Technology
Arts Sciences
TH Köln

Course Manual IBV

Industrial Image Processing

Version: 2 | Last Change: 23.09.2019 09:14 | Draft: 0 | Status: vom verantwortlichen Dozent freigegeben

General information

Long name	Industrial Image Processing
Approving CModule	IBV_BaET, IBV_BaTIN
Responsible	Prof. Dr. Lothar Thieling Professor Fakultät IME
Valid from	winter semester 2022/23
Level	Bachelor
Semester in the year	summer 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 image processing 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, global image properties, and access to image data graylevel and color images global image properties, mean value, variance, entropy histogram, cumulative histogram 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	gray level transformation linear gray level transformation, histogram spreading non-linear gray level transformation histogram equalization local histogram equalization look-up-table
Knowledge	analysis and processing of color images technical and human color perception additive and subtractive color mixing RGB color space HSI color space transformation RGB to HSI and vise versa
Knowledge	rank-order operators (non-linear filtering) max, min, median morphologische Operatoren erosion, dilation opening, closing locating structures

Special requirements

1.) Develop programs to solve specific problems. 2.) Problem solving competence in the field of linear algebra and analysis. 3.) Representation of time-discrete signals in the time and frequency domain (DFT).

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

Knowledge	analysis and processing in frequency domain fourier analysis and synthesis of one-dimensional digital signals real spectrum, imaginary spectrum amplitude spectrum, phase spectrum filtering in frequency domain fourier analysis and synthesisf of images real spectrum, imaginary spectrum amplitude spectrum, phase spectrum filtering in spatial domain non directional filter directional filter inverse filtering
Knowledge	linear filtering in spatial domain convolution, convolution, transfer function typical convolution maks (mean, gauß, differencial-operator, sobel-operator, laplace-operator) gradient and its calculation using differential-operator and sobel-operator analysis and evaluation of the operator in the frequency domain
Knowledge	Tracking normalized cross-correlation without prediction with prediction (kalman filter)
Knowledge	measuring of subpixel edges one-dimensional two-dimensional using gradient
Skills	the presented methods for image enhancement can be named described delineated in terms of application areas evaluated in terms of advantages and disadvanteges problemspecific parameterized
Skills	the presented color spaces and corresponding algorithms can be named described delineated in terms of application areas evaluated in terms of advantages and disadvanteges problemspecific parameterized

Skills	the presented methods for non liniar filtering can be named described delineated in terms of application areas evaluated in terms of advantages and disadvanteges problemspecific parameterized
Skills	Spectra of images and / or convolution masks can be analyzed designed discussed
Skills	the presented methods for linear filtering can be (space and frequency domain) 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 image processing
Skills	deal with complex tasks in a small team
Skills	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

Special requirements

1.) Develop programs to solve specific problems. 2.) Problem solving competence in the field of linear algebra and analysis. 3.) Representation of time-discrete signals in the time and frequency domain (DFT).

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