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Research Paper

Heart Rate Monitoring Using Wireless Sensors

Engineering

KEYWORDS : Body sensor network, electrocardiogram (ECG), Electromyografic (EMG) noise, Micro controller, Zigbee, UART.

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ABSTRACT

Electrocardiograms are widely used in biomedical signal processing to diagnose abnormal heart functioning. Many algorithms have been constructed to analyse, measure and compress these signals. These methods are hard to test because real ECG signals are distorted by several types of noise. Embedded technology can be found inside everything from computerized fitness equipment to lifesaving medical monitoring devices. Practitioners rely on these systems to administer proactive care including exercise and fitness programs, as well as point-of-care diagnostics, treatment and record-keeping. At Affinity Medical Technologies, our passion is remarkably simple: to design and manufacture interconnect products and systems of the highest quality. Affinity is recognized for its expertise in over molded Cable Design and Development of Patient Monitoring Cable Assemblies, ECG Cables, Low Noise Lead wires and Custom Engineered Connector solutions. Affinity is continually improving its Engineering Technology, materials expertise and Manufacturing processes to meet the dynamic needs of our customers.

I. Introduction

In this paper, using ECG, Vibration sensor, and Eye blink & Force sensor with the help of this sensor we continuously scan and monitor the health condition of driver's health. ECG is used for to monitor the heart beat rate, as like weather he is drowsy or be active which is detected by the Eye blink sensor. By using Force sensor exactly we can detect either he is drug injected or not .when these parameter is detected & cross the threshold value, then automatically motor the vehicle will shut down while driving.

II. Wireless health monitoring system-Transmission section

Now a days we are able to monitor the health condition of a patient by using ECG, echo cardio gram etc in stationary condition for example bed monitoring for old people.The drawback in ECG acquisition system is it usually require the use of several cables and electrodes, sometimes we are using conducting gel to increase the contact.The additional drawback is unable to transmit or store digitalized data. Three parameters representing motion detected by vibration monitors are displacement, velocity, and acceleration.

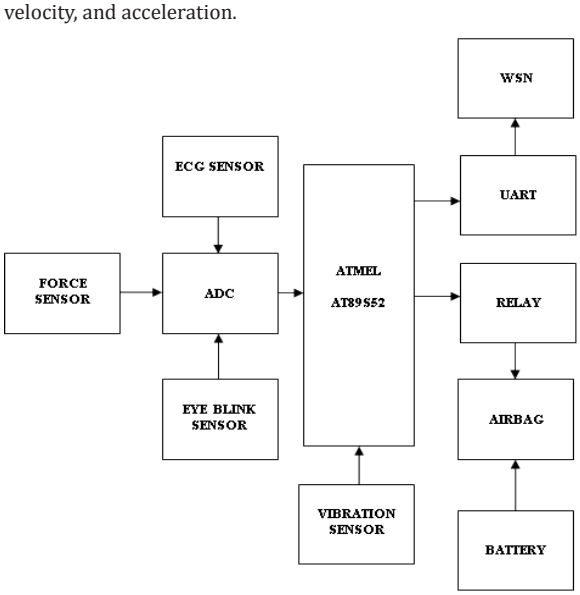

Fig.1: Transmission section- *Block diagram*

***a) Micro controller*:**

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the Indus-try-standard 80C51 instruction set and pin out.

The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory pro-grammer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.

***b) ECG sensor*:**

The design of low power low voltage signal processing circuits for ECG sensor. The development of computationally efficient signal processing algorithm for reducing noises and motion artifact in the wearable ECG sensor.

The electrocardiogram (ECG or EKG) is a diagnostic tool that measures and records the electrical activity of the heart in exquisite detail. Interpretation of these details allows diagnosis of a wide range of heart conditions. These conditions can vary from minor to life threatening.

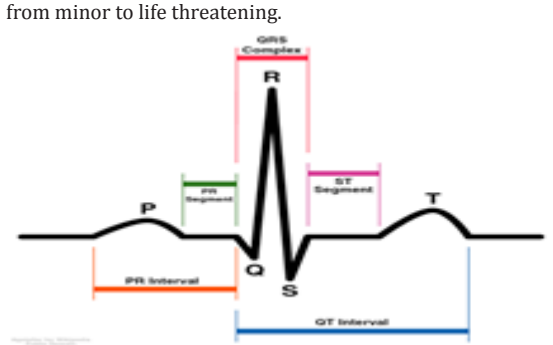

Fig 2: Schematic representation of ECG Signal

***c) Eye blink sensor*:**

Eye ball sensor is a sensor which is used to sense the movement of eye. Eyeball Sensor which is a chip of a hands free pointing device and Telemedicine System (TS) which is remote diagnosis and data transmitting system. Technical Field The present invention relates to an eye tracker which does not require peripheral devices through imaging process of a user's eye images, can be implemented using a single chip and can perform an image processing of a pixel level, thereby ensuring high operating speed.

***d) Vibration Sensor*:**

A piezoelectric sensor is a device that uses the piezoelectric effect to measure pressure, acceleration, strain or force by converting them to an electrical signal.Piezoelectric sensors have proven to be versatile tools for the measurement of various

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processes. They are used for quality assurance, process control and for research and development in many different industries.

e) Force sensor:
Many force transducers employ an elastic load-bearing element or combination of elements. Application of force to the elastic element causes it to deflect and this deflection is then sensed by a secondary transducer which converts it into a measurable output.

Fig 3: Photograph of force sensor

III. Wireless health monitoring system- Receiver section
At the receiver section, the rceived information from the driver monitoring syste shall be tested and stops the vehicle automatically.

Fig 4: Block diagram of receiver section

a) Zigbee
ZigBee is a specification for a suite of high level communication protocols using small, low-power digital radios based on the IEEE 802.15.4-2003 standard for wireless personal area networks (WPANs), such as wireless headphones connecting with cell phones via short-range radio. The technology defined by the ZigBee specification is intended to be simpler and less expensive than other WPANs, such as Bluetooth. ZigBee is targeted at radio-frequency (RF) applications that require a low data rate, long battery life, and secure networking.

b) UART:
The Universal Asynchronous Receiver/Transmitter (UART) controller is the key component of the serial communications subsystem of a computer. The UART takes bytes of data and transmits the individual bits in a sequential fashion. At the destination, a second UART re-assembles the bits into complete bytes. Serial transmission of digital information (bits) through a single wire or other medium is much more cost effective than parallel transmission through multiple wires. A UART is used to convert the transmitted information between its sequential and parallel form at each end of the link. Each UART contains a shift register which is the fundamental method of conversion between serial and parallel forms.

C) MAX232:
The MAX232 is an integrated circuit that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals

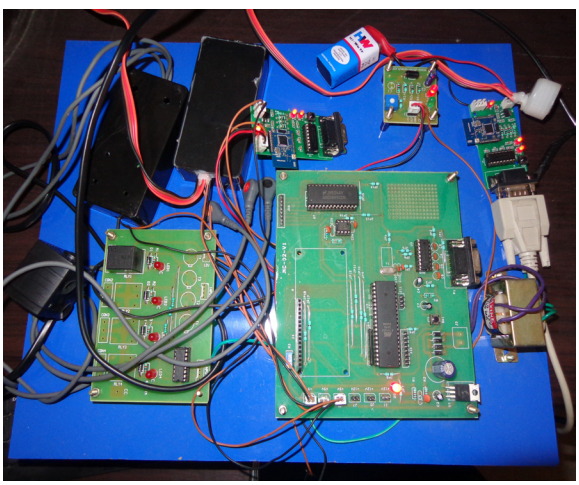

Fig 5: Photograph of heart rate monitoring monitoring system

IV. Simulation Results
The programs of the microcontroller have been written in Embedded C language and were compiled using KEIL, a compiler used for microcontroller programming. The communication between PC and the microcontroller was established MAX 232 standard and those programs were also done in C language.

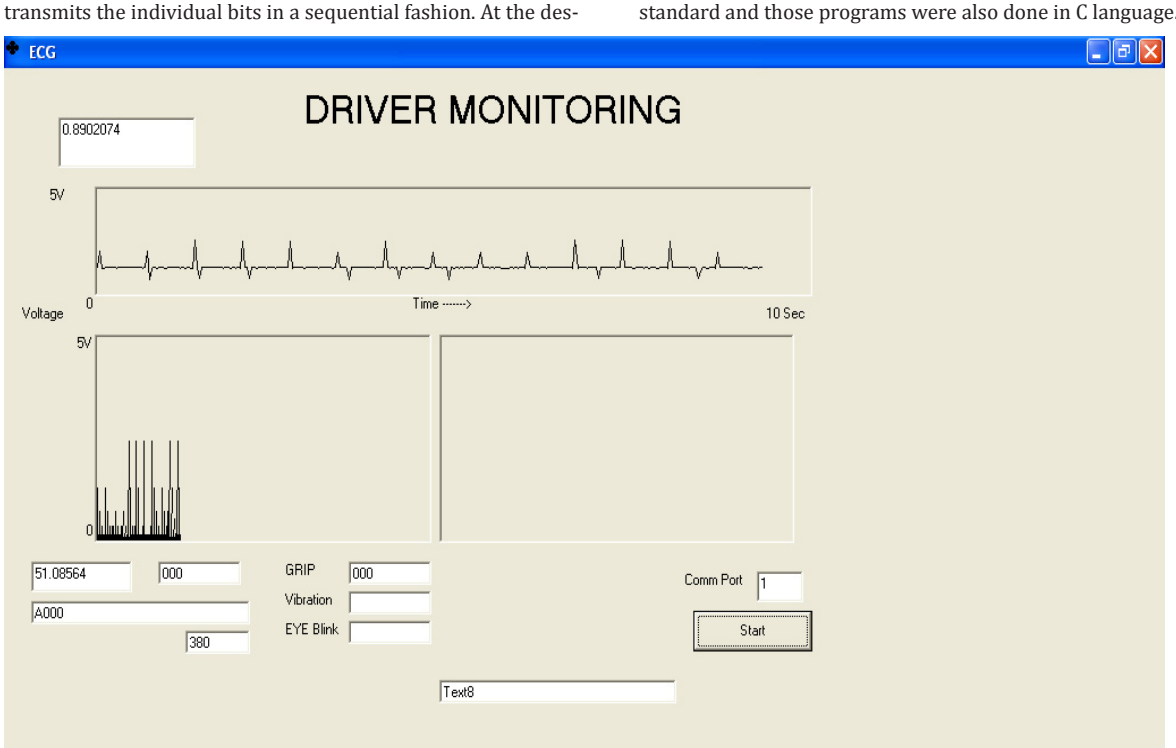

Fig 6: Simulation result of driver monitoring system

V. Conclusion

The hardware and software design of a wireless health monitoring system for induction machine is presented in this paper. Vibration signals have been analyzed to detect the mechanical faults. The implementations of analysis technique in time and frequency domain are given. The proposed rotor imbalance detection technique is verified with different level of severity. Rotor imbalance indicator can be used to estimate the range of severity level which is very useful part of the predictive maintenance. The wireless health monitoring system is tested under various operating conditions and is found to work satisfactorily.

REFERENCE

[1] Chen Xijun, Max Q.-H Meng, Ren Hongliang, "Design of Sensor Node Platform forWireless Biomedical Sensor Network", Proceedings of IEEE 27th Annual Conference Engineering in Medicine and Biology, Shanghai, China, September 1-4, 2005 | [2] David Malan, Thaddeus Fulford-Jones, Matt Welsh, Steve Moulton, "Codeblue: An Ad-hoc Sensor Network Infrastructure for Emergency Medical Care", International Workshop on Wearable and Implantable Body Sensor Networks, April 2004. | [3] J. Muhlsteff, O. Such, R. Schmidt, M. Perkuhn, H. Reiter, J. Lauter, J. Thijs, G. Musch, M.Harris, Wearable Approach for Continuous ECG – and Activity Patient-Monitoring, Proceedings of IEEE 26th Annual Conference Engineering in Medicine and Biology, September 2004 | [4] XBEE OEM RF modules, Product manual v1.xax-802.15.4 Protocol MaxStream.Inc, (2006.10.13), www.maxstream.net | [5] Charles E. Perkins, Elizabeth M. Royer, Ad-hoc On-Demand Distance Vector Routing, Proceedings of the 2nd IEEE Workshop on Mobile Computing Systems and Applications, New Orleans, LA, February 1999, pp. 90-100 | [6] EU Ageing Working Group, Brussels, Belgium, "The 2009 Ageing Report: Economic and budgetary projections for the EU-27 Member States (2008–2060)—ECFIN—European Commission," 2009. | [7] V. Nopparat and P. Keeratiwintakorn, "The three - lead wireless ECG in sensor networks for mobile patients," in Proc. SICE Annu. Conf., 2008, pp. 2308–2311. | [8] D. Bansal, M. Khan, and A. K. Salhan, "A computer based wireless system for online acquisition, monitoring and digital processing of ECG waveforms," Comput. Biol. Med., vol. 39, pp. 361–367, 2009, 4. | [9] C. Lin, K. Chang, C. Lin, C. Chiang, S. Lu, S. Chang, B. Lin, H. Liang, R. Chen, Y. Lee, and L.Ko, "An intelligent telecardiology system using a wearable and wireless ECG to detect atrial fibrillation," IEEE Trans. Inf. Technol. B., vol. 14, no. 3, pp. 726–733, May 2010. | [10] H.Wang, D. Peng, W. Wang, H. Sharif, H. Chen, and A. Khoynezhad, "Resource-aware secure ECG healthcare monitoring through body sensor networks," IEEE Wirel. Commun, vol. 17, no. 1, pp. 12–19, Feb. 2010.