Wireless sensor networks for personal health monitoring: Issues and an implementation.

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Abstract

Recent technological advances in sensors, low-power integrated circuits, and wireless communications have enabled the design of low-cost, miniature, lightweight, and intelligent physiological sensor nodes. These nodes, capable of sensing, processing, and communicating one or more vital signs, can be seamlessly integrated into wireless personal or body networks (WPANs or WBANs) for health monitoring. These networks promise to revolutionize health care by allowing inexpensive, non-invasive, continuous, ambulatory health monitoring with almost real-time updates of medical records via the Internet. Though a number of ongoing research efforts are focusing on various technical, economic, and social issues, many technical hurdles still need to be resolved in order to have flexible, reliable, secure, and power-efficient WBANs suitable for medical applications. This paper discusses implementation issues and describes the authors' prototype sensor network for health monitoring that utilizes off-the-shelf 802.15.4

compliant network nodes and custom-built motion and heart activity sensors. The paper presents system architecture and hardware and software organization, as well as the authorsâ€™ solutions for time synchronization, power management, and on-chip signal processing.

Keywords

Wireless sensor networks; Health monitoring; Hardware; Software; Signal processing; Time synchronization; Energy efficiency

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Aleksandar Milenkovic is an assistant professor in the Department of Electrical and Computer Engineering at the University of Alabama in Huntsville. He currently directs the LaCASA Laboratory (http://www.ece.uah.edu/~lacasa/). His research interests include advanced architectures for the next generation computing devices, low-power VLSI, reconfigurable computing, embedded systems, and wireless sensor networks. Dr. Milenkovic received his Dipl. Ing., MSc, and PhD degrees in Computer Engineering and Science from the University of Belgrade, Serbia, in 1994, 1997, and 1999, respectively.

Chris Otto is an embedded software engineer at Lewis Innovative Technologies, Inc. in Huntsville, Alabama. His interests include wireless sensor networks, real-time systems, embedded systems and packet voice technologies. Mr. Otto received his BS in Computer Engineering at the University of Alabama in Huntsville in 1999 and is expected to receive his MS in 2006.

Dr. Emil Jovanov is an Associate Professor in the Electrical and Computer Engineering Department at the University of Alabama in Huntsville. He received the Dipl. Ing., MSc, and PhD degrees in electrical and computer engineering from the University of Belgrade. Dr. Jovanov has been developing wireless intelligent sensors for personal health monitoring and mobile computing for more than five years. He was principal investigator or co-investigator on several grants from NSF and industry in the field of wireless sensor networks, wireless intelligent sensors, and wearable health monitors. His research interests include ubiquitous and mobile computing, biomedical signal processing, and telemedical health monitoring. Dr. Jovanov serves as an Associate Editor of IEEE Transaction on Information Technology in Biomedicine and Applied Psychophysiology

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