Technology
Arts Sciences
TH Köln

Course Manual KAT1

Image Sensor Technology

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General information

Long name	Image Sensor Technology
Approving CModule	KAT1_BaMT
Responsible	Prof. Dr.-Ing. Dirk Poggemann Professor Fakultät IME
Valid from	summer semester 2022
Level	Bachelor
Semester in the year	summer semester
Duration	Semester
Hours in self-study	60
ECTS	5
Professors	Prof. Dr.-Ing. Dirk Poggemann Professor Fakultät IME
Requirements	Basic Knowledge in Electronics (Module "Electronics") and Optics and Sensors (Modules "Phototechnology 1", "Phototechnology 2" and "Phototechnology 3")
Language	German, English if necessary
Separate final exam	Yes

Literature

G. C. Holst, T. S. Lomheim, CMOS/CCD Sensors and Camera Systems, SPIE

G. R. Hopkinson, T. M. Goodman, S. R. Prince, A Guide to the Use and Calibration of Detector Array Equipment, SPIE

J.R.Janesick, Photon Transfer DN -> Lambda, SPIE

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	Electronic Characteristics of Image Sensors - Pixelfunction (Semiconductors / Photoelectric Effect, Photo-/Darkcurrent, Electrontransfer, Charge-/Voltage Conversion) - CCD-Function (Chargetransfer, Binning, Multiple Output, CCD-Architectures) - CMOS-Function (Read-Out, Exposurecontrol / Rolling Shutter, HDR-Sensors, Live-View) - Comparison CCD-CMOS - Modelling and Measurement of Electronic Characteristics (Linearization, Offset and Gain, Defectpixel, Determined Signalartifacts (FPN, DSNU, PRNU), Random Signalartifacts (real Noise), Influence of Temperature) Optical Charateristics of Image Sensors - Optical Stack (Antialiasing-Filter, Microlenses, IR-Filter, Color-Filter, Semiconductor-Topography) - Modelling and Measurement of Optical Characteristics (Pixel-MTF, Vignetting, Spectral Sensitivity) Image Correction - Linearization/Gain- and Offset-Correction, Dark Image Subtraction (DSNU) Flatfielding (PRNU, Vignetting) - Multiple-Output-Correction Defectpixel- and Defectcluster-Correction

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	3
Tutorial (voluntary)	0

− Practical training

Learning goals

Goal type	Description
Skills	Measurement and Simulation of Characteristic Curve (Photodiode) Measurement of Electronic Characteristics of Image Sensors Measurement of Optical Characteristics of Image Sensors Description and Documentation of Results

Expenditure classroom teaching

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

Special requirements

none

Accompanying material	electronic description of lab-excercises
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