Technology
Arts Sciences
TH Köln

Course
IBA - Industrial Computer Vision

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General information

Long name	Industrial Computer Vision
Approving CModule	IBA_BaET, BV2_BaMT, IBA_BaTIN
Responsible	Prof. Dr. Lothar Thieling Professor Fakultät IME
Level	Bachelor
Semester in the year	winter semester
Duration	Semester
Hours in self-study	78
ECTS	5
Professors	Prof. Dr. Lothar Thieling Professor Fakultät IME
Requirements	basic skills in signal processing basic skills in Java and/or C basic skills in analysis and linear algebra
Language	German
Separate final exam	Yes

Final exam

Details

The students should demonstrate the following competences in an oral exam: 1.) Safe handling of basic concepts and mechanisms. 2.) Analyze problems in the field of industrial computer vision and solve them with suitable methods. 3.) Analyze existing solutions and explain the used algorithmic and theory.

Minimum standard

At least 50% of the total number of points

Exam Type

The students should demonstrate the following competences in an oral exam: 1.) Safe handling of basic concepts and mechanisms. 2.) Analyze problems in the field of industrial computer vision and solve them with suitable methods. 3.) Analyze existing solutions and explain the used algorithmic and theory.

Lecture / Exercises

Learning goals

Knowledge

image construction and access to image data
grey-level image and colour image
development environment
software design tools
compiler
linker
debugger
softwaretools for image processing and image analysis
softare-based access to image data and parameters
overview of the available ip-modules (moduls dor image processing and image analysis)
design and implementation of own ip-moduls
design of algorithmic chains based on ip-modules using visual programming

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segmentation
histogram-based segmentation
histogram analysis
shading and its compensation
region-based segmentation
filling
split and merge
region growing
contour-based segmentation
contour tracking
hough-transformation

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feature extraction
geometric features
basic features (area, perimeter, shape factor)
central moments
normalized central moments
polar distance
curvature
DFT of polar distance and curvature
color features (HSI)
texture features

co-occurrence matrix
haralick features

Klassifikation von Merkmalen
terms and concepts
feature vector, feature space, object classes
supervised / unsupervised classification
learning / not learning classification
typical methods
quader method
minimum distance
nearest neighbour
maximum likelihood
neuronale Netze
the artificial neuron as a simple classifier
operation
activation function
bias
training a neuron (gradient descent)
multi-layer-perceptron
operation
purposes of the layers
backpropagation training algorithm
development environment for creating and training neural networks
design and configuration of neural networks
training neural networks
verification tof rained networks
generating C-functions from trained networks

Skills

the presented methods for segmentation can be
named
described
delineated in terms of application areas
evaluated in terms of advantages and disadvanteges
problemspecific parameterized

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the presented methods for feature extraction can be
named
described
delineated in terms of application areas
evaluated in terms of advantages and disadvanteges
problemspecific parameterized

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problemspecific parameterized

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Lecture	2
Exercises (whole course)	0
Exercises (shared course)	0
Tutorial (voluntary)	0

Separate exam

none

Practical training

Learning goals

Skills

purposeful handling of the tool chain for computer vision

deal with complex tasks in a small team

derive complex solutions that can be implemented using image processing and image analysis

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Practical training	2
Tutorial (voluntary)	0

Separate exam

none