Scientific Visualization

Programme course

6 credits

Vetenskaplig visualisering

TNM067

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

Information Technology, Computer Science and Engineering, Media Technology and Engineering

Course level

Second cycle

Advancement level

A1X

Course offered for

- Media Technology and Engineering, M Sc in Engineering
- Computer Science and Engineering, M Sc in Engineering
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- Applied Physics and Electrical Engineering, M Sc in Engineering
- Biomedical Engineering, Master's programme
- Mathematics, Master's programme
- Information Technology, M Sc in Engineering
- Applied Physics and Electrical Engineering - International, M Sc in Engineering
- Computer Science and Software Engineering, M Sc in Engineering
- Computer Science, Master's programme

Specific information

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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

Computer Graphics, Physical modeling

Intended learning outcomes

The goal for this course is to provide the student with deep insights into methods for visualization of scientific data from experiments and simulations. The applicability of the various methods is shown through practical programming exercises. Upon completion of the course the student should be able to:

- For a given data set choose an appropriate visualization method.
- Design and implement a visualization tool using the chosen. method and available software toolkits.
- Read and present the content in scientific papers in the field.

Course content

- Introduction to visualization: visualization as a research field, applications, tasks
- Visualization pipeline
- Data representation and interpolation:
    - Basic data types: Scalar, vector and tensor data
    - Structured and unstructured data
- Basic visualization algorithms
    - for scalar fields, e.g. color mapping, contour lines and surfaces
    - for vector fields, e.g. flow lines and surfaces and time animation of these
    - for tensor fields, e.g. glyphs, tensor lines
- Overview of techniques for volume rendering
- Introduction to concepts for more advanced visualizations data analysis
    - data exploration
    - feature extraction
    - topological methods
- Examples of some application specific visualization techniques

The knowledge gained is applicable in several existing and emerging applications in industry and the public sector, but can also form the foundation of research and development in scientific visualization both within academia and specialized companies.

Teaching and working methods

The course is composed of lectures and laboratory assignments. Scientific papers will also be included as self-study material.

Examination

MUN1	Oral examination	3 credits	U, 3, 4, 5
LAB1	Laboratory work	3 credits	U, G

Grades

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

Department

Institutionen för teknik och naturvetenskap

Director of Studies or equivalent

Camilla Forsell

Examiner

Ingrid Hotz

Course website and other links

http://scivis.itn.liu.se/teaching/courses/scientific-visualization/

Education components

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

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.