

Postgraduate student: **Manetzi Theodora**

Thesis Title:

Computer system for emphysema quantification from CT images of the lungs

Abstract:

Emphysema is a disease that affects the lungs creating breathing problems for the patient, as exhaled air is trapped inside the lungs. In the present study the development and evaluation of a computer system to assess the distribution and quantification of emphysema in lungs, is described. Computed tomography may contribute to early diagnosis of emphysema, so for system support CT images from 18 patients were studied.

For emphysema detection, a pixel segmentation algorithm was implemented that was based on pattern recognition. Initially, representative features from predefined regions of interest (ROIs) by the expert radiologist were extracted. Hence, twenty textural features were extracted from: 1/ the histogram, 2/ the co-occurrence matrix and 3/ the run length matrix, of the emphysema and lung parenchyma regions. Subsequently, an image analysis system for emphysema quantification was implemented and evaluated. The minimum distance classifier (MDC), the k nearest neighbor classifier (kNN) and the probabilistic neural network classifier (PNN) were implemented and tested for classifying image pixels either to emphysema or to lung parenchyma regions.

Quantification of emphysema, as computed by the proposed image analysis system, was associated with the corresponding results from the CT software and with the spirometry findings, which gives evidence for the functional state of lungs. Spirometry data were derived from pulmonologist.

Results show a significant correlation between emphysema quantification by the proposed system and by CT software. A negative correlation was found between the proposed image analysis system and the spirometry findings. The proposed method of emphysema quantification may be used as a second opinion tool to aid the physician in diagnosing and determining the stage of the disease.

Examining Committee:

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