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In this paper, we present a non-iterative Simultaneous Phase Unwrapping and Denoising algorithm for phase imaging, referred to as SPUD. The proposed method relies on the least-squares Discrete...

(PDF) SPUD: Simultaneous Phase Unwrapping and Denoising ...

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Denoising phase unwrapping algorithm for precise phase ...

Phase unwrapping refers to the process of recovering the absolute phase ? from a wrapped phase ?. Phase unwrapping arise in many applications, such as wavefront measurements in interferometry, field mapping in magnetic resonance imaging, the interferometry SAR process, measurements in adaptive optics and even a deflectometry. Gaining attention for a long time, many algorithms have been developed in relation to phase unwrapping problem.

Denoising phase unwrapping algorithm for precise phase ...

phase unwrapping and denoising algorithm We are interested in ?nding the phase candidate that minimizes (6), a problem that contains the sum of four lower semicontin-uous convex functions from R D to R [f+1g, ie, they belong to the space 0 (R D) for some dimension D2fN;2Ng[14]

[Books] Denoising Phase Unwrapping Algorithm For Precise Phase

overcoming the state-of-the-art algorithms de-veloped for noisy phase unwrap The polynomial modeling is apopular ideafor both wrapped phase denoising and noisy phase unwrap ABSTRACT arXiv:1407.8040v1 [math.OC] 30 Jul 2014 phase unwrapping and denoising algorithm We are interested in ?nding the phase

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phase unwrapping and denoising algorithm We are interested in ?nding the phase candidate that minimizes (6), a problem that contains the sum of four lower semicontin- uous convex functions from R D to R [f+1g, ie, they belong to the space 0 (R D) for

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The phase unwrapping is performed using segment-wise, block-wise and pixel-wise phase unwrapping algorithms. The errors in phase unwrapping are shown in figures 3.17 (b)–(d), respectively. The effects of segment-wise, block-wise and pixel-wise methods of phase unwrapping are clearly visible in the error maps.

Fringe denoising and phase unwrapping - Book chapter ...

The algorithm has two main steps: 1. Phase unwrapping: we input two (or more) differ- ent frequency interferograms (of the same scene), which provides an extension of the [???[ambigu- ity interval and, consequently, an increasing of the phase rates that still allow unwrapping to be a well- posed problem.

PHASE IMAGING: UNWRAPPING AND DENOISING WITH DIVERSITY AND ...

In this paper, we present a noniterative simultaneous phase unwrapping and denoising algorithm for phase imaging, referred to as SPUD. The proposed method relies on the least squares discrete cosine transform (DCT) solution for phase unwrapping with an additional sparsity constraint on the DCT coefficients of the unwrapped solution.

OSA | SPUD: simultaneous phase unwrapping and denoising ...

However, the phase distribution is computed as modulo 2? of the absolute phase due to inverse tangent operation, which makes the phase unwrapping indispensable. the reliability of phase unwrapping depends heavily on the quality of the phase pattern. If the fringe patterns recorded in phase shifting or Fourier transform interferometry setups are not filtered before phase demodulation, the corresponding phase pattern carry the speckle noise that adversely affect the subsequent phase ...

Fringe denoising algorithms: A review - ScienceDirect

sence of discontinuities. The phase unwrapping equipped with this adaptive LPA prefiltering yields very good accuracy of the phase reconstruction, quite often overcoming the state-of-the-art algorithms de-veloped for noisy phase unwrap. The polynomial modeling is apopular ideafor both wrapped phase denoising and noisy phase unwrap.

Absolute phase estimation: adaptive local denoising and ...

Most of existing unwrapping algorithms implement denoising operations first to obtain noise-free phases and then conduct phase unwrapping pixel by pixel. This approach is sensitive to spikes and prone to unreliable results in practice. In this paper, a robust unwrapping algorithm based on the non-subsampled contourlet transform (NSCT) is developed.

Phase unwrapping in digital holography based on non ...

Abstract: In the traditional processing flow of interferometric synthetic aperture radar (SAR) technique, the processing of phase is conducted via two separated and successive steps, i.e., phase denoising and phase unwrapping. That is to say, first, wrapped phases without noise are generated, and then, the true phases without 2?-ambiguities are reconstructed (here and in the rest of this paper, true phase refers to the information-induced unwrapped phase without noise).

Integrated Denoising and Unwrapping of InSAR Phase Based ...

* A discussion of future trends in phase unwrapping research * Foreword by former NASA scientist Dr. John C. Curlander Two-Dimensional Phase Unwrapping skillfully integrates concepts, algorithms, software, and examples into a powerful benchmark against which new ideas and algorithms for phase unwrapping can be tested.

Two-Dimensional Phase Unwrapping: Theory, Algorithms, and ...

The paper attacks absolute phase estimation with a two-step approach: the first step applies an adaptive local denoising scheme to the modulo-2 pi noisy phase; the second step applies a robust phase unwrapping algorithm to the denoised modulo-2 pi phase obtained in the first step. The adaptive local modulo-2 pi phase denoising is a new algorithm based on local polynomial approximations.

[PDF] Absolute phase estimation: adaptive local denoising ...

Phase unwrapping is thus needed to reconstruct the true phase from the wrapped phase. However, noise in a wrapped phase is an obstacle for successful phase unwrapping, especially when a simple phase unwrapping method is used [2,3], and thus denoising is necessary.

Wrapped phase denoising using convolutional neural ...

>>> c0, c1 = np. ogrid [-1: 1: 128 j,-1: 1: 128 j] >>> image = 12 * np. pi * np. exp (-(c0 ** 2 + c1 ** 2)) >>> image_wrapped = np. angle (np. exp (1 j * image)) >>> image_unwrapped = unwrap_phase (image_wrapped) >>> np. std (image_unwrapped-image) < 1e-6 # A constant offset is normal True

Module: restoration — skimage v0.18.0.dev0 docs

Abstract. The phase of an image obtained with many magnetic resonance imaging techniques is related to some physical variable of interest. This phase needs to be unwrapped, which is complicated by the presence of noise and multiple objects of irregular shape. A new two?dimensional phase unwrapping algorithm is presented, along with simulation results. © 1992 Academic Press, Inc.

A new two?dimensional phase unwrapping algorithm for MRI ...

The adaptive local modulo-2? phase denoising is a new algorithm based on local polynomial approximations. The zero-order and the firstorder approximations of the phase are calculated in sliding windows of varying size.

In recent decades, optical techniques such as electronic speckle pattern interferometry, holographic interferometry, and fringe projection have emerged as the prominent tools for non-contact measurements. These methods have found applications in diverse areas ranging from biology to materials science, with examples including materials inspection and characterization; non-destructive testing and evaluation; flow visualization; surface profilometry; and biomechanics. In all of these processes, information about the measured physical quantity such as deformation, strain, profile, and refractive index is stored in the phase or associated derivatives of an interference fringe pattern. Consequently, a reliable estimation of phase and its derivatives, commonly referred to as fringe analysis becomes a primary requirement for the application and interpretation of these optical techniques. This book presents a review of the tools and methods of multicomponent fringe analysis and interferometric data. In addition, the authors also outline a wide range of digital signal-processing-based interferometric data-processing techniques to address the problem of accurate estimation of phase and phase derivatives with a particular focus on the simultaneous estimation of multiple phase and phase derivatives from a single frame of the interference field. The authors provide numerical simulations and practical examples to confirm the feasibility, effectiveness and accuracy of the methods described.. The book focuses on overview of concepts, attracting current research attention, by: Adopting a digital signal processing approach to spatial and temporal fringe demodulation. Offering innovative solutions for the demodulation of multicomponent signals. Proposing a range of ground breaking avenues for estimating simultaneously multiple phase components. Providing a range of methods for the simultaneous estimation of multiple phase derivatives of first order; and as well the single-phase derivatives of arbitrary order p. A strong focus on key topics of interest such as closed fringe demodulation; and fringe denoising and phase unwrapping operations.

This Open Access book discusses an extension to low-coherence interferometry by dispersion-encoding. The approach is theoretically designed and implemented for applications such as surface profilometry, polymeric cross-linking estimation and the determination of thin-film layer thicknesses. During a characterization, it was shown that an axial measurement range of 79.91 ?m with an axial resolution of 0.1 nm is achievable. Simultaneously, profiles of up to 1.5 mm in length were obtained in a scan-free manner. This marked a significant improvement in relation to the state-of-the-art in terms of dynamic range. Also, the axial and lateral measurement range were decoupled partially while functional parameters such as surface roughness were estimated. The characterization of the degree of polymeric cross-linking was performed as a function of the refractive index. It was acquired in a spatially-resolved manner with a resolution of 3.36 x 10-5. This was achieved by the development of a novel mathematical analysis approach.

This book features original research and recent advances in ICT fields related to sustainable development. Based the International Conference on Networks, Intelligent systems, Computing & Environmental Informatics for Sustainable Development, held in Marrakech in April 2020, it features peer-reviewed chapters authored by prominent researchers from around the globe. As such it is an invaluable resource for courses in computer science, electrical engineering and urban sciences for sustainable development. This book covered topics including • Green Networks • Artificial Intelligence for Sustainability• Environment Informatics• Computing Technologies

A resource like no other-the first comprehensive guide to phase unwrapping Phase unwrapping is a mathematical problem-solving technique increasingly used in synthetic aperture radar (SAR) interferometry, optical interferometry, adaptive optics, and medical imaging. In Two-Dimensional Phase Unwrapping, two internationally recognized experts sort through the multitude of ideas and algorithms cluttering current research, explain clearly how to solve phase unwrapping problems, and provide practicable algorithms that can be applied to problems encountered in diverse disciplines. Complete with case studies and examples as well as hundreds of images and figures illustrating the concepts, this book features: * A thorough introduction to the theory of phase unwrapping * Eight algorithms that constitute the state of the art in phase unwrapping * Detailed description and analysis of each algorithm and its performance in a number of phase unwrapping problems * C language software that provides a complete implementation of each algorithm * Comparative analysis of the algorithms and techniques for evaluating results * A discussion of future trends in phase unwrapping research * Foreword by former NASA scientist Dr. John C. Curlander Two-Dimensional Phase Unwrapping skillfully integrates concepts, algorithms, software, and examples into a powerful benchmark against which new ideas and algorithms for phase unwrapping can be tested. This unique introduction to a dynamic, rapidly evolving field is essential for professionals and graduate students in SAR interferometry, optical interferometry, adaptive optics, and magnetic resonance imaging (MRI).

The book provides insights into the Second International Conference on Computer Vision & Image Processing (CVIP-2017) organized by Department of Computer Science and Engineering of Indian Institute of Technology Roorkee. The book presents technological progress and research outcomes in the area of image processing and computer vision. The topics covered in this book are image/video processing and analysis; image/video formation and display; image/video filtering, restoration, enhancement and super-resolution; image/video coding and transmission; image/video storage, retrieval and authentication; image/video quality; transform-based and multi-resolution image/video analysis; biological and perceptual models for image/video processing; machine learning in image/video analysis; probability and uncertainty handling for image/video processing; motion and tracking; segmentation and recognition; shape, structure and stereo.

This book contains review papers presented at the International Workshop on Wave Propagation, Scattering and Emission on Theory, Experiment, Simulation and Inversion (WPSE). The papers are of high quality, covering broad areas: a new mechanism of interaction of electromagnetic waves with complex media, remote sensing information, computational electromagnetics, etc. This book summarizes the most significant progress in wave propagation, encompassing theory, experiment, simulation, and inversion. It will also serve as a good reference for scientists in future research.List of Foreign Invited Speakers: Henry Bertoni (Brooklyn Polytechnic University), Lawrence Carin (Duke U), Al Chang (NASA, Goddard), Margaret Cheney (Rensselaer Polytech Institute), Weng Chew (U of Illinois at Urbana Champaign), Shane Cloude (AEL Consultants, UK), Adrian Fung (U of Texas at Arlington), Al Gasiewski (Environmental Tech Lab, NOAA), Martti Hallikainen (Helsinki U of Technology), Akira Ishimaru (U of Washington), Magdy Iskander (U of Hawaii), J A Kong (MIT), Roger Lang (George Washington U), Alex Maradudin (U of California at Irvine), Eric Michielssen (U of Illinois at Urbana Champaign), Eni Njoku (Caltech, Jet Propulsion Lab), Carey Rappaport (Northeastern U), Marc Saillard (Institut Fresnel), Kamal Sarabandi (U of Michigan), David R Smith (U of California at San Diego), Mitsuo Tateiba (Kyushu University), George Uslenghi (U of Illinois at Chicago), and Werner Wiesbeck (Karlsruhe U).

Magnetic resonance elastography (MRE) is a medical imaging technique that combines magnetic resonance imaging (MRI) with mechanical vibrations to generate maps of viscoelastic properties of biological tissue. It serves as a non-invasive tool to detect and quantify mechanical changes in tissue structure, which can be symptoms or causes of various diseases. Clinical and research applications of MRE include staging of liver fibrosis, assessment of tumor stiffness and investigation of neurodegenerative diseases. The first part of this book is dedicated to the physical and technological principles underlying MRE, with an introduction to MRI physics, viscoelasticity theory and classical waves, as well as vibration generation, image acquisition and viscoelastic parameter reconstruction. The second part of the book focuses on clinical applications of MRE to various organs. Each section starts with a discussion of the specific properties of the organ, followed by an extensive overview of clinical and preclinical studies that have been performed, tabulating reference values from published literature. The book is completed by a chapter discussing technical aspects of elastography methods based on ultrasound.

Remote sensing is the acquisition of information of an object or phenomenon, by the use of either recording or real-time sensing device(s), that is not in physical or intimate contact with the object (such as by way of aircraft, spacecraft, satellite, buoy, or ship). In practice, remote sensing is the stand-off collection through the use of a variety of devices for gathering information on a given object or area. Human existence is dependent on our ability to understand, utilize, manage and maintain the environment we live in - Geoscience is the science that seeks to achieve these goals. This book is a collection of contributions from world-class scientists, engineers and educators engaged in the fields of geoscience and remote sensing.

The two-volume set CCIS 1332 and 1333 constitutes thoroughly refereed contributions presented at the 27th International Conference on Neural Information Processing, ICONIP 2020, held in Bangkok, Thailand, in November 2020.* For ICONIP 2020 a total of 378 papers was carefully reviewed and selected for publication out of 618 submissions. The 191 papers included in this volume set were organized in topical sections as follows: data mining; healthcare analytics-improving healthcare outcomes using big data analytics; human activity recognition; image processing and computer vision; natural language processing; recommender systems; the 13th international workshop on artificial intelligence and cybersecurity; computational intelligence; machine learning; neural network models; robotics and control; and time series analysis. * The conference was held virtually due to the COVID-19 pandemic.