Course Camera Technology

Responsible: Prof. Dr. Gregor Fischer

Course

Meets requirements of following modules(MID)

- in active programs
  - Ba MT2012 KAT2

Course Organization

Version	
created	2011-12-09
VID	1
valid from	WS 2012/13
valid to	

Course identifiers	
Long name	Camera Technology
CID	F07_KAT2
CEID (exam identifier)	

Contact hours per week (SWS)	
Lecture	3
Exercise (unsplit)	
Exercise (split)	
Lab	2
Project	
Seminar	
Tutorial(voluntary)	

Total contact hours	
Lecture	45
Exercise (unsplit)	
Exercise (split)	
Lab	30
Project	
Seminar	
Tutorial (voluntary)	

Max. capacity	
Exercise (unsplit)	
Exercise (split)	
Lab	18
Project	
Seminar	

Total effort (hours): 180

Instruction language

- German, English on demand

Study Level

- Undergraduate

Prerequisites

- none

Textbooks, Recommended Reading

- E.A. Weber, Foto Praktikum, Birkhäuser
- A. J. Theuwissen, Solid-State Imaging with Charge-Coupled Devices, Kluwer 1995
- G. R. Hopkinson, T. M. Goodman, S. R. Prince, A Guide to the Use and Calibration of Detector Array Equipment, SPIE 2004

- G. C. Holst, T. S. Lomheim, CMOS/CCD Sensors and Camera Systems, SPIE
- J. Nakamura, Image Sensors and Signal Processing for Digital Still Cameras, Taylor & Francis
- Reinhard/Ward/Pattanaik/Debevec, High Dynamic Range Imaging, Elsevier 2010

Instructors

- Prof. Dr. Gregor Fischer
- Prof. Dr. Dirk Poggemann

Supporting Scientific Staff

- tba

Transcipt Entry

Camera Technology

Assessment

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

Total effort [hours]	
wE	10

Frequency: 1/year

Course components

Lecture/Exercise

Objectives

Contents

- color imaging methods
  - color mosaic and spectral sensitivity
  - color interpolation (demosaicking)
  - white balance (incl. AWB)
  - color correction
- camera lenses
  - lens types (telephoto, normal, panorama, fish eye, zoom, macro, tilt/shift, telecentric)
  - aberration and correction
  - construction types (Petzval, Anastigmate, Gauß, Triplet …)
  - inner focus, zoom, image stabilization
  - characteristics / technical data (optical sizes, aberration, vignetting, stray light)
  - modelling and measurement of lenses (MTF/resolution, distortion, vignetting, stray light)
- camera systems and their characteristics
  - SLR-, system- and compact cameras
  - videocameras
  - HDR-cameras
    - contrastmanagement
  - autofocus
  - electronic viewfinder

Acquired Skills

- specify and explain the operation of color processing and related methods in a digital camera
- understand and define optical functionality and characteristics of different lens constructions
- derive and explain correction models for an optical system from lens properties
- analyze camera systems and their characteristics with respect to hardware (incl. autofocus and view finder) and distinguish between image processing methods

Additional Component Assessment

- none

Lab

Objectives

Acquired Skills

- analyze DNG color correction model and apply it for inspection of color reproduction quality
- create and recognise relationship between spectral sensitivity and metamerism of a digital camera
- recognise and assess artefacts in the image (aberration, stray light, vignetting, ...)
- analyze and assess MTF and resolution

Operational Competences

- inspection and review of color reproduction quality for digital cameras
- measurement of resolution for digital cameras
- inspection and review of autofocus accuracy
- implementation of a procedure for contrast management and realization of a simple automatic image control
- present and document results

Additional Component Assessment

Type	
fSC	supervised scenario study
fIN	interview on specific topics regarding to fSC

Contribution to course grade	
fSC	Attestation
fIN	interview on specific topics regarding to fSC

Frequency: 1/year