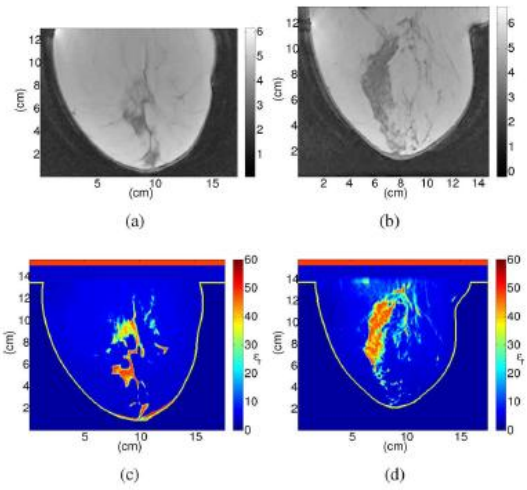
Development of electromagnetics breast model based on MR images

Worldwide, breast cancer is the second most common type of cancer after lung cancer (10.4% of all cancer incidence, both sexes counted) and the fifth most common cause of cancer death. In 2004, breast cancer caused 519,000 deaths worldwide (7% of cancer deaths; almost 1% of all deaths). Early detection of breast cancer is crucial to improve the survival rate of patents.

Currently, X-ray mammography and breast MR are the most common methods for breast cancer diagnostics. It is well known that X-ray is an ionization radiating which is harmful to human and MR scans is economically expensive. In view of this, researchers have been looking into non-ionizing microwave-based technologies as an alternative means for breast cancer detection.




Original Breast MR images (a), (b) and developed breast model (c) (d) [1]

In this project, you will be working on a method to develop realistic electromagnetic breast model based on breast MR images. Such model will then be used for investigation of the various techniques for breast cancer detection such as microwave tomography as well as enhancing algorithms for hyperthermia (cancer treatment by heating the tumour via microwave frequencies).

The project involves image processing techniques of breast MR images such as homomorphic filtering, interpolation and segmentation. A priori knowledge of dielectric properties of material under electromagnetic wave excitation is preferred but not essential.

[1] E. Zastrow, S. K. Davis, M. Lazebnik, F. Kelcz, B. D. Van Veen, S. C. Hagness, “Development of Anatomically Realistic Numerical Breast Phantoms with Accurate Dielectric Properties for Modeling Microwave Interactions with the Human Breast,” *IEEE Transactions on Biomedical Engineering*, Vol. 55, No. 12, pp. 2792-2800, December 2008.

[2]Rafael C. Gonzalez, Richard E. Woods, *Digital Image Processing*, 3rd Edition, Pearson, 2008

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