ScienceDirect

Microprocessors and Microsystems

Volume 79, November 2020, 103271

Design and implementation of low power bio signal sensors for wireless body sensing network applications

P.T. Kalaivaani [a], Raja Krishnamoorthi [b]

Show more

Share Cite

https://doi.org/10.1016/j.micpro.2020.103271

Get rights and content

Abstract

Continuous human surveillance alone will be useful for elderly people to realize the highest standard of living in human society. However, it is difficult to get such a setting as long as it can operate long hours without maintenances of its battery limitation. Biosensor signals, which are referred to as a device that consumes a lot of power in the system of a Microcontroller Unit (MCU), must be made continuously to signal samples of the biosensor. To decrease the power utilization of the Microcontroller Unit, and a low power application specific integrated circuit for biosensors feature extraction is designed for the replacement of a role of the microcontroller unit to extract the characteristic values of bio signal. In this investigation, an Application-Specific Integrated Circuit (ASIC) of Wireless Body Sensor Networks (WBSNs) is intended to fill in as a convention for medical use. The proposed wireless body sensor network comprise an newly designed sensor interfaces, integrated passive Radio Frequency (RF) receiver, contact ports, low-power Microcontroller Unit (MCU), wireless transistor control, a Power Management Unit (PMU), and an with low power harvesting capacity contains. The proposed method has been designed using 90nm and 45nm CMOS technology. Simulation results exhibit up to the change in noise immunity and lessening in power utilization contrasted with the traditional wireless body sensor networks design at a similar delay.

Introduction

The wireless sensor network provide the significant advantage in health monitoring applications for next evaluation. An emergency purpose a hospitals can monitor the different types of body signals, for example, Electrocardiogram (ECG), body temperature, hear beat and blood pressure etc. through a WBSNs [1], [2], [3]

for 24h checking without influencing the patient life. In other wireless mobile applications WBSN health monitoring applications plays an important role.

The efficient low power designing strategies for the WBSN have put forward the ideas for the researchers to reduce the communication power consumption. An open communication system is standard, and it is inevitable that high-cost hardware implementation. Different Types of wireless systems have been introduced by a small scale biomedical sensor system that can connect the open-source communication with Personal Digital Assistant (PDA) using the sensor node Bluetooth [4], [5], [6].

In long term health monitoring in WBSN applications need some essential parameters, such as low fabrication cost, low complexity in design and low power utilization. Recently, the energy consumption has played a significant role [7] with the development of low energy design, particularly the reduction of transceivers by elements.

To improve efficiency, WBSN system with the pipeline is synchronized to communication cycle. In Long-term low power adaptive design is important for health surveillance. In this proposed work, an adaptive power conservation mechanism has its own sensor node, each with a switch system for precise control to control a data encoder and adaptive power. MCU Front end signal amplifier, Successive-Approximation-Register-Analog to Digital Converter (SAR-ADC), data encoder and wireless transceiver are the important components for proposed WBSN. The organization of this research work as
Chapter 2: Literature Survey

Chapter 3: Low Noise Biosensor Filter and Amplifier

Chapter 4: Results and Discussion

Chapter 5: Conclusion

Section snippets

Literature survey

There are numerous off-the- shelf WSN materials made by various providers that meet standard wireless applications, for example, environmental sensing and personal area networks. Nonetheless, these WSN stages turned out to be not appropriate for body-proximal applications due to moderately expansive frame factors and power utilizations and being absence of availability with different biosensors [8], [9], [10]. The Essential Purpose of a Body Sensor Network (BSN) is to set up a widespread health …

Low noise biosensor filter and amplifier

The primary concern of power consumption is that in small or applicable biological systems, it will decrease the quantity of blocks and decrease the power consumption for each blocks. At computer based digital level, when the power management coordinates in this design, an active volume can be accomplished through packing several signal processing functions. The Fig.1 is shown that the usual approach varies and we must propose a new power structure with a weak power system.

It has Power…

Results and discussion

The proposed wireless body sensor network has been designed using Xilinx and cadence tool. The SAR-ADC timing diagram is verified in Xilinx 14.5 IDE with Virtex 6 using Verilog code. RTL schematic is taken from cadence pro tool. In the proposed Wireless body sensor network is verified by using Cadence tools in 90nm technology and 45nm technology.

The above Fig.15 is shown the SAR- ADC result using Xilinx. The sample value that is taken as "010,110 010,110″ is considered as the sample of an…

Conclusion

In this study, the wireless sensor network protocol has been designed with Application-Specific Integrated Circuit (ASIC) in the use of medical application. The proposed wireless body sensor network comprise an newly designed sensor interfaces, integrated passive Radio Frequency (RF) receiver, contact ports, low-power microcontroller unit (MCU), wireless transistor control, a power management unit (PMU), and an with low power harvesting capacity contains. Compared to a compatible system, the…

Declaration of Competing Interest

In Future work, Wireless body sensor network architecture and the internal blocks will be optimized to further reduce the power consumption also increases the ASIC and FPGA performances. Other possibilities of future work opportunities to implement compression, reduce radio broadcasts and increase power saving capabilities, increase sensor sample rate, and apply local flash storage sensors to continue collecting data in the absence of a private server are to allow.…

Dr.P.T.Kalaivaani received her B.E degree in Electronics and Communication Engineering from Periyar University, Salem in 2004. She received her M.E degree from Anna University, Chennai in 2006 . She obtained her Ph.D degree in Information and Communication Engineering from Anna University, Chennai in 2018. She has 13 years of teaching experience. Her areas of research includes Wireless Sensor Networks, Network Security, Digital Image Processing, Neural Network, Digital Signal Processing, Cloud…

References (41)

Luis Pérez-Lombard *et al.*

‘A Review on buildings energy consumption information

Energy Build (2008)

Tom Hargreaves *et al.*

‘making energy visible: a qualitative field study of how householders interact with feedback from smart energy monitors’

Energy Policy (2010)

Anton Beloglazov *et al.*
'Energy-Aware Resource Allocation Heuristics for Efficient Management of Data Centers for Cloud Computing'
Future Gener. Computer Syst. (2012)

C. Wong *et al.*
1A 1 V, micro power system-on-chip for vital-sign monitoring in WBNSs

Yano Kazuo *et al.*
Life thermoscope: integrated microelectronics for visualizing hidden life rhythm

X. Xie *et al.*
'A low-power digital IC design inside the wireless endoscopic capsule'
Int. J. solid state circuits (2006)

C.C. Enz
'An ultralow-power wireless sensor network solution'
Int. J. IEEE in computers (2008)

martin Ekstrom
'Small Wireless ECG Bluetooth Communication to a PDA'
M.S. Thesis(2006)

Park, Chulsung &; Chou, (2006), 'An ultra-wearable, wireless, low power ECG monitoring system', IEEE Biomedical...

Lee, Tae-Soo &; Hong, (2007), 'Biomedical Digital Assistant for Ubiquitous Healthcare. Conference proceedings',...

View more references

Cited by (23)

General probability distribution model for wireless body sensors in the medical monitoring system
2022, Biomedical Signal Processing and Control

Show abstract

Experiment of biological pulse sensor and its application in physical education
2021, Microprocessors and Microsystems

Citation Excerpt :

...As a tool to adapt the training plan to the individual athlete, it focuses on estimating energy consumption. Generally speaking, by analysing the players' habits and skills, it looks to obtain a significant advantage [16,17]. This information, direct, tailored to address each player's specific weaknesses, can define daily training....

Show abstract

Medical monitoring system design and treatment of helicobacter pylori gastric ulcer based on sensor network

2021, Microprocessors and Microsystems

Show abstract

Hospital wireless sensor network coverage and ambroxol hydrochloride in the treatment of mycoplasma pneumonia in children

2021, Microprocessors and Microsystems

Citation Excerpt :

...In addition, there are many patients who are allergic to penicillin. At this time, clindamycin plays a role in the treatment of infections caused by aerobic bacteria [15]. Clindamycin in the treatment of anaerobic infection caused by sensitive bacteria also has a very good effect, not only help to reduce the risk of premature delivery of women with gynecological diseases, but also can be a good treatment of toxic shock symptoms....

Show abstract

Hospital sensor network system and rehabilitation nursing of patients with urinary tract infection

2021, Microprocessors and Microsystems

Citation Excerpt :

...Five layers of different temperature detection system after X-ray photoelectron plotter, molecular force, and transfer electron microscope, crystal structure, synthesis, membrane synthesis, membrane microscope. Despite advances in medical and subsequent medical modernization, infected animals' incidence remains high, especially for inpatients [19,20]. This type of skin injury affects the nursing staff's patience and life and is a significant cause of illness....

Show abstract

Service Attack Improvement in Wireless Sensor Network Based on Machine Learning

2021, Microprocessors and Microsystems

Citation Excerpt :

...Functions admirably in a conveyed climate. Gunasegaram and Periakaruppan proposed an interruption recognition model dependent on hereditary calculations to comprehend rest disavowal assaults in remote sensor organizations [19]. The model actualizes an adjusted R.S.A. calculation in a base station to produce and disseminate key sets between sensor hubs....

Show abstract

View all citing articles on Scopus

Recommended articles (6)

Research article

Enhanced packet routing queuing model in optical burst switching network using queue-based dynamic optical route scheduling

Microprocessors and Microsystems, Volume 79, 2020, Article 103296

Show abstract

Research article

Scalable benchmark synthesis for performance evaluation of NoC core mapping

Microprocessors and Microsystems, Volume 79, 2020, Article 103272

Show abstract

Research article

Reconfigurable Superconducting FFT Processor Using Bit-Slice Block Share Processing Unit

Microprocessors and Microsystems, Volume 79, 2020, Article 103297

Show abstract

Research article

Securing VPN from insider and outsider bandwidth flooding attack

Microprocessors and Microsystems, Volume 79, 2020, Article 103279

Show abstract

Research article

A dynamically weighted discrete combination model for all releases of a software system

Microprocessors and Microsystems, Volume 79, 2020, Article 103290

Show abstract

Research article

Performance enhancement in digital hearing aidsystems using tunable filter

Microprocessors and Microsystems, Volume 79, 2020, Article 103294

Show abstract



Dr.P.T.Kalaivaani received her B.E degree in Electronics and Communication Engineering from Periyar University, Salem in 2004. She received her M.E degree from Anna University, Chennai in 2006 . She obtained her Ph.D degree in Information and Communication Engineering from Anna University, Chennai in 2018. She has 13 years of teaching experience. Her areas of research includes Wireless Sensor Networks, Network Security, Digital Image Processing, Neural Network, Digital Signal Processing, Cloud Computing, IoT. She has published many research articles in refereed journals. She is currently working as an Associate Professor & Head in the Department of Electronics and Communication Engineering, Vivekanandha College of Engineering for Women (Autonomous), Tiruchengode, Namakkal, Tamilnadu, India.



Dr. Raja Krishnamoorthi received his B.Tech. degree from Anna University, Chennai, India in 2007, M.Tech. degree from Anna University, Coimbatore, India in 2011 and Ph.D. degree from Anna University, Chennai, India in 2017. His-main area of research activity is VLSI Physical Design, Wireless Sensor Networks and Biomedical Engineering, Cloud Computing, IoT, Digital Image Processing. He has published many research articles in refereed journals. He is currently working as Professor and Research Associate Dean in the Department of Electronics and Communication Engineering at CMR Engineering College, Hyderabad, India.

View full text

© 2020 Elsevier B.V. All rights reserved.

Copyright © 2023 Elsevier B.V. or its licensors or contributors.
ScienceDirect® is a registered trademark of Elsevier B.V.