

Imaging with arrays of ultra-wideband radio frequency microwave sensors: breast cancer detection

Ahmed F. Mirza, Isah M. Danjuma, M Buhari, N Eya and R.A. Abd-Alhameed
Faculty of Engineering and Informatics, University of Bradford, United Kingdom
a.f.mirza@bradford.ac.uk, r.a.a.abd@bradford.ac.uk

UWB imaging for breast cancer detection is particularly promising due to its capabilities and advantages over existing techniques. It utilises advanced digital signal processing, and it does not need the infrastructure of MRI systems, and avoids the hazards of X-rays. Thus it could serve as an early-stage screening tool, thereby saving millions of lives.

Simulated tumours in both homogeneous and heterogeneous breast phantoms with mild to moderate densities, combined with an entropy-based artefact removal algorithm, are successfully identified and localised.

The results of using six algorithms are simulated with and without tumours within the breast tissue. Various MRI breast tissues (one sample is shown in Figure 1) were modelled and investigated. 12th types of tissues have been modelled. The antenna arrays were surrounded the tissues with known position from the breast tissues. A number of antenna arrays were applied to test the accuracy of reconstructing the breast 3D images concept in terms of mono-static and bi-static radar principles. Samples of two methods with and without cancer tumours are shown in Figure 2. In these images around 24 antenna array elements were used. It is very clear the cancer cells can be identified clearly from the constructed images. Work in progress and the results are new contribution to the RF field.

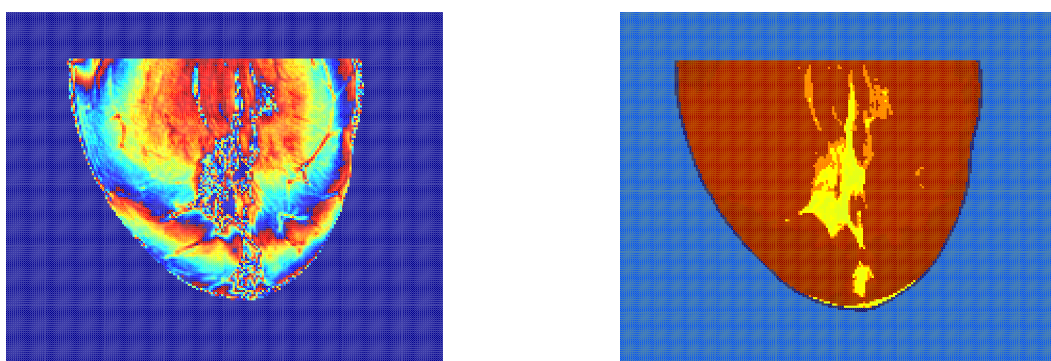


Fig. 1: MRI slice at the centre of the breast; (left) the relative permittivity, (b) Conductivity.

