

Master in Internet of Things for eHealth

M5. Smart Data Knowledge / Analytics

Local Descriptors

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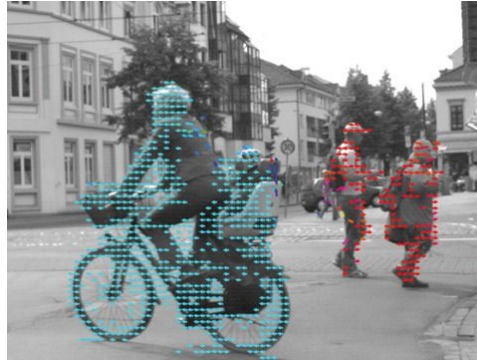
Local Descriptors

- Introduction

Shape



Motion



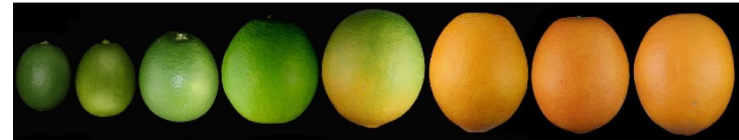
Texture



Temperature

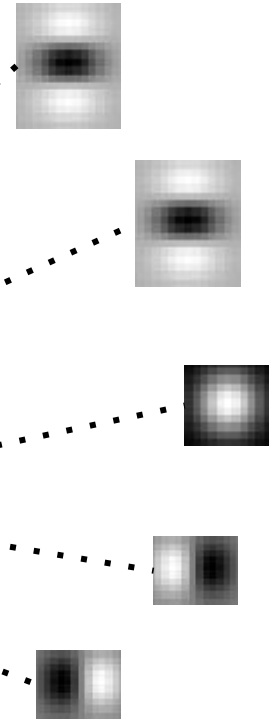
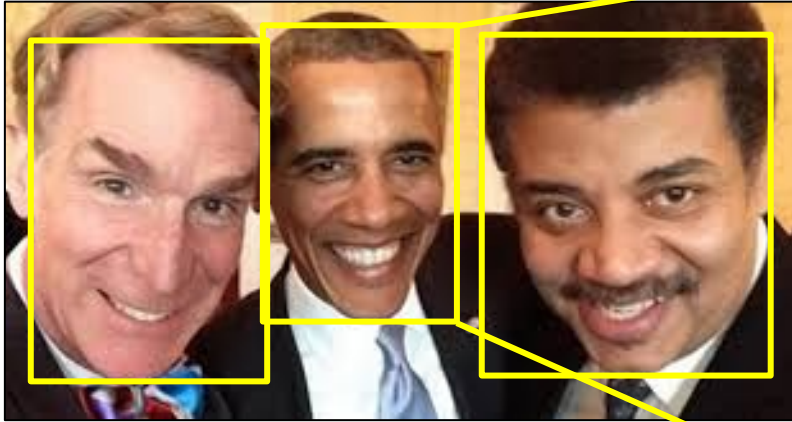


Color



Local Descriptors

- Introduction



Local Descriptors

- **Gabor Filter**

- Analyzes frequency and orientation of gradients around a point

$$g(x, y; \lambda, \theta, \psi, \sigma, \gamma) = \exp\left(-\frac{x'^2 + \gamma^2 y'^2}{2\sigma^2}\right) \exp\left(i\left(2\pi\frac{x'}{\lambda} + \psi\right)\right)$$

Wavelength

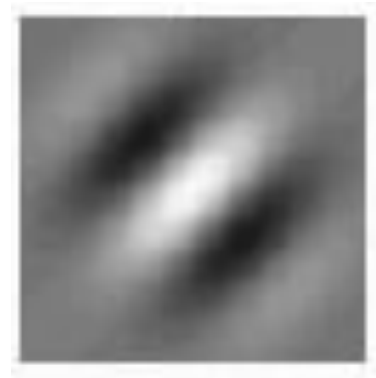
Orientation

Phase offset

Stdev of gaussian

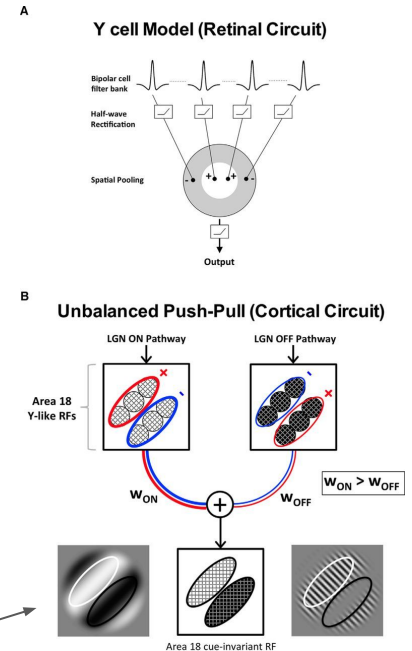
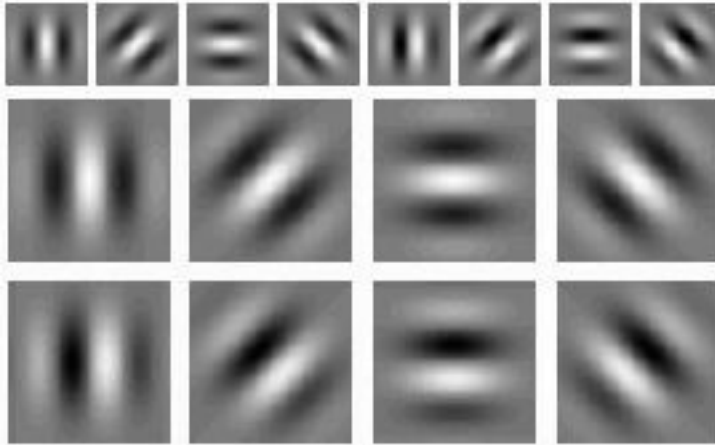
Spatial aspect ratio

(From <https://cvtuts.wordpress.com/2014/04/27/gabor-filters-a-practical-overview/>)



Local Descriptors

- **Gabor Filter**
 - Analyzes frequency and orientation of gradients around a point



Amol Gharat et al., Journal of Neuroscience, 2017

Local Descriptors

- **Difference of Gaussians**

Approximate the Laplacian of Gaussian (example of a Laplacian pyramid)

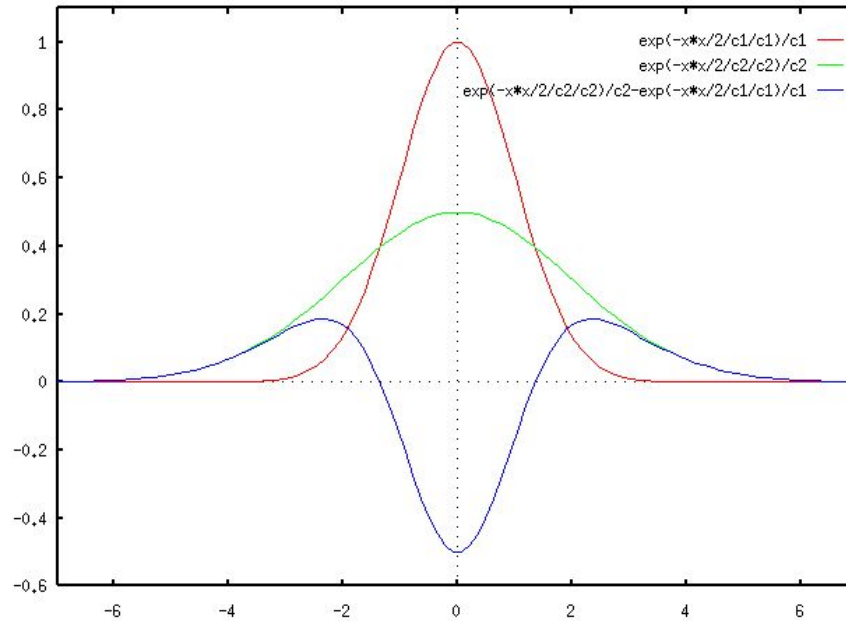


(From <http://www.cs.princeton.edu/~andyz/ip/proj3/>)

Local Descriptors

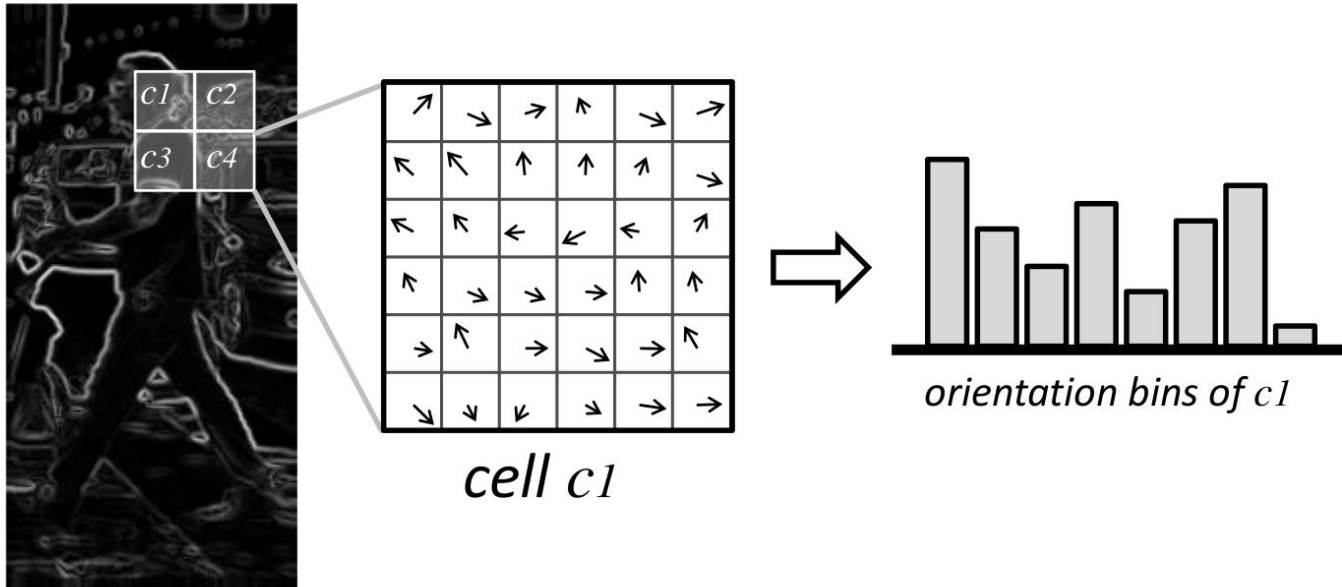
- **Difference of Gaussians**

The filter is the subtraction of two gaussians of different sigma



Local Descriptors

- Histograms of Oriented Gradients



Local Descriptors

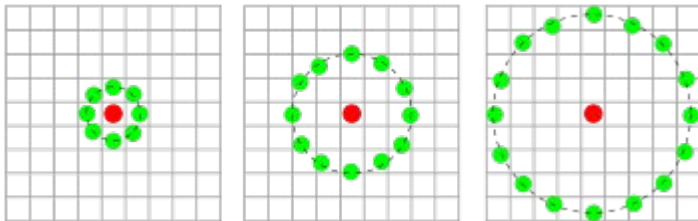
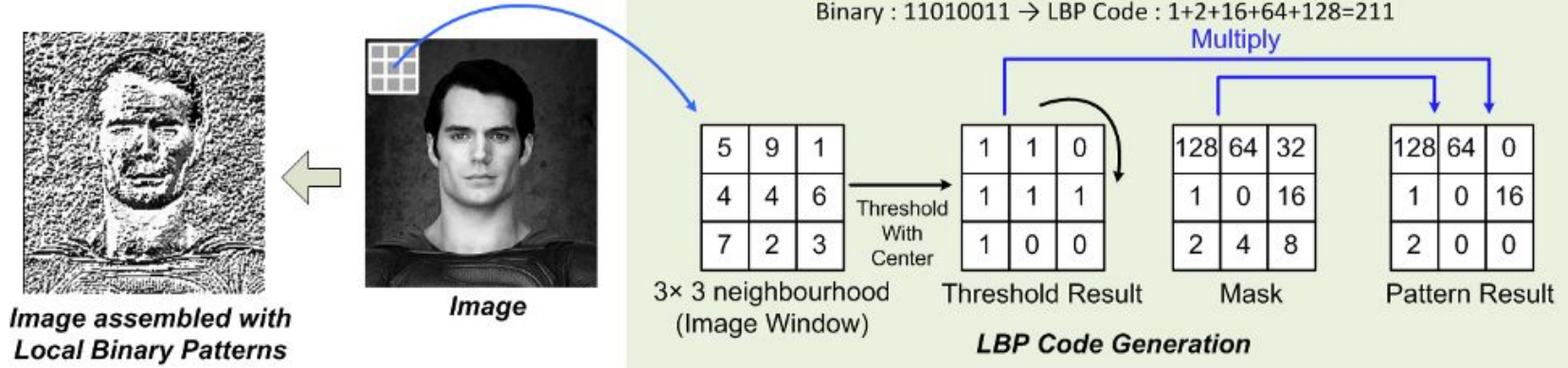
- **Histograms of Oriented Gradients**

Parameters:

- Pixels per cell: 2, 4, 8, 16, etc.
- Cells per block: 2x2, 4x4, etc.
- Stride: 1 cell, 2 cells, etc.
- Block normalization: L1-norm, L1-sqrt, L2-norm, L2-Hys
- Num bins: 6, 9, 18, etc.
- Sqrt and clipping

Local Descriptors

- Local Binary Patterns



Local Descriptors

- Local Binary Patterns

