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"System architecture of a wireless body area sensor network for ubiquitous health monitoring"

Prof, R, Deepa

Assistant professor

Department of ECE

Sri Sai Ram College Of Engineering

Anekal, Bangalore -562106, Karnataka, India

Mail id : deepar.ece@sairamce.edu.in

Mr.Mohan kumar

UG Scholar

Department of ECE

Sri Sai Ram College Of Engineering

Anekal, Bangalore -562106, Karnataka, India

***Abstract*:**

In this paper we present hardware and software architecture of a working wireless sensor network system for ambulatory health status monitoring. The system consists of multiple sensor nodes that monitor body motion and heart activity, network coordinator, and a personal server running on a personal digital assistant or a personal computer.

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1.INTRODUCTION

Recent technological advances in wireless networking, microelectronics integration and miniaturization, sensors, and the Internet allow us to fundamentally modernize and change the way health care services are deployed and delivered. Focus on prevention and early detection of disease or optimal maintenance of chronic conditions promise to augment existing health care systems that are mostly structured and optimized for reacting to crisis and managing illness rather than wellness

2 System Architecture

The proposed wireless body area sensor network for health monitoring integrated into a broader multi-tier telemedicine system is illustrated in Figure 1. The telemedical system spans a network comprised of individual health monitoring systems that connect through the Internet to a medical server tier that resides at the top of this hierarchy.

The top tier, centered on a medical server, is optimized to service hundreds or thousands of individual users, and encompasses a complex network of interconnected services, medical personnel, and healthcare professionals. Each user wears a number of sensor nodes that are strategically placed on her body. The primary functions of these sensor nodes are to unobtrusively sample vital signs and transfer the relevant data to a personal server through

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wireless Each sensor node receives initialization commands and responds to queries from the personal server.

WBAN nodes must satisfy requirements for minimal weight, miniature form-factor, low-power consumption to permit prolonged ubiquitous monitoring, seamless integration into a WBAN, standards based interface protocols, and patient-specific calibration, tuning, and customization. The wireless network nodes can be implemented as tiny patches or incorporated into clothes or shoes. The network nodes continuously collect and process raw information, store them locally, and send processed event notifications to the personal server.

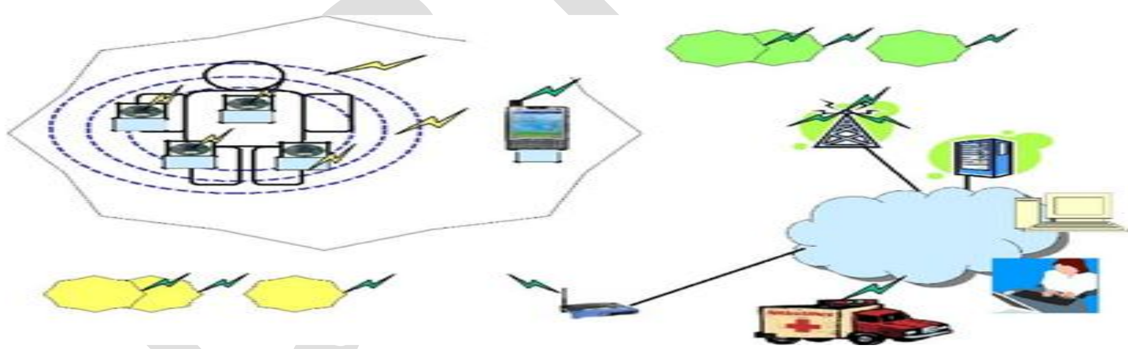
The type and nature of a healthcare application will determine the frequency of relevant events (sampling, processing, storing, and communicating). Ideally, sensors periodically transmit their status and events, therefore significantly reducing power consumption and extending battery life. When local analysis of data is inconclusive or indicates an emergency situation, the upper level in the hierarchy can issue a request to transfer raw signals to the next tier of the network.

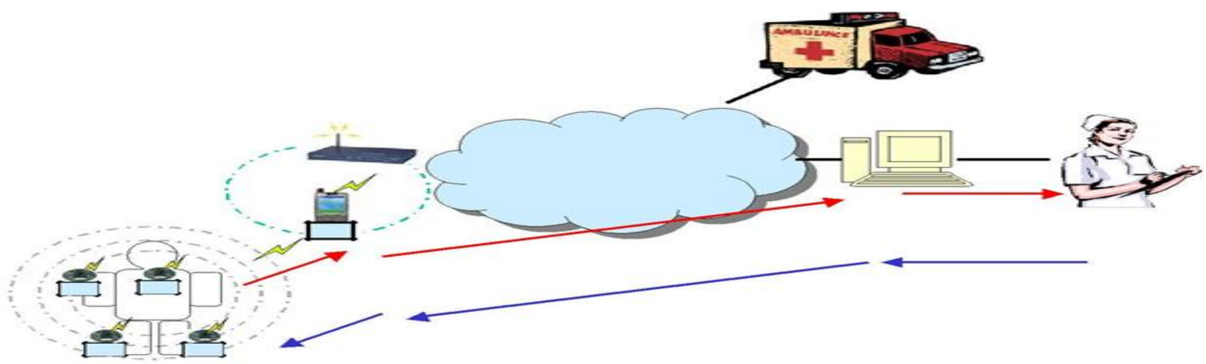
Patient privacy, an outstanding issue and a requirement by law, must be addressed at all tiers in the healthcare system. Data transfers between a user’s personal server and the medical server require encryption of all sensitive information related to the personal health [22]. Before possible integration of the data into research databases, all records must be stripped of all information that can tie it to a particular user.

The limited range of wireless communications partially addresses security within WBAN; however, the messages can be encrypted using either software or hardware techniques. Some wireless sensor platforms have already provided a low power hardware encryption solution for ZigBee communications personal network implemented using ZigBee (802.15.4) or Bluetooth

3 PROPOSED SYSTEM

Template matching





4 Hardware Architecture

In the spirit of the system architecture presented in Section 2, we have developed a prototype healthcare monitoring system. Figure 3 shows a photograph of the prototype components. The fully operational prototype system includes two activity sensors (ActiS), an integrated ECG and tilt sensor (eActiS), and a personal server. Each sensor node includes a custom application specific board and uses the Tmote sky platform [16] for processing and ZigBee wireless communication. The personal server runs either on a laptop computer or a WLAN/WWAN-enabled handheld PocketPC.

The network coordinator with wireless ZigBee interface is implemented on another Tmote sky that connects to the personal server through a USB interface. For an alternative setting we have developed a custom network coordinator that features the ZigBee wireless

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interface, an ARM processor, and a compact flash interface to the personal server (Figure 3).

Srows and **Scols** denote the rows and the columns of the search image and **Trows** and **Tcols** denote the rows and the columns of the template image, respectively. In this method the lowest SAD score is the best position of template within the search image.The microcontroller is based around a 16-bit RISC core integrated with 10 KB of RAM and 48 KB of flash memory, analog and digital peripherals, and a flexible clock subsystem.

5 Software Architecture

In this section we describe the software architecture of the prototype WBAN system, illustrated in Figure 4. It encompasses software modules running on the IAS/ISMP, the Tmote sky platform, the network coordinator, and the personal server. Our focus has been on developing solutions for real-time on-sensor processing, WBAN communications, time synchronization [16], maximizing battery life [13], managing data and events, and an easy to use user interface. These issues relate to the lower tiers of the network, and as such we describe our prototype software for the WBAN.

5.1 Sensor Node Software

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The sensor node software samples and collects physiological data, analyzes the signals in real-time, and transmits the results wirelessly to the personal server. In our prototype this software runs on the Tmote sky platform and custom application specific daughter cards.

We have developed software for two types of sensors. An Activity Sensor (ActiS) samples three-axis accelerometers to determine orientation, type of activity (walking, sitting, etc.), estimates activity induced energy expenditure (AEE) based on an algorithm proposed by Bouten, et. al. [1],

and performs step detection in real-time. An ECG and tilt sensor (eActiS) monitors heart activity and samples a two-axis accelerometer for orientation (upper body tilt). Sensor node and network coordinator software is implemented in the TinyOS environment.

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Real-time Data Capture

Although all sensors in our system perform on-sensor processing and event detection, there are events where processed and summary events are not sufficient and real-time raw signal capture is necessary. During development, it was invaluable to be able to monitor sensor data in real-time. For heart rate sensors we implemented a single graphical ECG trace; for motion sensors we implemented three traces representing x, y, and z acceleration components on the same graph, as represented in Figure 9. This captured data is also stored to a file and can be analyzed off-line to improve step detection algorithms. In most cases, the algorithms were first developed on sample data sets previously recorded. When the algorithms worked well on the sample data sets, they were then implemented on the embedded sensors to run in real-time.

6 Conclusion

WBAN systems that monitor vital signs promise ubiquitous, yet affordable health monitoring. We believe that WBAN systems will allow a dramatic shift in the way people think about and manage their health – in the same fashion the Internet has changed the way people communicate to each other and search for information. This shift toward more proactive preventive healthcare will not only improve the quality of life, but will also reduce healthcare costs.

References

1. Bouten, C.V.C., Koekkoek, K.T.M., Verduin, M., Kodde, R., and Janssen, J.D., A Triaxial Accelerometer and Portable Data Processing Unit for the Assessment of Daily Physical Activity. in IEEE Transactions On Biomedical Engineering, 44 (3). March 1997. 136-147.
2. CardioLabs, http://www.cardiolabs.com, last accessed December 2005.
3. CardioNet, http://www.cardionet.com, last accessed December 2005.
4. Cox, D., Jovanov, E., and Milenkovic, A., Time Synchronization for ZigBee Networks. in Proceedings of the 37th SSST, (Tuskegee, U.S.A., 2005).
5. DeVaul, R.W., Sung, M., Gips, J., and Pentland, S., MIThril 2003: Applications and Architecture. In Proceedings of ISWC 2003, (White Plains, U.S.A., 2003).
6. Dishman, E., Inventing Wellness Systems for Aging in Place. in IEEE Computer, 37 (5). May 2004. 34-41.
7. Istepanian, R.S.H., Jovanov, E., and Zhang, Y.T., Guest Editorial Introduction to the Special Section on M-Health: Beyond Seamless Mobility and Global Wireless Health-Care Connectivity. in IEEE Transactions on Information Technology in Biomedicine, 8(4). December 2004. 405 - 414.
8. Jovanov, E., Milenkovic, A., Otto, C., and de Groen, P.C., A Wireless Body Area Network of Intelligent Motion Sensors for Computer Assisted Physical Rehabilitation. in Journal of NeuroEngineering and Rehabilitation, 2 (6). Marc