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Quantitative image analysis in sonograms of the thyroid gland

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Abstract

High – resolution, real – time ultrasound is a routine examination for assessing the disorders of the thyroid gland. However, the current diagnosis practice is based mainly on qualitative evaluation of the resulting sonograms, therefore depending on the physician's experience.
Computerized texture analysis is widely employed in sonographic images of various organs (liver, breast), and it has been proven to increase the sensitivity of diagnosis by providing a better tissue characterization.
The present study attempts to characterize thyroid tissue by automatic texture analysis. The texture features that are calculated are based on co-occurrence matrices as they have been proposed by Haralick. The sample consists of 40 patients. For each patient two sonographic images (one for each lobe) are recorded in DICOM format. The lobe is manually delineated in each sonogram, and the co – occurrence matrices for 52 separation vectors are calculated. The texture features extracted from each one of these matrices are: contrast, correlation, energy and homogeneity.

Primary component analysis is used to select the optimal set of features. The statistical analysis resulted in the extraction of 21 optimal descriptors. The optimal descriptors are all co-occurrence parameters as the first-order statistics did not prove to be representative of the images characteristics. The bigger number of components depends mainly on correlation for very close or very far distances

The results indicate that quantitative analysis of thyroid sonograms can provide an objective characterization of thyroid tissue.

Measurement of relative levels of electric field intensity in the frequency ranges of radio and TV broadcasting antennas and wireless communication devices: Hazard evaluation study.

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Hazard evaluation owing to electromagnetic radiation emitted by artificial sources in occupational and professional environment is of critical importance as electromagnetic radiation sources increase at a considerable rate. Mainly epidemiologic studies have dealt with possible human health effects from radiation emitted by radio and television broadcasting antennas, mobile telephony antennas and other sources of EM radiation.
The aim of this study is the detailed measurement of electric field intensity in external and internal environment in the region of Attica in the frequency range 32 MHz – 3GHz. The measuring devices used (NARDA SRM 3000, SRM 3006) are suitable for spectral analysis; therefore the contribution of specific spectral bands to the total electromagnetic "pollution" was evaluated.
The results showed that: 1. the contribution of FM broadcasting antennas can reach up to 80% of the total detriment. In absolute values electric field intensity in the FM frequency range can reach up to 800mV/m when the corresponding total value owing to the whole measurable frequency range is 1mV/m. 2. Satisfactory functionality of cell phones is feasible when the electric field intensity is only 5-19mV/m. 3. In the occupational as well as in the professional environment the highest contribution is due to wireless communication devices (Wi Fi LAN, DECT).
Based on the results from studies dealing with potential hazard from non ionizing electromagnetic radiation, it is possible to detect health effects at exposures to electric field intensity values much lower from the limits proposed by the ICNIRP. Complying with the principle of risk minimization methods of lowering electric field intensity values should be sought.
Maximizing the distance from wireless communication devices and the use of lower power antennas from cellular phone companies prove to be effective methods for lowering the exposure.
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