,84,109,2,1,0,0,0,0,0,3,4,11,11,9,
0,0,0,5,24,1,0,1,0,0,110,131,7,0,0,0,0,2,131,131,3,7,0,0,0,7,10,8,35,67,2,0,0,0,1,
0,6,2,1,3,0,0,131,10,1,0,0,0,0,37,131,41,30,92,1,0,0,36,7,2,92,131,1,0,0,0,9,5,18,
0,0,0,0,1,126,6,2,2,4,1,1,73,47,15,28,116,63,4,3,30,0,0,17,130,9,0,0,0

■ Intersection of local descriptors

- Image = set of features

■ Find matching pairs (similar features)



■ Indexing:

- All features of images in M-tree
 - Along with image IDs

■ Searching:

- Get n the most important features from the query
- For each run a range query in M-tree
 - A candidate list of images is obtained
- Rank candidates by
 - sum of α -ranks divide by n
 - $\alpha \in \{x, y\}$ – spatial position of a feature
 - α -rank = number of swapped features w.r.t. to the query

■ Demonstration

- <http://mufin.fi.muni.cz/subimages/>

□ Data

- 15,337 company logos
- \Rightarrow 2,359,839 SIFTs extracted

□ Infrastructure

- One server: 2 quad-core CPU 2GHz, 14GiB RAM, six-disk RAID5

□ Parameters:

- radius $\epsilon \in \{0, 450\}$, default $\epsilon = 250$
- $n \in \{1, 24\}$, default $n = 18$
- limit $\in \{0, \infty\}$, default limit = 6