Technology
Arts Sciences
TH Köln

Course Manual 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
Valid from	summer semester 2023
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

Literature

Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Prentice Hall

Scott E Umbaugh, COMPUTER VISION and IMAGE PROCESSING: A Practical Approach Using CVIPtools, Prentice Hall

Wolfgang Abmayer, Einführung in die digitale Bildverarbeitung,Teubner

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	EN mündliche Prüfung, strukturierte Befragung

− Lecture / Exercises

Learning goals

Goal type	Description
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
Knowledge	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
Knowledge	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

Special requirements

fundamentals in image processing

Accompanying material	lecture foils (electronic), tool chain for computer vision, self-study tutorials for the tool chain
Separate exam	No

Knowledge	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
Skills	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

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

Expenditure classroom teaching

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

− Practical training

Learning goals

Goal type	Description
Skills	purposeful handling of the tool chain for computer vision
Skills	deal with complex tasks in a small team
Skills	derive complex solutions that can be implemented using image processing and image analysis

Special requirements

fundamentals in image processing

Accompanying material	problem and task description (electronic), tool chain for computer vision, self-study tutorials for the tool chain
Separate exam	No

Expenditure classroom teaching

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

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