



HL2012 Medicinsk bildrekonstruktion i 3D 6,0 hp

3D Image Reconstruction in Medicine

När kurs inte längre ges har student möjlighet att examineras under ytterligare två läsår.

Fastställande

Kursplan för HL2012 gäller från och med HT07

Betygsskala

A, B, C, D, E, FX, F

Utbildningsnivå

Avancerad nivå

Huvudområden

Elektroteknik

Särskild behörighet

Bachelor's degree in Engineering Physics, Electrical Engineering, Computer Science or equivalent. Basic knowledge of anatomy.

Undervisningsspråk

Undervisningsspråk anges i kurstillfällesinformationen i kurs- och programkatalogen.

Lärandemål

Three dimensional (3D) imaging plays a central role in medical imaging. 3D images are used for both diagnosis and treatment. For several imaging modalities, data are acquired digitally as one or 2D projections of the object. In order to obtain a 3D image from these projections, a reconstruction operation must be implemented, this course deals with basic methods for digital image processing and commonly used methods for 3D reconstructions. The course is organized as a project course that provides practical knowledge about 3D image reconstruction in medicine. It also provides experience in problem solving as well as presenting research result both orally and in writing.

Upon completion of this course the participant should understand:

- Digital image registration and factors affecting image quality
- Image filtering in space and frequency domains
- Image restoration
- 3D image reconstruction

Kursinnehåll

The course includes the following elements:

- An introduction to digital image processing, including digital image filtering both in room and frequency domains, Fourier Transform, Radon Transform, image restoration and registration
- The presentation of Gauss and Poisson noise, the sonogram, Fourier slice theorem
- Different image reconstruction techniques such as the filtered back projection technique, iterative methods, algebraic methods, Maximum Likelihood, ordered subsets as well as a Maximum a Posteriori

In parallel, students will work in small groups with a project aimed as solving a 3D image reconstruction problem and implementing the solution in Matlab code, in addition to writing a report, publishing it on the World Wide Web and presenting it orally for other students and researchers.

The course also includes a seminar work where each (small) group of students reads research articles on a topic in the area of Medical Image Reconstruction, and discusses it orally in a seminar.

Kurslitteratur

The course literature consists of current research articles that will be given out when the course starts, in addition to the book:

Gonzalez, Woods & Eddins, Digital Image Processing Using Matlab, Prentice Hall 2004, ISBN 0130085197

Examination

- ANN1 - Annan uppgift, 1,5 hp, betygsskala: P, F
- PRO1 - Projekt, 4,5 hp, betygsskala: A, B, C, D, E, FX, F

Examinator beslutar, baserat på rekommendation från KTH:s handläggare av stöd till studenter med funktionsnedsättning, om eventuell anpassad examination för studenter med dokumenterad, varaktig funktionsnedsättning.

Examinator får medge annan examinationsform vid omexamination av enstaka studenter.

Övriga krav för slutbetyg

Passed seminar work (ANN1; 1.5 cr.) grading P/F.

Passed project work (PRO1; 4.5 cr.) grading A-F.

Etiskt förhållningssätt

- Vid grupparbete har alla i gruppen ansvar för gruppens arbete.
- Vid examination ska varje student ärligt redovisa hjälp som erhållits och källor som använts.
- Vid muntlig examination ska varje student kunna redogöra för hela uppgiften och hela lösningen.