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the inverse scattering problem from microwave imaging and the structure of the block ma-trix arising in our linearization approach. The three-level iterative algorithm and appropriate numerical linear algebra tools to solve the resulting nonlinear optimization problem, and to do the super-resolution post-processing, are developed inSection 3.

(PDF) Fast Microwave Medical Imaging Based on Iterative ...

MICROWAVE INVERSE SCATTERING AND IMAGING William H. Weedon t, Weng Cho Chew and Chad A. Ruwet Department of Electrical and Computer Engineering University of Illinois, Urbana, IL 61801 INTRODUCTION Step-frequency radar (SFR) is an attractive alternative to impulse radar for obtaining broadband time-domain scattering data [1].

Computational Validation of a 3-D Microwave Imaging System ...

936 IEEE TRANSACTIONS ON BIOMEDICAL ENGINEERING, VOL. 59, NO. 4, APRIL 2012 A TSVD Analysis of Microwave Inverse Scattering for Breast Imaging Jacob D. Shea\*, Member, IEEE, Barry D. Van Veen, Fellow, IEEE, and Susan C. Hagness, Fellow, IEEE Abstract—A variety of methods have been applied to the inverse scattering problem for breast imaging at microwave frequencies.

(PDF) An Inverse Scattering Approach Based on the ...

imaging is accomplished with a precomputed linear inverse scat-tering solution combined with continuous vector network analyzer (VNA) measurements of a 36-antenna, HFSS-modeled, cylindrical cavity. Volumetric images of differential change of dielectric con-stant due to temperature are formed with a refresh rate as fast

(PDF) Inverse scattering for a three-dimensional object in ...

(1) In this paper, a microwave imaging technique is implemented for the simultaneous reconstruction of the permittivity and con- If the scatterer is illuminated by an incident wave, with elec- ductivity of lossy scatterers by means of scattered-field mea- tric field , then the scattered field satisfies the Helmholtz surements inversion.

Microwave imaging techniques for nondestructive evaluation

inverse scattering, microwave imaging, nonlinear inverse scat-tering algorithm, stabilized biconjugate-gradient fast Fourier transform (FFT) algorithm. I. INTRODUCTION I T IS of practical signi fi cance to detect, locate, characterize, and image tumors in healthy tissue of the breast. Over the last two decades, intensive investigations have been ...

Time Domain Inverse Scattering of Buried Inhomogeneous ...

tering inverse problems, microwave imaging, nonlinear equations. I. INTRODUCTION B REAST cancer is the most common type of cancer among women [1] – [4], and early detection is one of the most im-portant prerequisites for successful treatment of the cancer [5]. To this end, screening programmes using X-ray mammography is the most widespread ...

Inverse Tering In Microwave Imaging

in developing and applying microwave imaging techniques for the purpose of detecting and diagnosing breast cancer (see, for example, [7] and the references therein) or monitoring treat- ... breast. For example, in microwave tomography, inverse scat-tering algorithms are applied to the scattered microwave signals ...

IEEE TRANSACTIONS ON BIOMEDICAL ENGINEERING, VOL. 61, NO ...

solved by the moment methods, but this type of inverse scat- tering problem is, in general, ill-conditioned. The associated matrix equation (3) is treated by applying the Tikhonov regulansation of various ... microwave imaging using a multiview moment method solution for a two-dimensional infinite cylinder', IEEE Trans., 1991, MTr-39, pp. 1062 ...

Nonlinear Microwave Imaging for Breast-Cancer Screening ...

ICROWAVE imaging has recently emerged as a high-performance and cost-effective alternative to established techniques of non-destructive evaluation (NDE) and testing (NDT) [1]. The modern advances in the theory of and solution techniques for inverse problems in free space [2] has inspired substantial progress of microwave imaging in

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MicroWave Imaging (MWI). In [10], for example, an regularizer is exploited to enforce sparsity in contrast-enhanced ... The nonlinearity and ill-posedness of the EM inverse scattering problem can lead to unstable reconstructions in MWI medical applications, which involve the presence of dense or ...

1790 IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES ...

Microwave imaging techniques for nondestructive evaluation simulation and experimental studies ... Electromagnetic field scattering, propagation, radiation, reception and generation are characterized with the ... Inverse scattering problems aim to reconstruct or estimate the spatial distribution of a materials electrical properties or the ...

IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION, VOL. 55, NO ...

evaluate microwave imaging systems. A set of standard ... difficulties of inverse problems in high-frequency electromagnetics were introduced. The following were ... Introduction to inverse scattering and basic theory Day 2: Qualitative imaging methods Day 3:

IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES, VOL ...

406 IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES, VOL. 57, NO. 2, FEBRUARY 2009 Waveguide Microwave Imaging: Neural Network Reconstruction of Functional 2-D Permittivity Profiles Alexander V. Brovko, Member, IEEE, Ethan K. Murphy, and Vadim V. Yakovlev, Senior Member, IEEE Abstract—A new microwave imaging technique is proposed for samples in the course of their sintering [7], [8].

NUMERICAL LINEAR ALGEBRA FOR NONLINEAR MICROWAVE IMAGING

microwave imaging by time-harmonic electromagnetic (EM) wave illumination [3 – 13]. However, the application of wide-band incidents is important for microwave imaging because the available information content about unknown objects is more than single frequency scattering data alone. The main method to solve the inverse scattering problems in the time

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scattering problem. We propose to solve the set of under-determined equations at each iteration of the DBIM algorithm using an L2 ... The inverse problem in MicroWave Imaging (MWI) is an ill-posed ...

91 6770/1 SOIN0810373

Index Terms—Contrast source inversion (CSI) inverse scattering problems, finite-element method (FEM), microwave imaging (MWI), modulated scattering technique (MST), 3-D imaging. I. INTRODUCTION THE USE of microwave imaging (MWI) to noninvasively estimate the dielectric properties within an object-of-in-

A StepFrequency Radar System for Broadband Microwave ...

A compact, enclosed, ultrawide-band (UWB) antenna array is presented to acquire data for a quantitative microwave imaging method. Compared to existing systems, the proposed array allows a UWB ...

IEEE MICROWAVE AND WIRELESS COMPONENTS LETTERS, VOL. 18 ...

DE ZAEYTIJD et al.: FULL-WAVE 3-D MICROWAVE IMAGING WITH A REGULARIZED GAUSS – NEWTON METHOD 3281 Fig. 2. Definitions for the grids of the inverse and the direct problem. For the numerical reconstruction, it is necessary to parameterize the unknown permittivity in . Therefore the domain is contained in a uniform grid with cubic cells with side .

(PDF) Waveguide Microwave Imaging: Neural Network ...

electromagnetic scattering inverse problems, image reconstruction, imaging, inverse problems, microwave imaging, nonlinear equations. I. INTRODUCTION MICROWAVE imaging is emerging as a promising new technique for use in breast-cancer screening [1] – [5]. The use of microwave imaging as a supplement or alternative to

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