

Advanced Image Processing and Computer Vision

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Introduction to computer vision

- Camera Projection and Image Filtering

- Thinking in Frequency

- Thinking in Frequency, continued.

- Sampling and Aliasing. Light, cameras, eyes, and color.

Feature Detection and Matching

- Interest points and corners

- Local image features

- Model fitting, Hough Transform

- RANSAC and transformations

Multiple Views and Motion

- Stereo intro

- Remote guest lecture: John Lambert, GTSM

- Camera Calibration, Epipolar Geometry

- Dense Stereo Correspondence

- Optical Flow

Image Processing for Computer Vision

- Linear image processing

- Model fitting

- Frequency domain analysis

Camera Models and Views

- Camera models

- Stereo geometry

- Camera calibration

- Multiple views

Image Features

- Feature detection
- Feature descriptors
- Model fitting

Lighting

- Photometry
- Lightness
- Shape from shading

Image Motion

- Overview
- Optical flow

Tracking

- Introduction to tracking
- Parametric models
- Non-parametric models
- Tracking considerations

Classification and Recognition

- Introduction to recognition
- Classification: Generative models
- Classification: Discriminative models
- Action recognition

Useful Methods

- Color spaces and segmentation
- Binary morphology
- 3D perception

Human Visual System

- The retina
- Vision in the brain

- Face Detection with openCV

- Welcome to the Practical Applications
- Installations Instructions
- Common Debug Tips

Face Detection with OpenCV

Recognition

- Convolutional Neural Networks and Network Visualization

- Classical recognition techniques and Deeper Deep Architectures

- ResNet, Big Data

- "Unsupervised" Learning and Colorization

- Semantic Segmentation

- Deep Object Detection and Structured Output from Deep Networks

- 3D Point Processing and Lidar

- Transformer architectures

Image formation / projective geometry / lighting

- Practical linear algebra

- Image processing / descriptors

- Image warping

- Linear models + optimization

- Neural networks

- Applications of neural networks

- Motion and flow

- Single-view geometry

- Multi-view geometry

- Applications