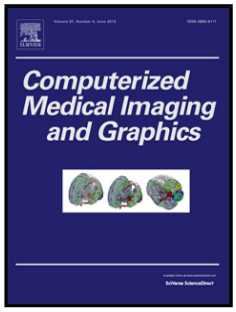

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Performance of Leading Artifact Removal Algorithms Assessed Across Microwave Breast Imaging Prototype Scan Configurations

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Abstract

Microwave imaging is a promising imaging modality for the detection of early-stage breast cancer. One of the most important signal processing components of microwave radar-based breast imaging is early-stage artifact removal. Several artifact removal algorithms have been reported in the literature. However, the neighbourhood-based skin subtraction and hybrid artifact removal algorithms have shown particularly promising results in different realistic 3D breast phantoms. For the first time in this paper, both algorithms have been evaluated and compared using the scan approaches of the most common microwave breast imaging prototype systems. The tests include 3D numerical as well as experimental breast phantoms scanned with hemispherical, cylindrical and adaptive scanning patterns. The efficacy of both algorithms has been evaluated across a range of appropriate performance metrics.

Keywords: Microwave Imaging, Ultra Wideband Radar, Breast Cancer, Artifact Removal, Skin Subtraction, Skin-Artifact Removal

1. Introduction

Most UWB radar-based systems for breast cancer detection include early-stage artifact removal and image reconstruction algorithms [1]. The early-stage artifact typically consists of the input signal, the reflection from the skin surface, skin-fat interface and any antenna reverberation present. This artifact is typically several orders of magnitude greater than the reflections from any tumours present within the breast. If the artifact is not removed effectively it could easily mask tumours at the image reconstruction stage.

A large number of early-stage artifact removal algorithms for microwave imaging of the breast have been reported in the literature [2, 3, 4, 5, 6, 7, 8].

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