

Image Features and their Extraction

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Introduction

Image Features

Edges, Corners

Video

Shapes, silhouette

Active contours (snakes)

Texture

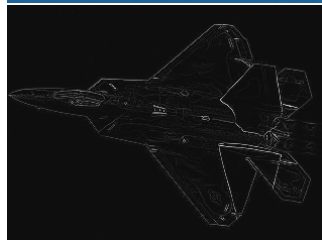
Summary

Introduction

- ▶ Extracting image features is important for automated image processing
- ▶ Many different features, ranging from simple to complex

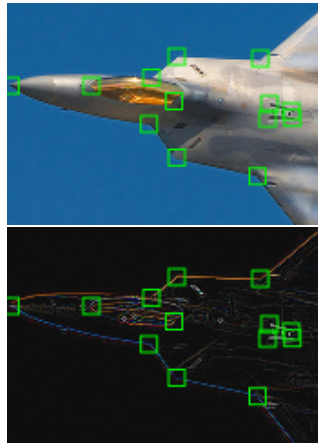
Low level Features - edges

- ▶ Simple and fast to find
- ▶ First order edge detection
 - ▶ Canny, Roberts, Sobel, ...
- ▶ Second order edge detection
 - ▶ Laplacian, Laplacian of Gaussian, ...
- ▶ Other methods of edge detection
 - ▶ Spacek, Petrou, ...



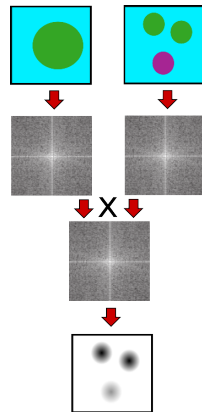
Low level Features - corners

- ▶ Curvature - rate of change in edge direction
- ▶ Corners - points of large curvature



Advanced shape matching

- ▶ Using FFT for faster matching
- ▶ Hough transform
 - ▶ Finding lines, circles, ellipses
- ▶ Generalized Hough transform
 - ▶ Finding arbitrary shapes



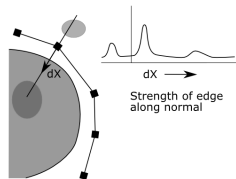
Problems with shapes

- ▶ Problems
 - ▶ Deformable shapes
 - ▶ Solvable by active contours (snakes)
 - ▶ Occlusion



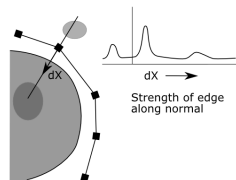
Active contours (snakes)

- ▶ Method to find similar shape in image
- ▶ Can find deformed shapes
 - ▶ Internal energy (snake tries to maintain "reasonable" shape)
 - ▶ External energy (snake tries to snap the shape to image features - edges, lines)
- ▶ Iterative algorithm



Active contours (snakes)

- ▶ Advantages:
 - ▶ Can handle well any elastic deformation
 - ▶ Finding arbitrary shapes
- ▶ Disadvantages:
 - ▶ Sensitive to initial position



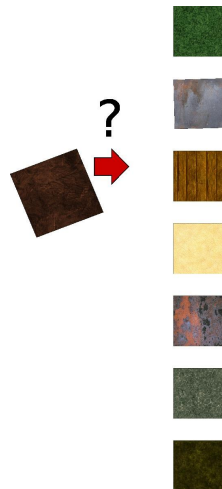
Texture description

- ▶ Fourier transform
- ▶ Wavelet transform
- ▶ Reducing to few values
 - ▶ entropy, frequency, size of peak,
...
- ▶ Co-occurrence matrix



Texture classification

- ▶ k-nearest neighbour
- ▶ neural networks



Literature

- ▶ Feature Extraction and Image Processing, *Mark S. Nixon, Alberto S. Aguado*
- ▶ Clustering of the Self-Organizing Map, *M. Sonka, V. Hlavac, R. Boyle*

Summary

Questions?