Doctoral School of Information and Biomedical Technologies Polish Academy of Sciences

Subject

Characterization of tissues by quantitative ultrasound. Applications in cancer diagnostics.

Supervisors, contact, place of research

prof. dr hab. Jerzy Litniewski (jlitn@ippt.pan.pl, tel. 228261281 w. 238), IPPT PAN, Pawińskiego 5b

Project Description

The classic B-mode ultrasound (USG) is one of the basic studies in imaging diagnostics. Quantitative ultrasound[1] uses ultrasound waves scattered in the tissue to determine the tissue parameters useful for its classification. These parameters, often referred to as ultrasound markers, are associated with the tissue structure at the microscopic level. Analyzed signals are collected from patients by means of ultrasonographs equipped with a research module, which in addition to the classic B-mode image registers raw radio-frequency (RF) data.

The aim of the PhD studies will be to support the classification of neoplastic changes. The study will be conducted on ultrasound (RF) data collected from oncological patients. Quantitative parameters and created parametric maps will be determined describing the distribution of physical properties and tissue microstructure. In the next step, the quantitative parameters and parameters determined from the maps will be tested in terms of their suitability in the classification of neoplastic lesions[2,3]. Ultrasound data collected from patients with breast tumors and thyroid tumors will be used. Cooperation with doctors from the Oncology Center is planned. The PhD studies are planned to cover the following research topics:

1. searching for new markers of breast cancer changes (parameters allowing for differentiation of malignancy and types of cancerous tissue)
2. developing a methods for creating parametric images and using them to assess tumor change, map texture characteristics
3. construction of numerical models of tissue structures characteristic of neoplastic changes

Bibliography

1. Quantitative Ultrasound in Soft Tissues, eds. Jonathan Mamou, Michael L. Oelze, Springer, 2013

2. Quantitative ultrasound: Enhancing diagnosis using estimates of acoustic attenuation and backscatter, James A. Zagzebski, et al., AIP Conference Proceedings 1747, 050001 (2016)

3. Breast-lesions characterization using Quantitative Ultrasound features of peritumoral tissue, Z. Klimonda, et al. Scientific Reports, 2019

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