

Wavelet based Signal Processing for Compression a Methodology for on-line Tele Cardiology

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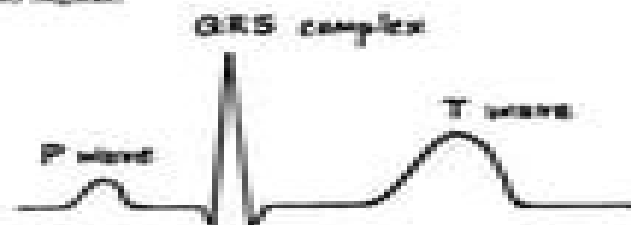
Abstract: On-Line continuous monitoring of ECG signals and Digital Signal Processing(DSP) for Deviation Detection has specific diagnostic value. Such analysis, need conservation of Digital storage space as large amount of digitized data results from body area electronics. So, Compression becomes essential for such Tele Cardiology, runs into hours and days in the case of critical patients and ICU situation. In this work a methodology for wavelet based on line compression is evolved, segmenting ECG beat waveform into 128 cubic splines, for Digital Signal Processing (DSP). In the compression methodology, depending on sampling rate, of ADC converter of the ECG body area electronics, a 'M' parameter is fine tuned practically, to reduce the digital storage space, to be able to do high frequency low loss decompression, from stored digital data, in case of requirement for later image and analysis or diagnostics. Loss based coding is also introduced for fine tuning M , M_{opt} , $M_{practically}$, to retain significant diagnostic spectrum in the major waves of ECG beat, for deriving $M_{practically}$, also for future diagnostics. A block matrix and function has been fixed for the Digital Signal Processing for compression based on wavelets. Compression to the tune of more than 200% is possible with the methodology, specifically useful for on-line mobile acquisition of digitized ECG, for early ECG deviation detection and tele transfer for diagnostics, in the case of ICU patients or already diagnosed cardiac patient.

Keywords: Tele cardiology, ECG, DSP, Wavelets, Compression, Cubic Splines.

I. Introduction:

One time ECG recording for a few beats may not give sufficient early clues in knowing deviations in the ECG waveform, to associate deviations to different Cardiology ailments. The signal processing based trend has been moving with improved Biomedical signal instrumentation and acquisition precision. The moment, Biomedical signal acquisition is required for long duration, data compression need to be adopted, in recording any such Biomedical electrical signal. Ideally, this Biomedical signal acquisition system need to be equipped with sufficient channels to be able to accommodate, acquisition of large number of Biomedical signals. In this work, ECG signal originated from Electrophysiology of heart as shown in Fig 1, below is taken up for compressing it for Tele Cardiology. Any compressed Biomedical signal has specific advantage in Tele medicine and economically attractive, for healthcare delivery, especially in rural and impoverished areas. On these continuously acquired ECG waveforms through Telemedicine, diagnostic software algorithms would evolve and pave way to researchers, to fix various heart abnormalities to find deviations, detected using wavelet processing of ECG Waveforms.

Electro-Cardiogram (ECG) Signals



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Handbook of Research on Disease Prediction Through Data Analytics and Machine Learning Rani, Geeta, Tiwari, Pradeep Kumar, 2020-10-16 By applying data analytics techniques and machine learning algorithms to predict disease medical practitioners can more accurately diagnose and treat patients However researchers face problems in identifying suitable algorithms for pre processing transformations and the integration of clinical data in a single module as well as seeking different ways to build and evaluate models The Handbook of Research on Disease Prediction Through Data Analytics and Machine Learning is a pivotal reference source that explores the application of algorithms to making disease predictions through the identification of symptoms and information retrieval from images such as MRIs ECGs EEGs etc Highlighting a wide range of topics including clinical decision support systems biomedical image analysis and prediction models this book is ideally designed for clinicians physicians programmers computer engineers IT specialists data analysts hospital administrators researchers academicians and graduate and post graduate students

Mobile Telemedicine Yang Xiao, Hui Chen, 2008-06-03 Advances in the area of wireless and mobile telemedicine to diagnose and treat patients have drawn growing attention from healthcare providers and recipients industry researchers and governments This volume examines computing and network dilemmas which arise from wireless and mobile telemedicine Comprised of the contributions of many prominent international researchers the book gives an overview of patient care and monitoring discusses the use of telemedicine in cardiology and diabetes analyzes security and privacy considerations examines issues relating to networking support and concludes with a section on the opportunities and challenges that are faced by those involved in this exciting technology

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activity in many relevant scientific and hi tech fields such as medicine biotechnology and chemistry Multidimensional and multisource signal processing can generate a number of information patterns which can be useful to increase the knowledge of several domains for solving complex problems Furthermore advanced signal and image manipulation allows relating specific application problems into pattern recognition problems often implying also the development of KDD and other computational intelligence procedures Nevertheless the amount of data produced by sensors and equipments used in biomedicine biotechnology and chemistry is usually quite huge and structured thus strongly pushing the need of investigating advanced models and efficient computational algorithms for automating mass analysis procedures Accordingly signal and image understanding approaches able to generate automatically expected outputs become more and more essential including novel conceptual approaches and system architectures The purpose of this third edition of the International Conference on Mass Data Analysis of Signals and Images in Medicine Biotechnology Chemistry and Food Industry MDA 2008 www.mda-signals.de was to present the broad and growing scientific evidence linking mass data analysis with challenging problems in medicine biotechnology and chemistry Scientific and engineering experts convened at the workshop to present the current understanding of image and signal processing and interpretation methods useful for facing various medical and biological problems and exploring the applicability and effectiveness of advanced techniques as solutions

Advances in Communication and Computing Prabin Kumar Bora, S R Mahadeva Prasanna, Kandarpa Kumar Sarma, Navajit Saikia, 2015-06-17 The present volume is a compilation of research work in computation communication vision sciences device design fabrication upcoming materials and related process design etc It is derived out of selected manuscripts submitted to the 2014 National Workshop on Advances in Communication and Computing WACC 2014 Assam Engineering College Guwahati Assam India which is emerging out to be a premier platform for discussion and dissemination of knowhow in this part of the world The papers included in the volume are indicative of the recent thrust in computation communications and emerging technologies Certain recent advances in ZnO nanostructures for alternate energy generation provide emerging insights into an area that has promises for the energy sector including conservation and green technology Similarly scholarly contributions have focused on malware detection and related issues Several contributions have focused on biomedical aspects including contributions related to cancer detection using active learning application of clinical information in MEGG using sample and channel convolution matrices for better diagnostic decision etc Some other works have focused on the DCT domain linear regression of ECG signals SVD Analysis on reduced 3 lead ECG data the quantification of diagnostic information on ECG signal a compressed sensing approach with application in MRI learning aided image denoising for medical applications etc Some works have dealt with application of audio fingerprinting for multi lingual Indian song retrieval semi automatic approach to segmentation and the marking of pitch contours for prosodic analysis semiautomatic syllable labeling for Assamese language stressed speech recognition handwriting recognition in

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