magnetic hyperthermia and ultrasonic hyperthermia may work synergistically, rather than independently, to produce a more efficient treatment.

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Military Airport Noise Modelling

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Accurate modeling of a military aircraft noise is much more complex, than modeling of an civil aircraft noise. Three main reasons of this situation can be identified. Polish legal regulations recommends aircraft noise prediction methodology based on ICAO Circular 205 – AN/1/25/1988 document and implemented in INM software. Since this method and software was originally developed in the USA there is lack of non-NATO aircraft data in this software, and several of these aircrafts are still in use in Poland. Second reason is more complex traffic structure at the military airports compared to the civil airports. Except standard approach and departure operations there are several specific types of other training operations at the military airports. Third reason of the complexity in military airport noise modelling is that profiles of military aircrafts – specially high performance aircrafts (opposite to the civil airplanes) can significantly differ from those standard profiles implemented in INM software. Moreover this profiles can be specific to the airport regarding its location in regard to the cities, other airports etc. Present paper shows – regarding the above issues – how important is accurate calibration and validation of an military aircraft noise prediction model. Two step approach to model verification was shown. The first step is calibration by adjustment flight profile parameters and comparing prediction result with measurement for sound exposure levels of a single flight operations. The second step is validation of a model in terms of a long term noise metrics calculated and measured for complex airport traffic. Present study shows errors in noise ranges originating from using standard – instead of real departure/approach profiles. We also shoved influence of calibration measurement points locations on modelling accuracy.

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Computationally Efficient Method for Reconstruction of Sound Speed in Soft Tissues

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Information on the sound speed in the imaged region is needed for correct image reconstruction in ultrasound pulse-echo imaging systems. Such devices are widely used in medical diagnostics due to their non-invasiveness, harmlessness, versatility, time resolution and relatively low cost. However, for the purpose of image reconstruction, these devices use a sound speed value that is an average for soft tissue, which locally can be far from reality and can lead to aberrations. Development of a method for real-time reconstruction of sound speed in tissue will make possible to efficiently correct aberrations in pulse-echo ultrasound imaging. Considering the fact that it is a well established imaging technique, the efficient aberration correction method will definitely contribute to the increase in quality of the diagnostic process. Another motivation for development of sound speed imaging technique is the fact that the sound speed reflects mechanical properties of tissues. Therefore, the calculated sound speed maps may provide additional diagnostic information qualitatively similar to those obtained from elastography. Furthermore, the sound speed data can be used in a more cognitive context in research projects that require non-invasive measurements and where it is not possible to use ultrasound tomography, e.g. study of sound speed in tissues during high intensity focused ultrasound treatment. The most recent scientific reports show that it is possible to qualitatively image the sound speed distribution at low computational costs. However, attempts to transit to a quantitative sound speed imaging required a substantial increase in the computational complexity. This raises doubts concerning the application of the quantitative method in real-time imaging systems.

The method presented in this paper is based on a new mathematical model which allows for computationally more efficient solution while preserving the quantitative character of sound speed imaging. Similarly as in the case of the approaches mentioned above, the input data are low resolution images (LRI) reconstructed for a compounded plane wave imaging (CPWI) sequence. Then, based on phase relations between LRIs, one can calculate the time shifts that are a direct result of the errors in the sound speed value assumed in the image reconstruction process. Next, using the new mathematical model the time shifts are converted to sound speed corrections which finally can be applied to the initial sound speed distribution used in the LRIs reconstruction.

The proposed method was implemented and verified through a number of simulations. The obtained results are comparable to those generated by the reference algorithm – the one described in the mentioned scientific reports. The computational complexity of this new approach is proportional to N while in case of the reference algorithm it is proportional to N^2 (where N is a number of pixels in the calculated sound speed image).

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Ultrasound Attenuation Imaging of Tumor Tissue

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The ultrasound imaging (USG) is one of the most common medical imaging modality. The technique allows for non-invasive and inexpensive visualization of the internal tissue structures. Standard images show the spatial distribution of echogenicity which is related to distribution of the acoustic impedance. Additional processing of acquired signals can provide more signal parameters which are related to physical properties of a tissue and its state. Ultrasound attenuation is related to tissue microstructure and can be used for soft tissue characterization in non-invasive manner. Such characterization is especially important for diagnostics and visualization of tumors. In our research we have applied quantitative ultrasound techniques that are based on raw RF signals processing and physical properties of tissue independent of the scanner properties and settings. Estimation of local attenuation coefficient allows for synthesis of parametric images. These images show the spatial distribution of attenuation coefficient and provide information about physical parameters of a tissue in convenient form. This additional information can be useful for medical diagnosis. The attenuation coefficient can be estimated utilizing the downshift of the central frequency of the propagating pulse. The value of the downshift is related with spectral parameters of the pulse and distribution of attenuation coefficient as well as the diffraction effects and impact of the receiving system. We have developed a modification of this approach and this modified spectral shift method was used. Our technique determines frequency shift using limited range of spectral frequencies. This approach reduces the influence of diffraction effects and noise. The results of tumors characterization using the attenuation estimate will be shown. The parametric images of the attenuation coefficient distribution in human tumor tissue will be presented and restrictions of the method will be discussed.

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Air Traffic Noise Indicators

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The growth of air traffic in recent years has led to a substantial increase of noise pollution in many Polish agglomerations. It also turned out, that applicable legislation is too imprecise in this matter. It leads to frustration of residents exposed to this noise impact on one side and blocks the development of airports on the other.

Air traffic noise is assessed in terms of A-weighted equivalent sound pressure level, L_{Aeq}, averaged over short (one day/one night, $L_{AeqD/N}$) or long (ex. one year, L_{DWN}/L_N) period. This level is determined based on traffic flow and a measure of single noise event, expressed by the sound exposure level, L_{AE}.

The L_{AE} of single air operation is simple to measure, but very difficult to calculate, due to its dependency on at least several factors. One of the main sources of uncertainty is the lack of definition or algorithm fixing so called representative air operation. What is important, the range of noise impact obtained by calculation method establishes the so called "limited use areas" around airports, which in turn give rise to compensation payment. According to the legal regulations, noise zones are expressed by daily equivalent sound pressure levels which are calculated with nearly the same uncertainty as L_{AE}, especially for night time when statistical dependencies do not work properly because of low number of aircraft operations. In case of restrictive requirements (examination of daily worst case) it is almost impossible to set representative noise scenario reliably, including noise prediction for many years ahead. That is way it is proposed to lay down daily noise assessment on the basis of long-term averaged noise levels, the same as used for strategic assessment, since it is the most probable scenario and then easiest to calculate. Such approach do not reduce or limit the intermittent controlling procedures. It still may be carried out by simple daily measurements, however the result must not exceed permissible long-term noise level by more than permissible daily deviation. This deviation is estimated in the paper, making use of long-standing continuous noise monitoring around airports.

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Measurement of Sound Absorption Coefficient of Microperforated Panel Absorbers

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Characteristic of microperforated panels (MPP) is the perforations size less than 1 mm and porosity around 1%. Microperforated panel should be fixed at some distance before a rigid surface to create air cavity. Geometric properties are chosen to create surface with a normal impedance close to the characteristic impedance in air. Using MPP absorber eliminates disadvantages of commonly used absorbers with porous materials eg. no resistance to environmental factors, dirt or fungus while ensuring broadband sound absorption. In the paper sound absorption measurement results made in the impedance tube of tens MPP samples with different parameters (orifice diameter, panel thickness, perforation ratio, cavity thickness, used material) are presented and compared with theoretical prediction based on mathematical model created by Maa (1998).

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Aeroacoustical Studies of Airfoil with the Trailing Edge Modifications

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To minimize the noise emission of the airfoil is an important issue to be considered in the design its. Solutions of the noise problems are also looking for in nature, especially in owl's. Their silent flight is possible thanks to the special structure of their feathers. Their secondary flight feathers are cut in the shape of the teeth at the leading edges and the combs of the trailing edges.

The effects of noise reducing by cutting the profile as a regular teeth of the trailing edge were been studied. The results depend on the size of the teeth, the width between the top of the teeth, angle of attack blade, Reynolds number, etc. These works concern only on the serrated trailing edge of the airfoil. In this work the noise of the flat