UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Professional Training

2122-3-I0303D018

Aims

The student should:
• learn the basic methods for proper acquisition and processing of medical images obtained with X-ray instruments, MRI and nuclear
medicine instruments.
• know the bioengineering of the human visual system
• be able to outline the steps that allow to convert bidimensional signal in a number
• know the basics of digital images
• know how to use bidimensional filter and interpret the spectrum of an image
• know the basics of tomographic reconstruction
• be able to describe the basic operations for the integration of multimodal images
• be able to recognize artifacts that disrupt the results and interpretation of the image.
• know the main indications of the imaging processing of radiological imaging, MRI and nuclear medicine imaging (in oncology and cardiology)

Contents

The laboratory provides students with the knowledge of the methods of acquisition, processing and analysis of medical images obtained from the instruments used in diagnostic radiology, MRI and nuclear medicine-not invasive. In particular the laboratory explains the procedures for the extraction of useful information through the use of appropriate techniques.
So this laboratory provides students with the knowledge of biomedical imaging processing for their effective application in work activities

Detailed program

- A/D image conversion: spatial sampling and color and gray level coding, dithering.
- Quality improvement techniques: histogram construction, brightness correction, contrast and gamma, threshold, histogram equalization, look-up table.
- Logical and bit-plane slicing operators.
- The two-dimensional convolution. Low pass and high pass mask filters.
- Exaltation and extraction of the contours: Prewitt and Sobel filters, gradient algorithm.
- Non convolutive filters: the median filter.
- The spatial frequency domain: the two-dimensional Fourier transform. 3D image processing: geometric transformations, surface extraction and reconstruction, 3D visualization models, multimodal image integration.
- Axial tomography: projections, sinogram, analytical and iterative methods of reconstruction.
- Reorientation of SPET and PET tomographic images in cardiac studies: short axis, horizontal long axis, vertical long axis.
- Biomedical image analysis methods - visual analysis of static and dynamic images in nuclear medicine - quantitative analysis of static, dynamic and gating images in nuclear medicine - regions of interest (ROI) - time/activity curves - Standardized uptake value (SUV))
- compartmental model FDG with plasma and tissue sampling - parametric images
- Application of the main methods of image analysis in oncology, cardiology and neurology - CT-SPET and CT-PET integration in oncology with applications in radiotherapy.

Prerequisites

None

Teaching form

Laboratories and exercises delivered in mixed mode: partial presence and/ or asynchronous/ synchronous videorecordings

Textbook and teaching resource

Slides of lectures

Semester

II semester

Assessment method

There isn't final assessment but the frequency is recorded in the laboratories.

Office hours

By appointement