Imaging Technology

Programme course

6 credits

Bildteknik

TNM089

Valid from: 2017 Spring semester

Determined by
Board of Studies for Computer Science
and Media Technology

Date determined
2017-01-25

Main field of study
Media Technology and Engineering

Course level
Second cycle

Advancement level
A1X

Course offered for
- Media Technology and Engineering, M Sc in Engineering

Entry requirements
Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites
Linear algebra (e.g. linear transforms, matrix factorizations, linear least squares), Mathematical statistics (probability distributions and basic statistics), Transform Theory (continuous and discrete Fourier transforms), Image Processing (basic image and signal processing). For the labs a working knowledge of Matlab is necessary.

Intended learning outcomes
The aim of the course is to give the student an introduction to the field of computational photography. Computational photography is a novel field that encompasses subject areas in computer graphics, computer vision and optics, using methods for combining optics and software to produce new types of images. After a completed course the student is expected to be able to:

- describe and use basic components of conventional digital camera technology.
- describe the basic concepts of color imaging techniques.
- use and analyze models for light scattering at surfaces.
- present an overview of multidimensional Lightfield imaging.
- implement and use multimodal imaging methods.
- describe novel and emerging imaging technologies.

Course content

Topics that are covered in the course are:

- Conventional camera technology: optics, sensors and near-sensor signal processing like demosaicing.
- Basic color imaging: multi-spectral and multi-channel imaging models and descriptions of illumination sources.
- Light-matter interaction: BRDF capture, analysis and modeling.
- Lightfield theory: Overview of techniques for multidimensional Lightfield capture and imaging.
- Multi-image techniques: exposure bracketing, basic multi-view imaging and coded apertures.
- Novel imaging techniques: Overview of experimental imaging techniques and some examples of imaging techniques in the non-visible wavelength range.

Teaching and working methods

Lectures and computer exercises, followed by a final project work and project presentation.

Examination

PRA1	Project Work with Oral and Written Presentation	6 credits	U, 3, 4, 5

Grades

Four-grade scale, LiU, U, 3, 4, 5

Department

Institutionen för teknik och naturvetenskap

Director of Studies or equivalent

Camilla Forsell

Examiner

Reiner Lenz

Course website and other links

http://www2.itn.liu.se/utbildning/kurs/

Education components

Preliminary scheduled hours: 48 h
Recommended self-study hours: 112 h

Course literature

Additional literature

Books

Sharma, *Digital Color Imaging Handboo*
Szeliski, *Computer Vision: Algorithms and Applications*

Articles

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.