

Computer vision

Credits: 5 Semester 2 Compulsory: No

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| Format | Lectures 24h | Tutorials/examples 16h | Private study 85h |
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Lecturers: (G.Garcia; B.Steux) (ECN)

Objectives:

To learn the methods of image processing

Contents:

Image formation and auto-calibration. Low-level image processing: image normalization, colour spaces, image compression and image filtering. Image segmentation: edge detection, chain and line segment detection, Hough transforms, homogeneous region-, shape- and texture description. Object classification: the potential functions-, Bayes-, k-NN, SVM- and MLP- classifiers. Object recognition: dynamic programming, hypothesis generation-and-test, model-to-image matching and graph search. Image motion estimation: gradient- and block-based optical flow, discrete feature motion and active contour tracking. Two-view geometry - stereo-vision. Multi-view and motion-based 3-D object reconstruction. Dynamic vision: object tracking – recursive state estimation, autonomous navigation, discrete self-localization.

Practical Work: Exercises on image processing for recognition purposes

Abilities: The students will be able to:

- Know the different image processing methods,
- To select the image processing method for the specific purpose.
- Process the images for the purpose of getting the required information.
- To use the vision for objects recognition and robot motion guidance

Assessment: 70% continuous assessment, 30% from end-semester examination

Recommended texts:

- Y. Ma, S. Soatto, J. Kosecka, S. Sastry, *An Invitation to 3D Vision. From Images to Geometric Models*, Springer-Verlag, New York 2004. on-line: vision.ucla.edu/MASKS/
- I. Pitas, *Digital Image Processing Algorithms*, Prentice Hall, New York, 1993.
- O. Faugeras, *Three-dimensional computer vision. A geometric viewpoint*, The MIT Press. Cambridge, Mass. 1993.

Further readings: will be provided by lecturer