Course Industrial Image Processing

Course
- Meets requirements of following modules(MID)
- Course Organization
- Assessment

Course components
- Lecture/Exercise
- Lab

Responsible: Prof. Dr. Thieling

Course

Meets requirements of following modules(MID)

- in active programs
  - Ba ET2012 IBV
  - Ba TIN2012 IBV

Course Organization

Version	
created	2011-10-14
VID	1
valid from	WS 2012/13
valid to	

Course identifiers	
Long name	Industrial Image Processing
CID	F07_IBV
CEID (exam identifier)	

Contact hours per week (SWS)	
Lecture	2
Exercise (unsplit)	
Exercise (split)	
Lab	2
Project	
Seminar	
Tutorial(voluntary)	

Total contact hours	
Lecture	30
Exercise (unsplit)	
Exercise (split)	
Lab	30
Project	
Seminar	
Tutorial (voluntary)	

Max. capacity	
Exercise (unsplit)	
Exercise (split)	30
Lab	15
Project	
Seminar	

Total effort (hours): 150

Instruction language

- Deutsch

Study Level

- Bachelor

Prerequisites

- basic skills in signal processing
- basic skills in Java and/or C
- basic skills in analysis and linear algebra

Textbooks, Recommended Reading

- 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

Instructors

- Prof. Dr. Thieling

Supporting Scientific Staff

- n.N.

Transcipt Entry

Industrial Image Processing

Assessment

Type	
oE	normal case (except on large numbers of assessments: wE

Total effort [hours]	
oE	10

Frequency: 3/Jahr

Course components

Lecture/Exercise

Objectives

Lerninhalte (Kenntnisse)

- 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
- gray level transformation
  - linear gray level transformation, histogram spreading
  - non-linear gray level transformation
  - histogram equalization
  - local histogram equalization
  - look-up-table
- 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

- rank-order operators (non-linear filtering)
  - max, min, median
  - morphologische Operatoren
    - erosion, dilation
    - opening, closing
    - locating structures
- 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
- 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
- Tracking
  - normalized cross-correlation
  - without prediction
  - with prediction (kalman filter)
- measuring of subpixel edges
  - one-dimensional
  - two-dimensional using gradient

Acquired 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
- 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
- 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
- Spectra of images and / or convolution masks can be
  - analyzed
  - designed
  - discussed
- 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

Additional Component Assessment

- none

Lab

Objectives

Acquired Skills

- purposeful handling of the software development environment
- purposeful handling of the softwaretools for image processing and image analysis

Operational Competences

- deal with complex tasks in a small team
- derive complex solutions that can be implemented using image processing and image analysis

Additional Component Assessment

- none