Computer Vision with MATLAB

Training Objectives

This one-day course provides hands-on experience with performing computer vision tasks. Examples and exercises demonstrate the use of appropriate MATLAB[®] and Computer Vision System Toolbox[™] functionality.

Topics include:

- Importing, displaying, and annotating videos
- Detecting objects in videos
- Estimating motion of objects
- Tracking a single object or multiple objects
- Removing lens distortion and measuring planar objects

Prerequisites

MATLAB Fundamentals or equivalent experience using MATLAB. *Image Processing with MATLAB* and basic knowledge of image processing and computer vision concepts.

Products

- MATLAB[®]
- Image Processing Toolbox[™]
- Computer Vision System Toolbox[™]
- Sensor Fusion and Tracking Toolbox[™]

Course Outline

Day 1 of 1

Importing, Visualizing, and Annotating Videos (1.0 hrs)

Objective: Import videos into MATLAB, as well as annotate and visualize them. The focus is on using System ObjectsTM for performing iterative computations on video frames.

- Importing and displaying video files
- Highlighting objects by drawing markers and shapes like rectangles
- Combining and overlaying two images
- Performing iterative computations on video frames

Detecting Objects (1.5 hrs)

Objective: Utilize machine learning and deep learning algorithms for complex object detection.

- Marking objects of interest in training images
- Training and using a cascade object detector
- Using a deep learning object detector

Estimating Motion (1.5 hrs)

Objective: Estimate direction and strength of motion in a video sequence.

- Understanding motion perception in images
- Estimating motion using optical flow methods

Tracking Objects (2.0 hrs)

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Objective: Track single and multiple objects and estimate their trajectory. Handle occlusion by predicting object position.

- Tracking single objects using a Kalman Filter
- Tracking multiple objects using a GNN tracker

Camera Calibration (1.0 hrs)

Objective: Remove lens distortion from images. Measure size of planar objects.

- Estimating intrinsic, extrinsic, and lens distortion parameters of a camera
- Visualizing the calibration error
- Removing lens distortion
- Measuring planar objects in real-world units

