Development And Magnetic Analysis Of Stirling Convertor

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Magnetic Resonance Imaging in Tissue Engineering Wiley-IEEE Press
Nanoparticles possess unique characteristics that make them well suited for molecular imaging. Particles can be synthesized in a systematic fashion with tight control over diameter and surface chemistry. Contrary to existing gadolinium-based MRI contrast agents, nanoparticle MRI contrast agents circulate in the blood for long periods of time, offer higher sensitivity, and exhibit little known toxicity. The qualities of nanoparticles are also well suited to the design of PET probes. Because of their large surface area nanoparticles can be radiolabeled at high specific activity, increasing the sensitivity of detection as well as the payload of therapeutic isotopes.
Analysis and Development of Strategies for Magnetic Resonance Functional Neuroimaging Academic Press
Diffusion-weighted Magnetic Resonance Imaging (DWI) has become a useful tool in medicine for the purpose of diagnosis, tracking disease progression, and monitoring response to therapy. The current techniques used for DWI suffer from artifacts due to magnetic field inhomogeneities, image distortion, and low spatial resolution. The aim of the presented work is to advance DWI by improving upon and developing novel high-resolution acquisition techniques. The approach taken for this purpose was to utilize radial fast spin-echo data acquisitions, which have been shown to produce high-resolution DWI without artifacts due to magnetic field inhomogeneities. In addition, there is little image distortion in radial fast spin-echo DWI, which allows for direct overlay onto anatomical MRI. However, a draw back is that radial methods require longer scan times. By increasing the imaging speed of existing radial fast spin-echo acquisitions, it may become a more practical clinical tool. In addition, novel acquisition techniques are developed that push high-resolution to all three dimensions. By employing a three-dimensional radial fast spin-echo acquisition, voxels in an image have equal size in each dimension and can be on the order of 1mm3. By decreasing the voxel size, the tissue contained within a voxel is more homogeneous. This is important for DWI applications that aim to measure the microscopic integrity of the tissue. The development and analysis of the novel radial fast spin-echo techniques are presented in this work along with several clinical applications. The remaining issues to be addressed for application to quantitative DWI measures are also presented, along with possible solutions.
The Analysis of Subsidence Associated with Geothermal Development: Handbook John Wiley & Sons
The principle of using magnetics to evaluate stress levels has not been as widely investigated as other techniques until recently; however, it can be a very useful method. The magnetic properties of a magnetic material can be greatly affected by the presence of a stress through the magnetoelastic coupling. Because of this, the stress state of a material can be determined by simply measuring some of the magnetic properties of the material. A few methods for doing this have been previously investigated and partially employed. One of these methods involves utilizing the magnetomechanical effect. That is the change in magnetization with stress. The other method is by analysis of the stress dependence of the magnetic hysteresis loop and Barkhausen emission noise. In this work, a magnetic imaging system has been developed to non-destructively measure variations in material conditions or stress concentrations in magnetic materials. This system is capable of producing an image of the special variation of the magnetic properties in materials by measuring the magnetic hysteresis loop and Barkhausen effect noise. Images produced by this system are compared with FEM images which show the system is able to detect defects and stress gradients. This work also involves progress in the development of a new magnetomechanical stress sensing material based off of a metal bonded cobalt ferrite composite. An improvement upon this cobalt ferrite composite has been made by lowering the Curie temperature by substituting other materials into the cobalt ferrite. This will decrease the magnetomechanical hysteresis present at room temperature. A new manganese doped cobalt ferrite material that was recently developed exhibits a lower Curie temperature then the pure cobalt ferrite. Results on this material along with some other materials developed are discussed.
High-resolution Diffusion-weighted Magnetic Resonance Imaging: Development and Application of Novel Radial Fast Spin-echo Acquisitions Springer Nature
"A comprehensive and self-contained exposition of the theory and methods used in the analysis and design of permanent magnet and eletromechanical devices."--Back cover.
Development of an Analysis and Display System for in Vivo Magnetic Resonance Spectroscopy Electromagnetic Analysis and Design in Magnetic Resonance Imaging
Co-authored by an international research group with a long-standing cooperation, this book focuses on engineering-oriented electromagnetic and thermal field modeling and application. It presents important contributions, including advanced and efficient finite element analysis used in the solution of electromagnetic and thermal field problems for large and multi-scale engineering applications involving application script development; magnetic measurement of both magnetic materials and components under various, even extreme conditions, based on well-established (standard and non-standard) experimental systems; and multi-level validation based on both industrial test systems and extended TEAM P21 benchmarking platform. Although these are challenging topics, they are useful for readers from both academia and industry.
Modeling and Application of Electromagnetic and Thermal Field in Electrical Engineering Springer Science & Business Media
Currently 7-8% of all babies born in the UK are born preterm and the incidence has increased significantly over the past two decades. Improving medical care has led to increased survival in those born prematurely; however, preterm infants carry a profound risk of severe neurological disabilities along with a spectrum of major deficits across several domains including cognition, attention, coordination and behaviour. These wide-ranging and long-term consequences represent a significant burden to health and education services, yet the aetiology of the most prevalent cognitive and behavioural disorders remain unclear. Magnetic resonance imaging provides the means to quantitatively assess cerebral growth and development and is being increasingly employed to study the developing preterm brain. Evidence from neonatal imaging studies has revealed a number of specific cerebral alterations present in the preterm population that appear to predict neurodevelopmental outcome in early childhood and include diffuse microstructural disturbances of the developing white matter and regional volumetric tissue losses. In addition, a number of perinatal risk factors have been identified that are associated with both preterm birth and altered cerebral development. This thesis aims to test the hypothesis that connectivity and growth of developing neural systems are adversely affected by prematurity at birth and additionally influenced by specific perinatal risk factors. This is achieved through the application of multi-subject, multi-modal MRI analysis to quantify tissue microstructure and volume alongside novel methods for defining regional connectivity in the developing preterm brain. Evidence is provided that suggests connected neural structures are disturbed in preterm infants resulting in a complex pattern of regional micro- and macrostructural alteration that is evident at term- equivalent age and potentiated by respiratory morbidity. This is convergent with current theories of the mechanisms underpinning preterm brain injury and provides further insight into the consequences of preterm birth on brain development. 3.
Methodological Development and Advanced Neuroimaging Analysis of Fetal Magnetic Resonance Imaging ASTM International
Compiling the expertise of nine pioneers of the field, Magnetic Bearings - Theory, Design, and Application to Rotating Machinery offers an encyclopedic study of this rapidly emerging field with a balanced blend of commercial and academic perspectives. Every element of the technology is

examined in detail, beginning at the component level and proceeding through a thorough exposition of the design and performance of these systems. The book is organized in a logical fashion, starting with an overview of the technology and a survey of the range of applications. A background chapter then explains the central concepts of active magnetic bearings while avoiding a morass of technical details. From here, the reader continues to a meticulous, state-of-the-art exposition of the component technologies and the manner in which they are assembled to form the AMB/rotor system. These system models and performance objectives are then tied together through extensive discussions of control methods for both rigid and flexible rotors, including consideration of the problem of system dynamics identification. Supporting this, the issues of system reliability and fault management are discussed from several useful and complementary perspectives. At the end of the book, numerous special concepts and systems, including micro-scale bearings, self-bearing motors, and self-sensing bearings, are put forth as promising directions for new research and development. Newcomers to the field will find the material highly accessible while veteran practitioners will be impressed by the level of technical detail that emerges from a combination of sophisticated analysis and insights gleaned from many collective years of practical experience. An exhaustive, self-contained text on active magnetic bearing technology, this book should be a core reference for anyone seeking to understand or develop systems using magnetic bearings.

Computational Magnetic Resonance Image Analysis of Brain Development in the Preterm Infant Routledge

Image registration and segmentation techniques have been widely applied to various MRI-based clinical scenarios as they can: i) serve as the preprocessing for any further computer-aided analysis (diagnosis/detection), ii) present better visualization of various anatomical features to doctors, and iii) provide many quantitative and in-depth analysis that cannot be observed visually. The goal of this dissertation is to develop different types of segmentation and registration methods and apply them to solve several clinical problems including: i) breast density analysis, ii) image-guided prostate interventional procedures, and iii) hippocampus shape analysis. The proposed ideas and methods are not only limited to the above applications but also can be potentially applied to many other image-based clinical studies. The first part of the dissertation provided the fundamental introduction to several commonly used registration methods which were also applied in this dissertation. Rigid/affine registration of which the alignment is global and linear was first introduced. On the other hand, nonrigid registration was categorized into intensity-based methods and structure-based methods. Some introduction regarding to the registration theories and implementations was also provided. The second part of the dissertation provided the complete procedures of breast density analysis in MRI which is the major application of this dissertation. A novel template-based breast segmentation method was proposed and validated. The breast density was then segmented based on a new and robust bias field correction algorithm. Based on the automated segmentation of breast density, nonrigid registration was further used to evaluate the local volumetric changes among the intra-patient MR scans. The proposed local volumetric analysis is a novel application to the field of breast density analysis and may potentially provide a new clinical tool to radiologists for the prediction and management of breast cancer. The third part of the dissertation proposed a novel structure-based registration framework to coregister the preoperative prostate MRI with the intraoperative transrectal ultrasound. This study was dedicated to improve the accuracy of image-guided prostate interventional procedures. The proposed method was validated on a MR dataset because of the lack of the fiducials in transrectal ultrasound. The concept of weighted registration was introduced and an initial experiment of MRI and transrectal ultrasound registration was also provided. The fourth part of the dissertation proposed a study of hippocampus shape analysis in child brain using three different methods. A well-established analysis method, radial distance mapping, was compared with two registration-based methods (robust point matching and demons algorithm). This is the first study of quantitative comparison of the three methods and similar analysis results were obtained, indicating the potential of using robust point matching and demons algorithm as the alternatives for hippocampus shape analysis.

Development of Magnetic Stress Detection Methods Involving a Cobalt Ferrite Composite Stress Sensing Material and a Magnetic Imaging System

Electrical Engineering Magnetic Hysteresis Understanding magnetic hysteresis is vitally important to the development of the science of magnetism as a whole and to the advancement of practical magnetic device applications. Magnetic Hysteresis, by acclaimed expert Edward Della Torre, presents a clear explanation of the connection between physical principles and phenomenological hysteresis. This comprehensive book offers a lucid analysis that enables the reader to save valuable time by reducing trial-and-error design. Dr. Della Torre uses physical principles to modify Preisach modeling and to describe the complex behavior of magnetic media. While Pretsach modeling is a useful mathematical tool, its congruency and deletion properties present limitations to accurate descriptions of magnetic materials. Step-by-step, this book describes the modifications that can overcome these limitations. Special attention is given to the use of feedback around a Preisach transducer to remove the congruency restriction, and to the use of accommodation and aftereffect models to remove the deletion restriction. Magnetic state selection rules are introduced to couple scalar Preisach models to form a vector model. Magnetic Hysteresis is indispensable reading for engineers, physicists, and materials scientists who want to gain a better understanding of hysteresis losses and create more energy-efficient motor designs.

U.S. Government Research & Development Reports

This book presents a comprehensive treatment of electromagnetic analysis and design of three critical devices for an MRI system - the magnet, gradient coils, and radiofrequency (RF) coils. Electromagnetic Analysis and Design in Magnetic Resonance Imaging is unique in its detailed examination of the analysis and design of the hardware for an MRI system. It takes an engineering perspective to serve the many scientists and engineers in this rapidly expanding field. Chapters present: an introduction to MRI basic concepts of electromagnetics, including Helmholtz and Maxwell coils, inductance calculation, and magnetic fields produced by special cylindrical and spherical surface currents principles for the analysis and design of gradient coils, including discrete wires and the target field method analysis of RF coils based on the equivalent lumped-circuit model as well as an analysis based on the integral equation formulation survey of special purpose RF coils analytical and numerical methods for the analysis of electromagnetic fields in biological objects With the continued, active development of MRI instrumentation, Electromagnetic Analysis and Design in Magnetic Resonance Imaging presents an excellent, logically organized text - an indispensable resource for engineers, physicists, and graduate students working in the field of MRI.

Development of Finite Element Analysis of Magnetic Resonance Elastography to Investigate Its Potential Use in Abdominal Aortic Aneurysms

Electromagnetic Analysis and Design in Magnetic Resonance ImagingRoutledge

Development of Switched Reluctance Machine Design Tools and Magnetic Power Loss Analysis

Magnetic Resonance Imaging in Tissue Engineering provides a unique overview of the field of non-invasive MRI assessment of tissue engineering and regenerative medicine Establish a dialogue between the tissue-engineering scientists and imaging experts and serves as a guide for tissue engineers and biomaterial developers alike Provides comprehensive details of magnetic resonance imaging (MRI) techniques used to assess a variety of engineered and regenerating tissues and organs Covers cell-based therapies, engineered cartilage, bone, meniscus, tendon, ligaments, cardiovascular, liver and bladder tissue engineering and regeneration assessed by MRI Includes a chapter on oxygen imaging method that predominantly is used for assessing hypoxia in solid tumors for improving radiation therapy but has the ability to provide information on design strategies and cellular viability in tissue engineering regenerative medicine

An Analysis of Two-components Magnetic Brush Development

Magnetic Hysteresis

Development and Analysis of Radiolabeled Magnetic Nanoparticles for Positron Emission Tomography and Magnetic Resonance Imaging

The Analysis and Development of Sensors for Active Magnetic Bearings

Development and Analysis of Magnetic Resonance Imaging Acquisition and Reconstruction Methods for Functional and Structural Investigation of Cardiac and Lung Tissues

Development on Earth's Field Proton Magnetic Resonance Instrumentation and Analysis

Development of Segmentation and Dimensionality Reduction Techniques for Ultrasound and Magnetic Resonance Image Analysis