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<<医学图像重建>>

图书基本信息

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前言

The first time I heard about image reconstruction was twenty years ago Icame to the University of Utah as a post-doctoral fellow in the Departmentof Radiology. Dr. Grant Gullberg and Dr. Rolf Clackdoyle gave many lec-tures on image reconstruction and I took notes. Even today I still go backto those notes from time to time. I benefit from those notes significantly.This book is complied together with parts of those notes and some currentresearch papers with most mathematical proofs removed. I am grateful toDr. Gullberg and Dr. Clackdoyle for introducing me to the wonderful worldof image reconstruction. I appreciate Dr. Michel Defrise, Dr. Ge Wang, andDr. Guang-Hong Chen for their helpful suggestions. I also like to thank mycolleagues in the department and in other institutions. I would especially liketo thank Kathy Gullberg and Jacob Piatt for proof-reading the drafts.This tutorial text introduces the classical and modern image reconstruc-tion technologies to the general audience. It covers the topics in two-dimensional （2D） parallel-beam and fan-beam imaging, three-dimensional（3D） parallel ray, parallel plane, and cone-beam imaging. Both analyticaland iterative methods are presented. The applications in X-ray CT, SPECT（single photon emission computed tomography）, PET （positron emissiontomography）, and MRI （magnetic resonance imaging） are also discussed.Contemporary research results in exact ROI （region-of-interest） reconstruc-tion with truncated projections, Katsevich's cone-beam filtered backprojec-tion algorithm, and reconstruction with highly undersampled data with/0-minimization are also included in this book.This book is written in an easy-to-read style, which lets the diagrams dothe most talking. The readers who intend to get into medical image recon-struction will gain the general knowledge of the field in a painless way. I hopeyou enjoy reading it as much as I enjoy writing （and drawing） it. The firsttime reader can skip the more challenging materials marked by the "*" signwithout interrupting the flow of this book.

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内容概要

Medical Image Reconstruction A Conceptual Tutorial introduces the classical and modern image reconstruction technologies, such as two-dimensional (2D) parallel-beam and fan-beam imaging, three-dimensional (3D) parallel ray, parallel plane, and cone-beam imaging. This book presents both analytical and iterative methods of these technologies and their applications in X-ray CT (computed tomography), SPECT (single photon emission computed tomography), PET (positron emission tomography),and MRI (magnetic resonance imaging). Contemporary research results in exact region-of-interest (ROI) reconstruction with truncated projections,Katsevich's cone-beam filtered backprojection algorithm, and reconstruction with highly undersampled data with/o-minimization are also included. This book is written for engineers and researchers in the field of biomedical engineering specializing in medical imaging and image processing with image reconstruction.

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作者简介

作者：(美国)曾更生Gengsheng Lawrence Zeng is an expert in the development of medicalimage reconstruction algorithms and is a professor at the Department of Radiology, University of Utah, Salt Lake City, Utah, USA.

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章节摘录

插图：What you have just done is a standard mathematical procedure calledbackprojection. If you backproject from all angles from You will produce an image similar to the one shown in Figure 1.9 （d）.After backprojection, the image is still not quite the same as the orig-inal image but rather is a blurred version of it. To eliminate the blurring,we introduce negative "wings" around the spike in the projections beforebackprojection [see Figure 1.9 （e）]. The procedure of adding negative wingsaround the spike is called filtering. The use of the negative wings results in aclear image [see Figure 1.9 （f）]. This image reconstruction algorithm is very common and is referred to as a Filtered Backprojection （FBP） algorithm. In this section, we use a point source to illustrate the usefulness of filtering and backprojection with many views in image reconstruction. We must point out that if the object is a point source, we only need two views to reconstruct the image, just like the map making example in Section 1.1.

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