www.ijecs.in
International Journal Of Engineering And Computer Science ISSN:2319-7242
Volume – 4 Issue - 12 December, 2015 Page No. 15334-15340

NOVEL INDUSTRIAL WIRELESS SENSOR NETWORK FOR MACHINE CONDITION MONITORING

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Abstract

The main aim of this project is to monitor the faults in a motor by wireless communication. In our proposal a solution to both electrical and mechanical based faults in an industrial machine is obtained based on WSN. The industrial machine model and its various types of faults are analyzed using a ARM9 LPC2929 processor. Although tremendous progress made in the past years still lot of problems needs to be resolved and the existing system based on the WSNs are short distance communication and need human interaction. The proposed system has capability to resolve all the issues which happen in the existing methods and proposed method offers long distance communication, safe operation, maintenance of time and increased operation reliability.

KEYWORDS: WSN, Fault diagnose, Industrial machine, ARM9 LPC2929 processor

I. INTRODUCTION

Although tremendous progress has been made in the past years still designing an efficient routing algorithms is concerned area in the wireless communications networks which is based on the sensors. Generally these sensor nodes acts as medium between two or more entities to create a wireless sensor network to pass the information between them and technically these are called as routing algorithms. The important points about the sensor nodes are as follows

The power plays a crucial role in any wireless communication and especially in the wireless sensor networks power plays a prominent role and to generate the power usage of batteries are done in the WSNs. The batteries used are non replaceable and non-rechargeable in the applications which are operating based on the sensors based networks. Although a conventional sensor node operates in the general mode but the sensor modes in the advance applications are mostly works in the unattended mode. In all sensor nodes the prominent energy dissipation factor is radio communication. The research on the sensors nodes are carried out in international level to create an approach which is simple and consumes less power.

History of Wireless Sensor Networks

To understand the tradeoffs in today's WSNs, it is helpful to briefly examine their history. Like many advanced technologies, the origin of WSNs can be seen in military and heavy industrial applications, far removed from the light industrial and consumer WSN applications that are prevalent today. The first wireless network that bore any real resemblance to a modern WSN is the Sound Surveillance System (SOSUS), developed by the United States Military in the 1950s to detect and track Soviet submarines. This network used submerged acoustic sensors – hydrophones – distributed in the Atlantic and Pacific oceans. This sensing technology is still in service today, and serving more peaceful functions of monitoring undersea wildlife and volcanic activity.

Echoing the investments made in the 1960s and 1970s to develop the hardware for today's Internet, the United States Defence Advanced Research Projects Agency (DARPA) started the Distributed Sensor Network (DSN) program in 1980 to formally explore the challenges in implementing distributed/wireless sensor networks. With the birth of DSN and its progression into academia through partnering universities such as Carnegie Mellon University and the Massachusetts Institute of Technology Lincoln Labs, WSN technology soon found a home in academia and civilian scientific research.

Governments and universities eventually began using WSNs in applications such as air quality monitoring, forest fire detection, natural disaster prevention, weather stations and structural monitoring. Then as engineering students made their way into the corporate world of technology giants of the day, such as IBM and Bell Labs, they began promoting the use of WSNs in heavy industrial applications such as power distribution, waste-water treatment and specialized factory automation. While the market demand for WSNs was strong, moving beyond these limited applications proved to be a challenge. The military, science/technology and heavy industrial applications of previous decades were all based on bulky, expensive sensors and proprietary networking protocols. These WSNs placed a premium on functionality and performance, while other factors such as hardware and deployment costs, networking standards, power consumption and scalability fell to the wayside. The combination of high cost and low volume prevented the widespread adoption and deployment of WSNs into a broader range of applications.

II. BACKGROUND

The term 'wireless sensor network' ages from early 1990's and the research work on networks based on wireless sensors are speed up as a result the presence of the wireless sensor network has witnessed in many applications such as security and surveillance, smart grids and advanced energy control mechanisms, etc. The various applications based on the wireless sensor networks are as follows in Fig 2.1

Since interconnection of the different fields in the modern world through one source can share the information in ease and reliable way and wireless sensor network are broadly classified into two segments namely data acquisition and data distribution.

Since the prominence of the wireless sensor networks has been increased in recent years and on the other hand rigorous research work has been carried out to design an efficient wireless sensor network which can meet the all practical requirements in a quipped way. Generally the term sensor is technically defined as it is an entity which has capability to detect the input and as well as good ability to respond to the input, the respective input

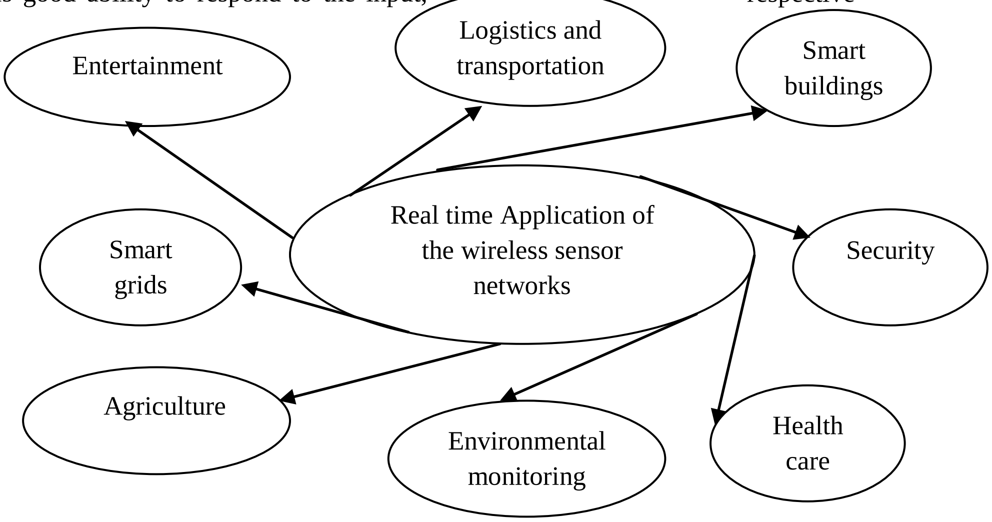


Figure 2.1: Applications of wireless sensor networks

can be in terms physical and as well as environmental conditions such as heat source, light source etc. The output of the respective sensory network is in the form of electrical signal and for the better efficiency and performance the acquired electrical signal is transmitted to a controller.

Wireless Sensor Networks (WSNS)

The wireless sensor networks design is reliable in nature and the main intention of WSN is to interconnect the different fields to share the information in ease and reliable way. Generally the WSN is technically defined as a group of devices communicate with each other through the wireless links and the gathered information which are used to communication acquired from the monitor field.

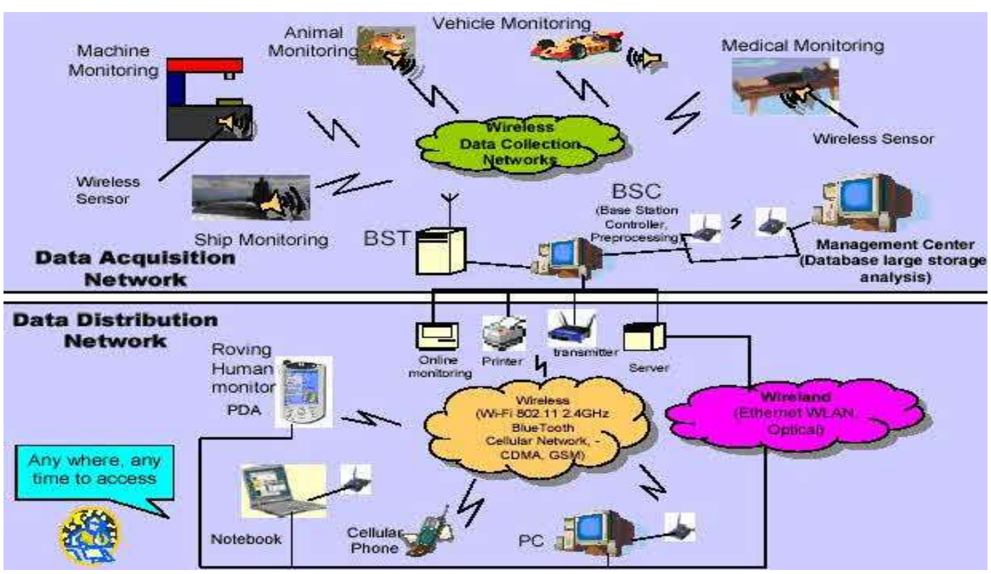


Figure 2.2: Wireless sensor networks

The data used for communication in Wireless sensor networks between two entities is performed through multiple nodes and the respective communication is performed within a gateway. The data network is connected to its respective neighbors like same as wireless Ethernet. Generally the wireless Ethernet is good example of wireless network providing to the different locations which are commonly used in offices and academia.

Generally WSN is defined as advanced wireless communication arena which is mainly comprises of base stations to transmit the information to different locations from the main network and the sensor nodes at other end to create the network between the main station and the respective base stations.

III. LITERATURE SURVEY

(1) In literature large amount of research has performed on the wireless communications especially on wireless sensor networks. Recently a novel work on the wireless senor networks (WSNs) has been proposed **by K. PADMANABHAN AND P. KAMALAKKANNAN** (1) on energy routing protocols in the wireless senor networks (WSNs) and the proposed work in this paper are mainly relies on the concept that once used sensor networks cannot be used again for the adhoc networks. The reason behind this is that battery powered nodes has that unique behavior. The sensor nodes have some components namely capacity in terms of storage, limited energy and power consumption**.**

(2) An innovative routing algorithm is proposed by **P.KRISHNAVENI AND DR.J.SUTHA (2)** which mainly shows the how effectively one can utilize sensor node which is also called as sink node for accurate communication. The main drawback faced in the previous approaches is collecting data from m different sensor nodes and send it to the sink nodes. All the data which transmitted from the sensor nodes to the sink nodes is calculated at the sink nodes to check the accuracy.

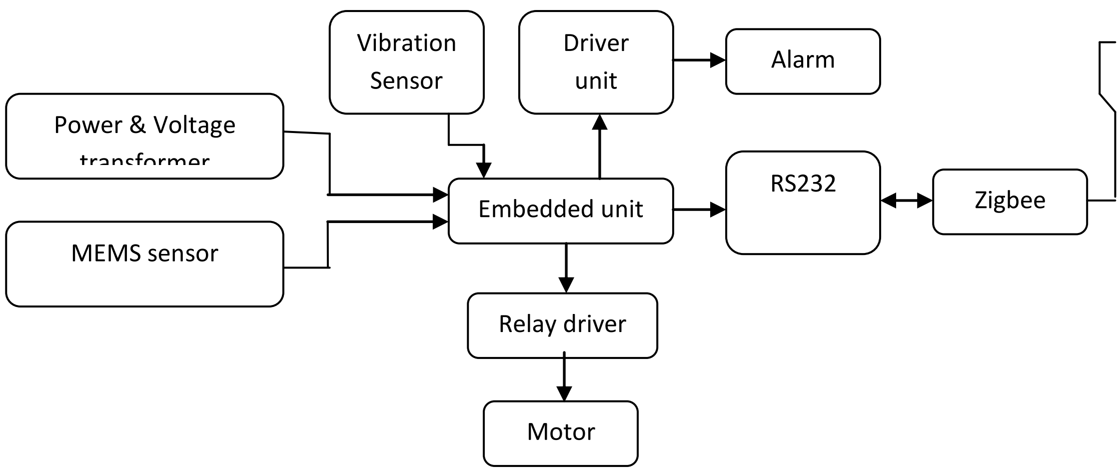
(3) The works which are proposed in the past are based on the direct communication protocol, low energy transmission protocols and static protocols in terms of communication. A novel approach namely LEACH in terms of wireless communication network is proposed with internal built hierarchy routing protocol by **WANG WEICHAO, DU FEI AND XU QIJIAN (3**). But the LEACH algorithm too has some drawbacks which is addressed in this paper efficiently.

(4) A work namely Modify LEACH Algorithm for Wireless Sensor Network is proposed by **MORTAZA FAHIMI KHATON ABAD AND MOHAMMAD ALI JABRAEIL JAMALI**. In this work a novel clustering algorithm based on the LEACH protocol. The LEACH (Low Energy Adaptive Clustering Hierarchy) is a cluster-based structure which uses a mechanism namely TDMA based MAC protocol and its main motto is to create an reliable balancing approach in the Wireless Sensor Network. This method also discusses the routing problems in detail and also implements Sensor Protocols for Information via Negotiation (SPIN) and Directed Diffusion in the LEACH (Low Energy Adaptive Clustering Hierarchy) protocol.

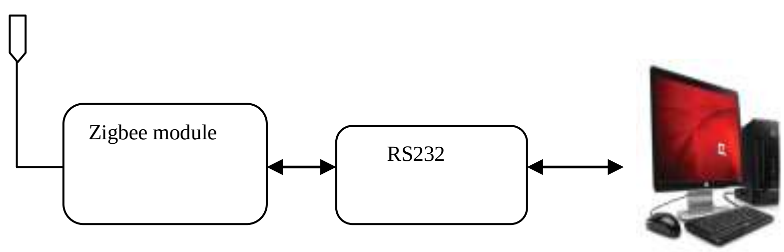
(5) The three important criterions namely long battery life, reliable load balancing mechanism and scalability. The key issue in the wireless sensor networks is the lifetime of the network which is used as key factor to all applications used in the network to communicate with each other to transfer the information to the base station from the sensor nodes which are deployed in the target region in large numbers. An optimized approach is proposed by **AMAR PRAKASH AZAD** in order to enhance the network lifetime based on the norms and characteristics of the three important criterions namely long battery life, reliable load balancing mechanism and scalability

IV. PROPOSED METHOD

A. Induction node



B. Control Node



4.1 Description of Block Diagram

In an objective of a solution to both electrical and mechanical based faults in an industrial machine analog, digital and WSN based techniques are used. The industrial machine model and its various types of faults are analyzed using a ARM9 LPC2929 processor. The signal data corresponding to the working condition can be taken out through the on-chip peripherals of the processor. The processor section has a data acquisition unit. After reading, these values will be transferred to the PC through the serial transmission technique.

Various sensing parameters are attached to the processor section. To identify the tilting position of the angle, micro electro mechanical sensor is used in the project. Any unbalanced condition of the machine can be identified by this section. A CT PT arrangement in the project application helps to identify the problem occurring in the power line of the load. In case of any voltage failure or fluctuation, the intimation will be passed to the control room through the serial communication. Load pressure or device fix condition can be identified from the pressure sensor of piezo electric material. Overall , this application can be used in any industrial sector for any motor , AC load or DC load monitor purpose.

V. RESULTS

5.1 Snapshots OF Project

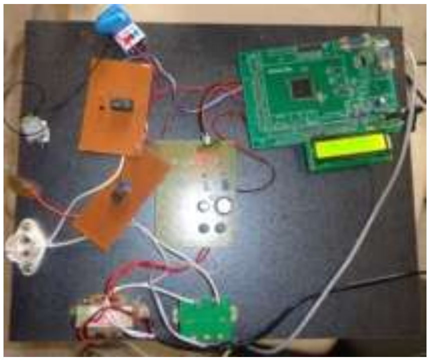


Fig 5.1: picture of project

The above picture shows the hardware components used in the Industrial Application

5.2.Output of the project

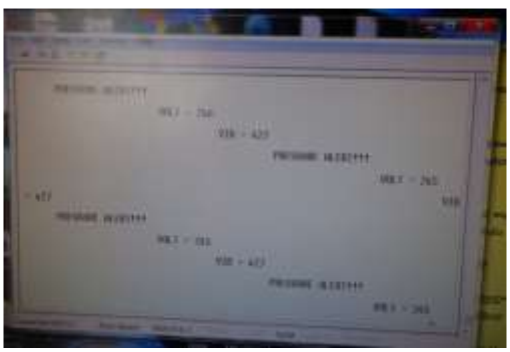


Fig 5.2: Output of the project

The above picture shows the output obtained on the screen after implementing the project

VI CONCLUSION

CONCLUSION

To diagnose the various types of fault, generally occurred in Industrial motor based machines, this paper describes a monitoring and analysis system. In our proposal , a solution to both electrical and mechanical based faults in an industrial machine is obtained based on WSN. Various sensing parameters are attached to the processor section. The processor section has a data acquisition unit. After reading, these values will be transferred to the PC through the serial transmission technique. Overall , this application can be used in any industrial sector for any motor , AC load or DC load monitor purpose.

Future Scope

This project developed is designed to be of assistance for industrial purpose. This project can be enhanced in future with further increase in speed, accuracy, and range of applications. WSN technology could become applicable to heavier industries and could thereby engage the interest and resources of private industry. Some of them are Industrial application, Home applications, Monitoring device applications and Remote control applications.

REFERENCES

[1] F. Salvadori, M. de Campos, P. S. Sausen, R. F. de Camargo, C. Gehrke, C. Rech, M. A. Spohn, and A. C. Oliveira, "Monitoring in industrial systems using wireless sensor network with dynamic power management," *IEEE Trans. Instrum. Meas.*, vol. 58, no. 9, pp. 3104–3111, Sep. 2009.

[2] L. Bin and V. C. Gungor, "Online and remote motor energy monitoring and fault diagnostics using

wireless sensor networks," *IEEE Trans. Ind. Electron.*, vol. 56, no. 11, pp. 4651–4659, Nov. 2009.
[3] G. Shafer, *A Mathematical Theory of Evidence*. Princeton, NJ: Princeton Univ. Press, 1976.
[4] L. A. Klein, *Sensor and Data Fusion Concepts and Applications*. Washington, DC: SPIE Opt. Eng. Press, 1993.
[5] R. B. Randall, *Vibration-Based Condition Monitoring: Industrial, Aerospace and Automotive Applications*. Chichester, U.K.: Wiley, 2011.
[6] *JN5139 Wireless Microcontroller*, [accessed Aug. 23, 2010]. [Online]. Available: http://www.jennic.com/products/wireless_microcontrollers/ jn5139
[7] A. Flammini, D. Marioli, E. Sisinni, and A. Taroni, "Design and implementation of a wireless fieldbus for plastic machineries," *IEEE Trans. Ind.Electron.*, vol. 56, no. 3, pp. 747–755, Mar. 2009.
[8] A. Tiwari, P. Ballal, and F. L. Lewis, "Energy-efficient wireless sensor network design and implementation for condition-based maintenance,"*ACM Trans. Sensor Netw.*, vol. 3, no. 1, p. 23, Mar. 2007.
[9] F. Salvadori, M. de Campos, P. S. Sausen, R. F. de Camargo, C. Gehrke,C. Rech, M. A. Spohn, and A. C. Oliveira, "Monitoring in industrial systems using wireless sensor network with dynamic power management," *IEEE Trans. Instrum. Meas.*, vol. 58, no. 9, pp. 3104–3111, Sep. 2009.
[10] L. Bin and V. C. Gungor, "Online and remote motor energy monitoringand fault diagnostics using wireless sensor networks,"*IEEE Trans.*
, Nov. 2009.