UiO : Department of Informatics
University of Oslo

INF5442 – Fall 2014

Image Sensor Circuits and Systems

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Course goal

- Acquire basic knowledge of how cameras work, including pixels and pixel array readout circuits, 2D and 3D capture techniques and digital processing used in machine vision applications

- …and to spur your interest in designing your own imaging systems!

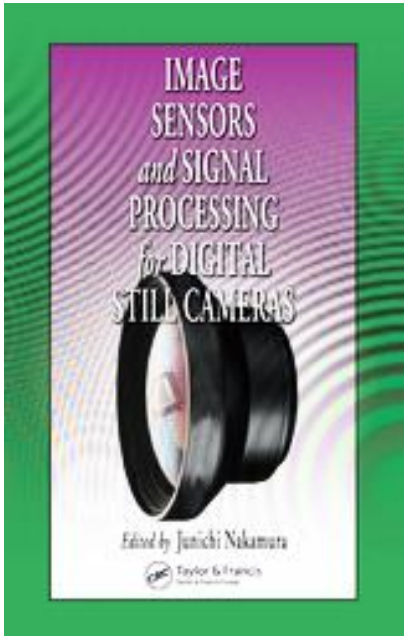
MSc project: CMOS camera-on-a-chip

Course contents

- Systems overview and basic optics
- Photon detection in Silicon
- CCD and CMOS pixel circuits
- Image sensor noise and mitigation techniques
- Characterization of image sensors
- High dynamic range image sensors
- 3D distance measurement with image sensors
- Image signal processing
- JPEG compression
- Camera interfaces
- *Signal-to-noise model (INF9442 only)*

References

- Image Sensors and Signal Processing for Digital Still Cameras, by Junichi Nakamura
- List of Recommended Image Sensor Books: http://cmos-image-sensor.blogspot.no/2010/06/list-of-image-sensor-books.html



Teaching

- 2 hours of lectures every Monday thru 24-Nov-2014
- Mandatory exercises (hand-outs)
- Practical experiment with camera

Project

- Grade: **pass/fail** (must pass to take exam)
- Optional category:
  - Analog design (e.g. pixel array and readout circuits)
  - Digital design (e.g. array timing&control, noise filtering)
  - Algorithm design (in Matlab or other SW)
  - Test and measurements with camera in lab

Examination

- Oral or written examination (4 hours). All mandatory assignments have to be accepted in order to take the exam.

- Exam date: TBD (see course web site)