Technology
Arts Sciences
TH Köln

Course Manual KAT2

Camera Technology

Version: 2 | Last Change: 01.12.2019 22:14 | Draft: 0 | Status: vom verantwortlichen Dozent freigegeben

General information

Long name	Camera Technology
Approving CModule	KAT2_BaMT
Responsible	Prof. Dr. Gregor Fischer Professor Fakultät IME
Valid from	winter semester 2022/23
Level	Bachelor
Semester in the year	winter semester
Duration	Semester
Hours in self-study	60
ECTS	5
Professors	Prof. Dr. Gregor Fischer Professor Fakultät IME
Requirements	Attending the courses PHO1, PHO2 and SIGA
Language	German, English if necessary
Separate final exam	Yes

Literature

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

Final exam

Details	Written exam with arithmetic and comprehension excercises
Minimum standard	50% of maximum points
Exam Type	EN Klausur

− Lecture / Exercises

Learning goals

Goal type	Description
Knowledge	color imaging methods color mosaic and spectral sensitivity color interpolation (demosaicking) white balance (incl. AWB) color correction
Knowledge	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)
Knowledge	camera systems and their characteristics SLR-, system- and compact cameras videocameras HDR-cameras contrastmanagement autofocus electronic viewfinder
Skills	specify and explain the operation of color processing and related methods in a digital camera
Skills	understand and define optical functionality and characteristics of different lens constructions
Skills	derive and explain correction models for an optical system from lens properties
Skills	analyze camera systems and their characteristics with respect to hardware (incl. autofocus and view finder) and distinguish between image processing methods

Special requirements

none

Accompanying material	electronic slides as presented during lectures, electronic collection of excercises
Separate exam	No

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Lecture	2
Exercises (whole course)	1
Exercises (shared course)	0
Tutorial (voluntary)	0

− Practical training

Learning goals

Goal type	Description
Skills	analyze DNG color correction model and apply it for inspection of color reproduction quality
Skills	create and recognise relationship between spectral sensitivity and metamerism of a digital camera
Skills	recognise and assess artefacts in the image (aberration, stray light, vignetting, ...)
Skills	analyze and assess MTF and resolution
Skills	inspection and review of color reproduction quality for digital cameras
Skills	measurement of resolution for digital cameras
Skills	inspection and review of autofocus accuracy
Skills	implementation of a procedure for contrast management and realization of a simple automatic image control
Skills	present and document results

Expenditure classroom teaching

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

Special requirements

none

Accompanying material	electronic description of lab-excercises, electronic developping tools for access to raw data (Matlab) image processing (Matlab) digital camera simulation (Stanford's Imageval in Matlab)
Separate exam	Yes

Separate exam

Exam Type	EN praxisnahes Szenario bearbeiten (z.B. im Praktikum)
Details	Short technical discussion during lab excercise Reports about lab excercises
Minimum standard	Reports for all lab excercises must be delivered in correct form with correct results