Image Reconstruction From Projections

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this revised and updated second edition now with two new chapters is the only book to give a comprehensive overview of computer algorithms for image reconstruction it covers the fundamentals of computerized tomography including all the computational and mathematical procedures underlying data collection image reconstruction and image display among the new topics covered are spiral ct fully 3d positron emission tomography the linogram mode of backprojection and state of the art 3d imaging results it also includes two new chapters on comparative statistical evaluation of the 2d reconstruction algorithms and alternative approaches to image reconstruction

image reconstruction from projections probability and random variables an overview of the process of ct physical problems associated with data collection in ct computer simulation of data collection in ct data collection and reconstruction of the head phantom under various assumptions basic concepts of reconstruction algorithms backprojection convolution method for parallel beams other transform methods for parallel beams convolution methods for divergent beams the algebraic reconstruction techniques quadratic optimization methods noniterative series expansion methods truly three dimensional reconstruction three dimensional display of organs mathematical background

methods of the fourier transform are widely used for practical applications of image reconstruction from projections such as the computerized tomography we mention the well known methods of back projection and methods based on the fourier slice theorem which requires a crude interpolation when transforming the fourier projections from the polar grid to the traditional cartesian grid the solution of this complex problem is very important in medical diagnoses where projections data for reconstructing two and three dimensional images are obtained by means of the roentgen radiation with an investigated part of the body in this work we analyze solutions of the problem of reconstruction of the discrete image on the cartesian grid from projections of the image on the spatial domain which are based on the concept of the two dimensional discrete tensor transformation in the framework of the constructed model we show a way of using the line integrals of the image or real projections data for exact reconstructing the discrete image the model of image reconstruction proposed in this research is described for the cases when the size of the cartesian grid are primes and power of two the problem we focus on is formulated as follows for a given image f x y on the bounded region such as the square 0 1 0 1 and the n n cartesian grid placed on the region

reconstruct exactly the discrete image fn m from the line integrals of the image f x y calculated in a finite number of projections the solution of this problem is based on the new approach proposed by grigoryan which allows to transfer uniquely the geometry of the projections from the image plane to the geometry of projections onto the cartesian grid this transformation allows calculating the tensor representation of the discrete image where the image is described by one dimensional splitting signals carrying the spectral information about the image at frequency points of different subsets covering the cartesian lattice when the size of the image is a power of two these subsets are intersected and this property can be used effectively for solution of the well known problem of image reconstruction from limited angle range projections our preliminary results show that the proposed method of reconstruction is more accurate than the known projections onto convex sets algorithm in addition the simulations of our algorithm demonstrate good reconstructions when the projections are within a limited angular range the proposed method of image reconstruction is robust relative to the additive signal independent noise in projection data

the monograph is devoted to a new branch of remote sounding of the iono sphere ionospheric tomography adoption of tomographic methods seems to be an inevitable stage of the evolution of almost all diagnostic systems ad vanced techniques for remote sensing and progressive means for data process ing open the possibility of reconstructing the spatial structure of the medium on the base of tomography in this book mainly the problems of satellite radio tomography of the ionosphere are discussed and only one subsection is alloted to optical ionospheric tomography modern radio sounding techniques make it possible by means of satellite facilities to probe the ionosphere within a wide range of varying positions of transmitting receiving systems and to apply tomographic methods in this connection in recent years active tomo graphic investigations of the ionosphere have been done the purpose of this monograph is to set forth the tomographic methods developed for recovering the 2 d and 3 d structure of the ionosphere and to discuss experimental implementation of these methods the topic of discus sion is reconstruction of electron density distribution and effective collision frequency the structure of the ionosphere is known to be quite complex along with a quasi stratified background with large scale variations in elec tron density there are also local irregularities of various scale sizes including turbulent volumes

concepts in projection reconstruction by ray freeman and Ēriks kupče automated projection spectroscopy and its applications by sebastian hiller and gerhard wider data sampling in multidimensional nmr fundamentals and strategies by mark w maciejewski mehdi mobli adam d schuyler alan s stern and jeffrey c hoch generalized fourier transform for non uniform sampled data by

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this book gathers the proceedings of medicon 2019 the xv mediterranean conference on medical and biological engineering and computing which was held in september 26 28 2019 in coimbra portugal a special emphasis has been given to practical findings techniques and methods aimed at fostering an effective patient empowerment i e to position the patient at the heart of the health system and encourages them to be actively involved in managing their own healthcare needs the book reports on research and development in electrical engineering computing data science and instrumentation and on many topics at the interface between those disciplines it provides academics and professionals with extensive knowledge on cutting edge techniques and tools for detection prevention treatment and management of diseases a special emphasis is given to effective advances as well as new directions and challenges towards improving healthcare through holistic patient empowerment

this book is a collection of accepted papers that were presented at the international conference on communication and computing systems icccs 2016 dronacharya college of engineering gurgaon september 9 11 2016 the purpose of the conference was to provide a platform for interaction between scientists from industry academia and other areas of society to discuss the current advancements in the field of communication and computing systems the papers submitted to the proceedings were peer reviewed by 2 3 expert referees this volume contains 5 main subject areas 1 signal and image processing 2 communication computer networks 3 soft computing intelligent system machine vision and artificial neural network 4 vlsi embedded system 5 software engineering and emerging technologies

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