Image Processing with MATLAB

Scientific Programming (EL2310)

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Motivation

- Widely used among science and engineering fields
- Which applications are coming into your minds thinking of image processing?

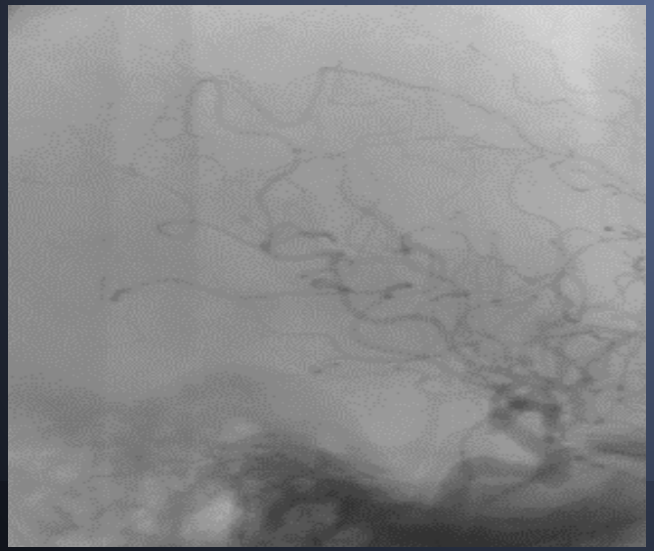
Motivation - some applications

- modern microscopy, medical diagnostics(f. ex. X-rays), security(f.ex at airports), astronomy, robotics, qualitymanagement/manufacturing(f.ex. measuring chips in semiconducter industry)
- and many many more….

Histogram Equalization

What for?

- enhance the contrast of an image (= contrast adjustment)

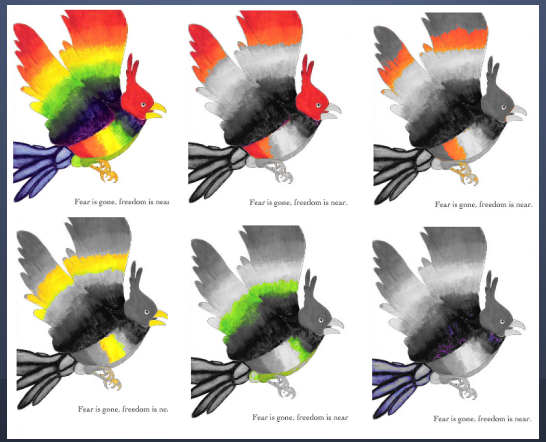


How does it work? - algorithm(one solution)

- counting how often intensity level i(0...255) occures--->vector(256X1)
- computing propability of an occurance of a pixel of level i(0...255) ---> ‘p’-vector(256X1)
- computing cumulative sum of ‘p’ -->cdf-vector
- replacing every element in image ‘I(:,:)==i’ with cdf(i) *255

Color Based Segmentation

- Image segmentation = partitioning image into **regions**
- Color Based segmentation = dividing image into regions based on **color values**



http://www.mathworks.com/matlabcentral/fileexchange/20718-vibgyor-color-segmentation

Color Based Segmentation

- What is it used for ?
  - to identify the region(s) of interest in a picture
  - counting objects
  - separating objects
  - video tracking (locating a moving object)
  - ...

Color Based Segmentation

- Automatic color based segmentation algorithms very difficult to implement :
  - Real pictures → many colors, different textures, non homogeneous color regions, …

    ⇒ difficult to identify regions

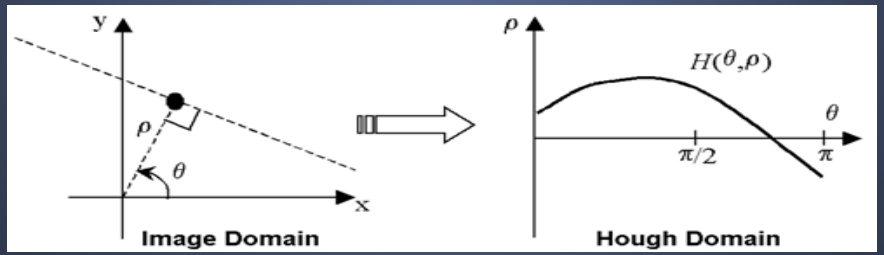
http://en.wikipedia.org/wiki/Image_segmentation#mediaviewer/File:Polarlicht_2.jpg

Hough Transform

- Was invented in 1972 by Richard Duda and Peter Hart
- Was first used to find lines in images
- Is now generalised to find other figures

The transform

Works by transforming Cartesian coordinates (x,y) to Polar coordinates (ρ,θ) for each point



$\rho = x \cos\theta + y \sin\theta$

Example

Electrical circuit