Karlsruhe Institute of Technology

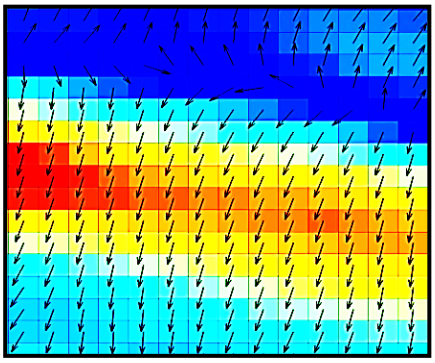
Institute for Data Processing and Electronics

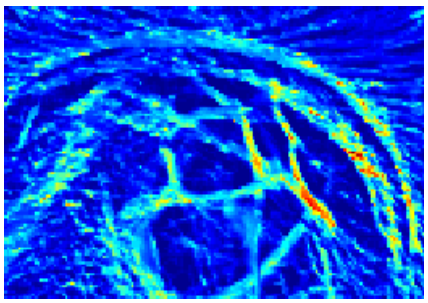
Thesis or Internship

Extension and evaluation of tissue classification based on a back scattering model for 3D Ultrasound Computer Tomography

Background

At Karlsruhe Institute of Technology a new medical imaging method for breast cancer diagnosis is developed. The 3D Ultrasound Computer Tomography system allows reconstructing 3D reflectivity images using synthetic aperture focusing technique (SAFT). SAFT calculates one reflectivity value for each reconstructed voxel. The complete SAFT image represents the echotexture of human tissue which is expected to be related to different types of tissue.





The direction information (i.e. under which angle a reflection can be seen most prominently), which is also contained in the raw data, is currently not used in the standard reconstruction method. First investigations of this topic showed that there are many promising possibilities to interpret this data: It could be used to improve the image quality as well to classify different tissue types (see reconstructed predominant reflection direction color-coded in the image on the right). As the amount of data increases by taking in account also the direction of reflectivity there is the necessity to accelerate the calculation with GPUs.

Aim

The aim of the work is to analyze the current status of the prototype implementation and extend and evaluate the method with simulated and experimental data. The project should lead to a better understanding of reflectivity characteristics of materials and the extent of reconstructing them with the proposed method in order to estimate the potential of the reconstruction method.

Task description *(topics will be adapted to available time frame)*

- Analyze the current prototype implementation and integrate the implementation in our image reconstruction workflow.
- Evaluate the methodology using simulated as well as experimental data: therefore suitable use cases, experiments and image acquisition procedures need to be defined.
- Analysis of resulting images, e.g. finding suitable classification methods to distinguish different multidimensional patterns of the reflectivity characteristics of neighboring voxels.
- Accelerate the method with parallel computation with GPUs

Qualifications

- Basic knowledge and interest in medical imaging, image reconstruction algorithms
- Programming skills in MATLAB and preferably CUDA / C.

Contact

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