

# **Tutorial 2: Image Feature Extraction**

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# Why Image Processing?

- "A picture is worth a 1000 words"
- Alternative form of communication
- Popular medium of information on the Internet
- Not everything can be described in text; not everything can be described in images

**Feature Extraction** - method of capturing visual content of images for indexing & retrieval.





## Feature Extraction







## The issue of choosing the features to be extracted should be guided by the following concerns:

**Feature Extraction** 

 $\succ$  the features should carry enough information about the image and should not require any domain-specific knowledge for their extraction.

> they should be easy to compute in order for the approach to be feasible for a large image collection and rapid retrieval.

➤ they should relate well with the human perceptual characteristics since users will finally determine the suitability of the retrieved images. DEPAULC"



### Because of perception subjectivity, there does not exist a single best representation for a feature.

**Feature Extraction** 

**Color feature** is one of the most widely used feature in Image Retrieval. **Color Histogram** is the most used in color feature representation.



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#### **Color as low-level feature representation:**

#### Closely related to human visual perception

≻HSV color model

#### >Encode the spatial distribution of features in images

**Color Feature Extraction** 

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- Fixed partitioning scheme
- > each image divided into M ´ N overlapping blocks

3 separate local histograms (H,S,V) are calculated for every block

#### Compact to provide efficient storage and retrieval

>The location of area-peak for every local histogram determines the value of the corresponding histogram.









### Two examples of original images and their approximations:











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# Color - wise Similarity Retrieva

#### 0017.tif sim=1







1726.tif sim=1



0466.tif sim=1



1532.tif sim=0.75691



1156.tif sim=0.73691



1724.tif sim=0.77635



0450.tif sim=0.77512



0042.tif sim=0.74022





1193.tif\_sim=0.63713



1725.tif\_sim=0.7264



0457.tif sim=0.69947



0517.tif sim=0.72324



1876.tif sim=0.57141



1727.tif sim=0.71533



0456.tif sim=0.68313



1875.tif\_sim=0.70182



1158.tif sim=0.57029



0141.tif sim=0.70591



0360.tif\_sim=0.6687





# **Texture Feature Extraction**

- Textures can be rough or smooth, vertical or horizontal etc
- Generally they capture patterns in the image data (or lack of them), e.g. *repetitiveness* and *granularity*

- Texture features:
  - Statistical measures:
    - Entropy
    - Homogeneity
    - Contrast
  - Wavelets
  - Fractals





## Shape Feature Extraction

Methods:



#### **Retrieval Results**