

A Wireless Wearable Ecg Sensor For Long Term Applications

Electrocardiogram (ECG) is a noninvasive technology widely used in health care systems for diagnosis of heart diseases, and a wearable ECG sensor with long-term monitoring is necessary for real-time heart disease detection. However, the conventional ECG is restricted considering the physical size and power consumption of the system. In this thesis, we propose a Wireless ECG System with Bluetooth Low Energy (BLE) and Compressed Sensing (CS). The proposed Wireless ECG System includes an ECG sensor board based on a BLE chip, an Android application and a web service with a database. The ECG signal is first collected by the ECG Sensor Board and then transmitted to the Android application through BLE protocol. At last, the ECG signal is uploaded to the cloud database from the Android app. We also introduce Compressed Sensing into our system with a novel sparse sensing matrix, data compression and a modified Compressive Sampling Matching Pursuit (CoSaMP) reconstruction algorithm. Experiment results show that the amount of data transmitted is reduced by about 57% compared to not using Compressed Sensing, and reconstruction time is 64% less than using Orthogonal Matching Pursuit (OMP) or Iterative Re-weighted Least Squares (IRLS) algorithm.

Fundamentals of Wireless Sensor Networks Theory and Practice John Wiley & Sons

Healthcare Data Analytics and Management help readers disseminate cutting-edge research that delivers insights into the analytic tools, opportunities, novel strategies, techniques and challenges for handling big data, data analytics and management in healthcare. As the rapidly expanding and heterogeneous nature of healthcare data poses challenges for big data analytics, this book targets researchers and bioengineers from areas of machine learning, data mining, data management, and healthcare providers, along with clinical researchers and physicians who are interested in the management and analysis of healthcare data. Covers data analysis, management and security concepts and tools in the healthcare domain Highlights electronic medical health records and patient information records Discusses the different techniques to integrate Big data and Internet-of-Things in healthcare, including machine learning and data mining Includes multidisciplinary contributions in relation to healthcare applications and challenges

The rapid development of new technologies has created a lasting impact in the healthcare sector during the past decades. Due to this influence, potential clinical problems have decreased while the quality of healthcare delivery and overall user friendliness has increased and contributed to cost-effective healthcare systems. Biomedical and Clinical Engineering for Healthcare Advancement is an essential reference source that discusses growth in healthcare applications driven by the adoption of new technologies, as well as the expansion of machine learning algorithms for clinical decision making. It focuses on combining vision, motion, data acquisition, and automated control to accelerate the development of affordable and portable medical devices. Featuring research on topics such as artificial intelligence, drug delivery, and retinal imaging, this book is ideally designed for healthcare professionals, biomedical engineers, biomedical professionals, clinicians, hospital directors, physicians, medical students, and clinical researchers.

Ubiquitous physiological monitoring will be a key driving force in the upcoming wireless health revolution. Cardiac and brain signals in the form of ECG and EEG are two critical health indicators that directly benefit from long-term monitoring. Despite advancements in wireless technology and electronics miniaturization, however, the use of wireless home ECG/EEG monitoring is still limited by the inconvenience and discomfort of wet, contact electrodes. This research focuses on the development of non-contact electrodes, which do not require direct

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electrical skin contact as a patient-friendly alternative and begins with a review of the field. Early attempts at building non-contact sensors using off-the-shelf commercial components demonstrated the feasibility of building low-cost, wireless, wearable ECG and EEG monitoring systems. As part of this early work, it was discovered that the interface noise from the insulating medium between body and sensor was often dominant, contributing significant new knowledge in this field. Further research revealed that discrete amplifiers contained many limitations, especially regarding frequency response and noise that were difficult to surmount. Previous implementations known in the literature required extensive manual tuning and calibration in order to boost the input impedance of discrete amplifiers, an imperfect and tedious process. To overcome the challenges with using discrete components, a fully custom analog sensor front-end was developed, achieving input impedances and frequency responses far exceeding than what was previously possible, all completely without the need for manual adjustment. Validation of this sensor in ECG applications show that it easily meets medical grade frequency response specifications and attains closer signal correlation to adhesive wet electrodes. Neural applications of this sensor were also explored and validated within an EEG (stead state visual evoked potential) brain-computer interface and benchmarked against dry and wet sensors. Successful real-time control of a computer, to a degree never before demonstrated with non-contact sensors, was achieved with the electrodes placed on top of hair, completely without gels or skin preparation. Additional sensor applications including EOG eye tracking and low-power integrated, focal-plane video compression are also discussed.

This monograph presents a comprehensive overview of the electrocardiography from the aspect of wireless and mobile monitoring and its potential for personalized health management. The topical focus is on the implementation and efficient application of user friendly m-Health systems. The target audience comprises biomedical engineers, medical doctors, students, industrial experts and health managers developing m-Health solutions.

Big Data Analytics for Intelligent Healthcare Management covers both the theory and application of hardware platforms and architectures, the development of software methods, techniques and tools, applications and governance, and adoption strategies for the use of big data in healthcare and clinical research. The book provides the latest research findings on the use of big data analytics with statistical and machine learning techniques that analyze huge amounts of real-time healthcare data. Examines the methodology and requirements for development of big data architecture, big data modeling, big data as a service, big data analytics, and more Discusses big data applications for intelligent healthcare management, such as revenue management and pricing, predictive analytics/forecasting, big data integration for medical data, algorithms and techniques, etc. Covers the development of big data tools, such as data, web and text mining, data mining, optimization, machine learning, cloud in big data with Hadoop, big data in IoT, and more

The International Conference on Signals, Systems and Automation (ICSSA 2011) aims to spread awareness in the research and academic community regarding cutting-edge technological advancements revolutionizing the world. The main emphasis of this conference is on dissemination of information, experience, and research results on the current topics of interest through in-depth discussions and participation of researchers from all over the world. The objective is to provide a platform to scientists, research scholars, and industrialists for interacting and exchanging ideas in a number of research areas. This will facilitate communication among researchers in different fields of Electronics and Communication Engineering. The International Conference on Intelligent System and Data Processing (ICISD 2011) is organized to address various issues that will foster the creation of intelligent solutions in the future. The primary goal of the conference is to bring together worldwide leading researchers, developers, practitioners, and educators interested in advancing the state of the art in computational

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intelligence and data processing for exchanging knowledge that encompasses a broad range of disciplines among various distinct communities. Another goal is to promote scientific information interchange between researchers, developers, engineers, students, and practitioners working in India and abroad.

This book provides a comprehensive guide to the state-of-the-art in cardiovascular computing and highlights novel directions and challenges in this constantly evolving multidisciplinary field. The topics covered span a wide range of methods and clinical applications of cardiovascular computing, including advanced technologies for the acquisition and analysis of signals and images, cardiovascular informatics, and mathematical and computational modeling.

With the growing interest in the use of technology in daily life, the potential for using wearable wireless devices across multiple segments, e.g., healthcare, sports, child monitoring, military, emergency, consumer electronics, etc., is rapidly increasing. Multibillion wearable sensors are predicted to be in use by 2025, with over 30% of them being new types of sensors that are only beginning to emerge. This book will focus on wireless wearable and implantable systems, flexible textile-based electronics, bio-electromagnetics, antennas and propagation, radio frequency (RF) circuits, sensors, security of wearables and implantable systems, nano-bio communication, and electromagnetic sensing

Wearable and Implantable Medical Devices: Applications and Challenges, Fourth Edition highlights the new aspects of wearable and implanted sensors technology in the healthcare sector and monitoring systems. The book's contributions include several interdisciplinary domains, such as wearable sensors, implanted sensors devices, Internet-of-Things (IoT), security, real-time medical healthcare monitoring, WIBSN design and data management, encryption, and decision-support systems. Contributions emphasize several topics, including real-world applications and the design and implementation of wearable devices. This book demonstrates that this new field has a brilliant future in applied healthcare research and in healthcare monitoring systems. Includes comprehensive information on wearable and implanted device technology, wearable and implanted sensors design, WIBSN requirements, WIBSN in monitoring systems and security concepts Highlights machine learning and computing in healthcare monitoring systems based on WIBSN Includes a multidisciplinary approach to different healthcare applications and their associated challenges based on wearable and implanted technologies

The proceedings includes cutting-edge research articles from the Fourth International Conference on Signal and Image Processing (ICSIP), which is organised by Dr. N.G.P. Institute of Technology, Kalapatti, Coimbatore. The Conference provides academia and industry to discuss and present the latest technological advances and research results in the fields of theoretical, experimental, and application of signal, image and video processing. The book provides latest and most informative content from engineers and scientists in signal, image and video processing from around the world, which will benefit the future research community to work in a more cohesive and collaborative way.

This book covers the state-of-the-art approaches for automated non-invasive systems for early cardiovascular disease diagnosis. It includes several prominent imaging modalities such as MRI, CT, and PET technologies. There is a special emphasis placed on

automated imaging analysis techniques, which are important to biomedical imaging analysis of the cardiovascular system. Novel 4D based approach is a unique characteristic of this product. This is a comprehensive multi-contributed reference work that will detail the latest developments in spatial, temporal, and functional cardiac imaging. The main aim of this book is to help advance scientific research within the broad field of early detection of cardiovascular disease. This book focuses on major trends and challenges in this area, and it presents work aimed to identify new techniques and their use in biomedical image analysis. Key Features: Includes state-of-the art 4D cardiac image analysis Explores the aspect of automated segmentation of cardiac CT and MR images utilizing both 3D and 4D techniques Provides a novel procedure for improving full-cardiac strain estimation in 3D image appearance characteristics Includes extensive references at the end of each chapter to enhance further study

The development of better processes to provide proper healthcare has enhanced contemporary society. By implementing effective collaborative strategies, this ensures proper quality and instruction for both the patient and medical practitioners. Health Care Delivery and Clinical Science: Concepts, Methodologies, Tools, and Applications is a comprehensive reference source for the latest scholarly material on emerging strategies and methods for delivering optimal healthcare and examines the latest techniques and methods of clinical science. Highlighting a range of pertinent topics such as medication management, health literacy, and patient engagement, this multi-volume book is ideally designed for professionals, practitioners, researchers, academics, and graduate students interested in healthcare delivery and clinical science.

Advances in technology continue to alter the ways in which we conduct our lives, from the private sphere to how we interact with others in public. As these innovations become more integrated into modern society, their applications become increasingly relevant in various facets of life. Wearable Technologies: Concepts, Methodologies, Tools, and Applications is a comprehensive reference source for the latest scholarly material on the development and implementation of wearables within various environments, emphasizing the valuable resources offered by these advances. Highlighting a range of pertinent topics, such as assistive technologies, data storage, and health and fitness applications, this multi-volume book is ideally designed for researchers, academics, professionals, students, and practitioners interested in the emerging applications of wearable technologies.

This book constitutes the thoroughly refereed post-workshop proceedings of the 5th International Workshop on Empathic Computing, IWEC 2014, co-located with PRICAI 2014, held in Gold Coast, QLD, Australia, in December 2014, as well as the 6th International Workshop on Empathic Computing, IWEC 2015, and the 15th Workshop on Computational Models of Natural Argument, CMNA XV, both co-located with PRIMA 2015, held in Bertinoro, Italy, in October 2015. The 12 papers presented were carefully reviewed and selected from 32 initial submissions. The workshops are going alongside with the PRIMA 2015 Conference and are intended to facilitate active exchange, interaction and comparison of approaches, methods and various ideas in specific areas related to intelligent agent systems and multiagent systems.

Over the past three decades, the exploding number of new technologies and applications introduced in medical practice, often

powered by advances in biosignal processing and biomedical imaging, created an amazing account of new possibilities for diagnosis and therapy, but also raised major questions of appropriateness and safety. The accelerated development in this field, alongside with the promotion of electronic health care solutions, is often on the basis of an uncontrolled diffusion and use of medical technology. The emergence and use of medical devices is multiplied rapidly and today there exist more than one million different products available on the world market. Despite the fact that the rising cost of health care, partly resulting from the new emerging technological applications, forms the most serious and urgent problem for many governments today, another important concern is that of patient safety and user protection, issues that should never be compromised and expelled from the Biomedical Engineering research practice agenda.

This book presents the post-proceedings, including all revised versions of the accepted papers, of the 2017 European Alliance for Innovation (EAI) International Conference on Body Area Networks (BodyNets 2017). The goal of BodyNets 2017 was to provide a world-leading and unique forum, bringing together researchers and practitioners from diverse disciplines to plan, analyze, design, build, deploy and experiment with/on Body Area Networks (BANs).

This book documents some of the most recent advances on the physical layer of the Internet of Things (IoT), including sensors, circuits, and systems. The application area selected for illustrating these advances is that of autonomous, wearable systems for real-time medical diagnosis. The book is unique in that it adopts a holistic view of such systems and includes not only the sensor and processing subsystems, but also the power, communication, and security subsystems. Particular attention is paid to the integration of these IoT subsystems as well as the prototyping platforms needed for achieving such integration. Other unique features include the discussion of energy-harvesting subsystems to achieve full energy autonomy and the consideration of hardware security as a requirement for the integrity of the IoT physical layer. One unifying thread of the various designs considered in this book is that they have all been fabricated and tested in an advanced, low-power CMOS process, namely GLOBALFOUNDRIES 65nm CMOS LPe.

Wearable Sensors: Fundamentals, Implementation and Applications has been written by a collection of experts in their field, who each provide you with an understanding of how to design and work with wearable sensors. Together these insights provide the first single source of information on wearable sensors that would be a fantastic addition to the library of any engineers working in this field. Wearable Sensors covers a wide variety of topics associated with development and applications of wearable sensors. It also provides an overview and a coherent summary of many aspects of wearable sensor technology. Both professionals in industries and academic researchers need this package of information in order to learn the overview and each specific technology at the same time. This book includes the most current knowledge on the advancement of light-weight hardware, energy harvesting, signal processing, and wireless communications and networks. Practical problems with smart fabrics, biomonitoring and health informatics are all addressed, plus end user centric design, ethical and safety issues. The new edition is completely reviewed by key figures in the field, who offer authoritative and comprehensive information on the various topics. A new feature for

the second edition is the incorporation of key background information on topics to allow the less advanced user access to the field and to make the title more of an auto-didactic book for undergraduates. Provides a full revision of the first edition, providing a comprehensive and up-to-date resource of all currently used wearable devices in an accessible and structured manner Helps engineers manufacture wearable devices with information on current technologies, with a focus on end user needs and recycling requirements This book provides a fully updated overview of the many aspects of wearable sensor technology in one single volume, enabling engineers and researchers to fully comprehend the field and to identify opportunities

From past decades, Computational intelligence embraces a number of nature-inspired computational techniques which mainly encompasses fuzzy sets, genetic algorithms, artificial neural networks and hybrid neuro-fuzzy systems to address the computational complexities such as uncertainties, vagueness and stochastic nature of various computational problems practically. At the same time, Intelligent Control systems are emerging as an innovative methodology which is inspired by various computational intelligence process to promote a control over the systems without the use of any mathematical models. To address the effective use of intelligent control in Computational intelligence systems, International Conference on Intelligent Computing, Information and Control Systems (ICICCS 2019) is initiated to encompass the various research works that helps to develop and advance the next-generation intelligent computing and control systems. This book integrates the computational intelligence and intelligent control systems to provide a powerful methodology for a wide range of data analytics issues in industries and societal applications. The recent research advances in computational intelligence and control systems are addressed, which provide very promising results in various industry, business and societal studies. This book also presents the new algorithms and methodologies for promoting advances in common intelligent computing and control methodologies including evolutionary computation, artificial life, virtual infrastructures, fuzzy logic, artificial immune systems, neural networks and various neuro-hybrid methodologies. This book will be pragmatic for researchers, academicians and students dealing with mathematically intransigent problems. It is intended for both academicians and researchers in the field of Intelligent Computing, Information and Control Systems, along with the distinctive readers in the fields of computational and artificial intelligence to gain more knowledge on Intelligent computing and control systems and their real-world applications.

The last decade has witnessed a rapid surge of interest in new sensing and monitoring devices for wellbeing and healthcare. One key development in this area is wireless, wearable and implantable in vivo monitoring and intervention. A myriad of platforms are now available from both academic institutions and commercial organisations. They permit the management of patients with both acute and chronic symptoms, including diabetes, cardiovascular diseases, treatment of epilepsy and other debilitating neurological disorders. Despite extensive developments in sensing technologies, there are significant research issues related to system integration, sensor miniaturisation, low-power sensor interface, wireless telemetry and signal processing. In the 2nd edition of this popular and authoritative reference on Body Sensor Networks (BSN), major topics related to the latest technological developments and potential clinical applications are discussed, with contents covering. Biosensor Design, Interfacing and Nanotechnology

Wireless Communication and Network Topologies Communication Protocols and Standards Energy Harvesting and Power Delivery Ultra-low Power Bio-inspired Processing Multi-sensor Fusion and Context Aware Sensing Autonomic Sensing Wearable, Ingestible Sensor Integration and Exemplar Applications System Integration and Wireless Sensor Microsystems The book also provides a comprehensive review of the current wireless sensor development platforms and a step-by-step guide to developing your own BSN applications through the use of the BSN development kit.

The 4th European Congress of the International Federation for Medical and Biological Federation was held in Antwerp, November 2008. The scientific discussion on the conference and in this conference proceedings include the following issues: Signal & Image Processing ICT Clinical Engineering and Applications Biomechanics and Fluid Biomechanics Biomaterials and Tissue Repair Innovations and Nanotechnology Modeling and Simulation Education and Professional

This is the first-ever book to illustrate the principles and applications of liquid metal biomaterials. Room-temperature liquid metal materials are rapidly emerging as next-generation functional materials that display many unconventional properties superior to those of conventional biomaterials. Their outstanding, unique versatility (“one material, diverse capabilities”) opens many exciting opportunities for the medical sciences. The book reviews representative applications of liquid metal biomaterials from both therapeutic and diagnostic aspects. It also discusses related efforts to employ liquid metals to overcome today’s biomedical challenges. It will provide readers with a comprehensive understanding of the technical advances and fundamental discoveries on the frontier, and thus equip them to investigate and utilize liquid metal biomaterials to tackle various critical problems.

Smart mobile systems, smart textiles, smart implants and sensor controlled medical devices are among the recent developments which have become important enablers for telemedicine and next-generation health services. Social media and gamification have added yet another dimension to Personalized Health (pHealth). This book presents the proceedings of pHealth 2015, the 12th International Conference on Wearable Micro and Nano Technologies for Personalized Health, held in Västerås, Sweden, in June 2015. The conference addressed mobile technologies, knowledge-driven applications and computer-assisted decision support, as well as apps designed to support the elderly and those with chronic conditions in their daily lives. The 23 conference papers, three keynotes and two specially invited contributions included here address the fundamental scientific and methodological challenges of adaptive, autonomous and intelligent pHealth approaches. Participants at this truly interdisciplinary conference included representatives from all relevant stakeholder communities, and the topics covered will be of interest to all those whose work involves improving the quality of medical services, optimizing industrial competitiveness and managing healthcare costs.

This book looks at the growing segment of Internet of Things technology (IoT) known as Internet of Medical Things (IoMT), an automated system that aids in bridging the gap between isolated and rural communities and the critical healthcare services that are available in more populated and urban areas. Many technological aspects of IoMT are still

being researched and developed, with the objective of minimizing the cost and improving the performance of the overall healthcare system. This book focuses on innovative IoMT methods and solutions being developed for use in the application of healthcare services, including post-surgery care, virtual home assistance, smart real-time patient monitoring, implantable sensors and cameras, and diagnosis and treatment planning. It also examines critical issues around the technology, such as security vulnerabilities, IoMT machine learning approaches, and medical data compression for lossless data transmission and archiving. Internet of Medical Things is a valuable reference for researchers, students, and postgraduates working in biomedical, electronics, and communications engineering, as well as practicing healthcare professionals.

This book provides a dual perspective on the Internet of Things and ubiquitous computing, along with their applications in healthcare and smart cities. It also covers other interdisciplinary aspects of the Internet of Things like big data, embedded Systems and wireless Sensor Networks. Detailed coverage of the underlying architecture, framework, and state-of-the-art methodologies form the core of the book.

This book discusses feature engineering and computational intelligence solutions for ECG monitoring, with a particular focus on how these methods can be efficiently used to address the emerging challenges of dynamic, continuous & long-term individual ECG monitoring and real-time feedback. By doing so, it provides a “snapshot” of the current research at the interface between physiological signal analysis and machine learning. It also helps clarify a number of dilemmas and encourages further investigations in this field, to explore rational applications of feature engineering and computational intelligence in ECG monitoring. The book is intended for researchers and graduate students in the field of biomedical engineering, ECG signal processing, and intelligent healthcare.

Wearable Technology in Medicine and Health Care provides readers with the most current research and information on the clinical and biomedical applications of wearable technology. Wearable devices provide applicability and convenience beyond many other means of technical interface and can include varying applications, such as personal entertainment, social communications and personalized health and fitness. The book covers the rapidly expanding development of wearable systems, thus enabling clinical and medical applications, such as disease management and rehabilitation. Final chapters discuss the challenges inherent to these rapidly evolving technologies. Provides state-of-the-art coverage of the latest advances in wearable technology and devices in healthcare and medicine Presents the main applications and challenges in the biomedical implementation of wearable devices Includes examples of wearable sensor technology used for health monitoring, such as the use of wearables for continuous monitoring of human vital signs, e.g. heart rate, respiratory rate, energy expenditure, blood pressure and blood glucose, etc. Covers examples of wearables for early

diagnosis of diseases, prevention of chronic conditions, improved clinical management of neurodegenerative conditions, and prompt response to emergency situations

Written by industry experts, this book aims to provide you with an understanding of how to design and work with wearable sensors. Together these insights provide the first single source of information on wearable sensors that would be a valuable addition to the library of any engineer interested in this field. *Wearable Sensors* covers a wide variety of topics associated with the development and application of various wearable sensors. It also provides an overview and coherent summary of many aspects of current wearable sensor technology. Both industry professionals and academic researchers will benefit from this comprehensive reference which contains the most up-to-date information on the advancement of lightweight hardware, energy harvesting, signal processing, and wireless communications and networks. Practical problems with smart fabrics, biomonitors and health informatics are all addressed, plus end user centric design, ethical and safety issues. Provides the first comprehensive resource of all currently used wearable devices in an accessible and structured manner. Helps engineers manufacture wearable devices with information on current technologies, with a focus on end user needs and recycling requirements. Combines the expertise of professionals and academics in one practical and applied source.

Electronic Devices, Circuits, and Systems for Biomedical Applications: Challenges and Intelligent Approaches explains the latest information on the design of new technological solutions for low-power, high-speed efficient biomedical devices, circuits and systems. The book outlines new methods to enhance system performance, provides key parameters to explore the electronic devices and circuit biomedical applications, and discusses innovative materials that improve device performance, even for those with smaller dimensions and lower costs. This book is ideal for graduate students in biomedical engineering and medical informatics, biomedical engineers, medical device designers, and researchers in signal processing. Presents major design challenges and research potential in biomedical systems Walks readers through essential concepts in advanced biomedical system design Focuses on healthcare system design for low power-efficient and highly-secured biomedical electronics

This book discusses the innovative and efficient technological solutions for sustainable smart societies in terms of alteration in industrial pollution levels, the effect of reduced carbon emissions, green power management, ecology, and biodiversity, the impact of minimal noise levels and air quality influences on human health. The book is focused on the smart society development using innovative low-cost advanced technology in different areas where the growth in employment and income are driven by public and private investment into such economic activities, infrastructure and assets that allow reduced carbon emissions and pollution, enhanced energy, and resource efficiency and prevention of

the loss of biodiversity and ecosystem services. The book also covers the paradigm shift in the sustainable development for the green environment in the post-pandemic era. It emphasizes and facilitates a greater understanding of existing available research i.e., theoretical, methodological, well-established and validated empirical work, associated with the environmental and climate change aspects.

Abstract : Wireless wearable body sensor networks are widely used in the continuous daily monitoring of vital parameters such as electrocardiography (ECG). The wireless wearable technology is a key enabling technology for out-hospital patient-centric healthcare which enables the improvement for the ability of prevention, diagnosis and patient life quality. However, as wireless transmission is power-demanding and the power supply from battery is also limited, the energy efficiency issue impose a stringent constraint on the continuous vitals monitoring in wearable body sensor networks (BSN). Signal compression for biosignals provides a good solution to reduce the power consumption of data transmission by decreasing the transmitted data size of the biosignals. In this study, we develop the first scheme of applying empirical mode decomposition (EMD) on ECG signal for feature extraction and compression and further propose a new ECG signal compression framework based on EMD constructed feature dictionary for energy-efficient ECG sensing in wearable body sensor networks. Our method is validated with the ECG data from MIT-BIH arrhythmia database and compared with existing methods. Based on the simulations on the ECG signals from MIT-BIH, the results show that our method achieves the compression ratio (CR) up to 133 with RMSE of 5.58% and the average CR of 96.08 with RMSE 6.69% which is more than twice of the highest CR among other existing methods with similar recovering error rate of around 6%. For diagnostic distortion perspective, our method achieves high QRS detection performance with the sensitivity (SE) of 99.8% and the specificity (SP) of 99.6%, which shows that our ECG compression method can preserve almost all the QRS features and have no impact on the diagnosis process. In addition, the energy consumption is only 30% of the energy consumption achieved by the other methods considering the ECG signals from MIT-BIH database. The excellent compressing performance and low energy consumption make it outperform the prior studies in ECG data compressing for wearable body sensor networks.

In this book, the authors describe the fundamental concepts and practical aspects of wireless sensor networks. The book provides a comprehensive view to this rapidly evolving field, including its many novel applications, ranging from protecting civil infrastructure to pervasive health monitoring. Using detailed examples and illustrations, this book provides an inside track on the current state of the technology. The book is divided into three parts. In Part I, several node architectures, applications and operating systems are discussed. In Part II, the basic architectural frameworks, including the key building blocks required for constructing large-scale, energy-efficient sensor networks are presented. In Part III, the challenges and approaches pertaining to local and global management strategies are presented – this includes topics on power management, sensor node localization, time synchronization, and security. At the end of each chapter, the authors provide practical exercises to help students strengthen their grip on the subject. There are more than 200 exercises altogether. **Key Features:** Offers a comprehensive introduction to the theoretical and practical concepts pertaining to wireless sensor networks Explains the constraints and challenges of wireless sensor network design; and discusses the most promising solutions Provides an in-depth treatment of the most critical technologies for sensor network communications, power management, security, and programming Reviews the latest research results in sensor network design, and demonstrates how the individual components fit together to build complex sensing systems for a variety of application scenarios Includes an accompanying website containing solutions to exercises (http://www.wiley.com/go/dargie_fundamentals)

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This book serves as an introductory text to the field of wireless sensor networks at both graduate and advanced undergraduate level, but it will also appeal to researchers and practitioners wishing to learn about sensor network technologies and their application areas, including environmental monitoring, protection of civil infrastructure, health care, precision agriculture, traffic control, and homeland security.

This book provides a candid assessment and practical knowledge about the current technological advancements of the wireless healthcare system. This book presents the competencies of modeling e-health framework, medical wireless body sensor networks, communication technologies for mobile health, nanotechnology innovations in medicine, security issues for medical records, personalized services in healthcare applications, and Big Data for wireless health. This book covers multiple research perspectives in order to address the strong need for interdisciplinary research in the area of wireless health, such as the interactive research among biomedical sensor technology, intelligent textiles and advanced wireless network technology. The interactions involve experts from multidisciplinary fields including medical, information technology and computing fields. Designed as a study tool for graduate students, researchers, and medical professionals, this book is also valuable for business managers, entrepreneurs, and investors within the medical and healthcare industries. It is useful for anyone who cares about the future opportunities in healthcare systems.

This book summarizes various approaches for the automatic detection of health threats to older patients at home living alone. The text begins by briefly describing those who would most benefit from healthcare supervision. The book then summarizes possible scenarios for monitoring an older patient at home, deriving the common functional requirements for monitoring technology. Next, the work identifies the state of the art of technological monitoring approaches that are practically applicable to geriatric patients. A survey is presented on a range of such interdisciplinary fields as smart homes, telemonitoring, ambient intelligence, ambient assisted living, gerontechnology, and aging-in-place technology. The book discusses relevant experimental studies, highlighting the application of sensor fusion, signal processing and machine learning techniques. Finally, the text discusses future challenges, offering a number of suggestions for further research directions.

Research Progress in Nano and Intelligent Materials presents a broad selection of chapters on leading-edge research from top international researchers on various applications of nano and intelligent materials. The collection of topics in this book aims to reflect the diversity of recent advances in nano and intelligent materials with a broad perspective that will be useful for scientists as well as for graduate students and engineers. Chapters present a range of research, from new methods to novel applications of existing methods to foster the understanding of the material and/or structural behavior of new and advanced systems. Topics include: Updates on pan monofilament in nanoscale The development of flexible electrode using inkjet printing of silver nanoparticles Supreme EMI shielding using electroless plating of metallic nanoparticles on cotton fabric Inkjet deposited circuit components Reinforcing chitosan/poly(vinyl alcohol) nanofiber scaffolds using Single-walled carbon nanotube for neural tissue engineering Wireless wearable ECG monitoring system Conductive chitosan nanofiber Progress in production of nanofiber web

Provides a comprehensive overview of wireless computing in medicine, with technological, medical, and legal advances This book brings together the latest work of leading scientists in the disciplines of Computing, Medicine, and Law, in the field of Wireless Health. The book is organized into three main sections. The first section discusses the use of distributed computing in medicine. It concentrates on methods for treating chronic diseases and cognitive disabilities like Alzheimer's, Autism, etc. It also discusses how to improve portability and accuracy of monitoring instruments and reduce the redundancy of data. It emphasizes the privacy and security of using such devices. The role of mobile sensing, wireless power and Markov decision process in distributed computing is also examined. The second section covers nanomedicine

and discusses how the drug delivery strategies for chronic diseases can be efficiently improved by Nanotechnology enabled materials and devices such as MENs and Nanorobots. The authors will also explain how to use DNA computation in medicine, model brain disorders and detect bio-markers using nanotechnology. The third section will focus on the legal and privacy issues, and how to implement these technologies in a way that is a safe and ethical. Defines the technologies of distributed wireless health, from software that runs cloud computing data centers, to the technologies that allow new sensors to work Explains the applications of nanotechnologies to prevent, diagnose and cure disease Includes case studies on how the technologies covered in the book are being implemented in the medical field, through both the creation of new medical applications and their integration into current systems Discusses pervasive computing's organizational benefits to hospitals and health care organizations, and their ethical and legal challenges Wireless Computing in Medicine: From Nano to Cloud with Its Ethical and Legal Implications is written as a reference for computer engineers working in wireless computing, as well as medical and legal professionals. The book will also serve students in the fields of advanced computing, nanomedicine, health informatics, and technology law.

This edited book contains invited papers from renowned experts working in the field of Wearable Electronics Sensors. It includes 14 chapters describing recent advancements in the area of Wearable Sensors, Wireless Sensors and Sensor Networks, Protocols, Topologies, Instrumentation architectures, Measurement techniques, Energy harvesting and scavenging, Signal processing, Design and Prototyping. The book will be useful for engineers, scientist and post-graduate students as a reference book for their research on wearable sensors, devices and technologies which is experiencing a period of rapid growth driven by new applications such as heart rate monitors, smart watches, tracking devices and smart glasses.

Applications which use wireless sensors are increasing in number. The emergence of wireless sensor networks has also motivated the integration of a large number of small and lightweight nodes which integrate sensors, processors, and wireless transceivers. Existing books on wireless sensor networks mainly focus on protocols and networks and pay little attention to the sensors themselves which the author believes is the main focus. Without adequate knowledge of sensors as well as how they can be designed, realized and used, books on wireless sensor networks become too theoretical and irrelevant. The purpose of this book is to intimately acquaint readers with the technique of sensing (resistive, capacitive, inductive, magnetic, inertial, etc.) and existing sensor technologies. It also discusses how the sensors are used in a wide application domain and how new sensors can be designed and used in a novel way.

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