RESEARCH ARTICLE

INDUSTRIAL PARAMETERS MONITORING USING SCADA AND WIRELESS NETWORK

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ARTICLE INFO	ABSTRACT
	Almost all the Industrial Data Acquisition and control systems today use connection oriented concepts for interfaces. However, the variety of physical shapes and functional commands that each cable or wire based system has also raises numerous problems the difficulties in locating the particular area affected by the industrial parameter, the complexity in operation of the system, the maintenance issue and so on. The control of sensitive industrial parameters by using SCADA-based wireless technology has gained significant industry and academic attention lately for the usability benefits and convenience that it offers users. The control of the Gas, Alcohol, humidity and vibration the existing research has failed to provide a flexible solution for controlling such conditions by connection oriented systems. They have used cables and bulky equipment which require large amount of space, high degree of the maintenance and are easily decorated by moisture and excessive heat. Additionally, the Data acquisition and control techniques used so far have imposed considerable computational burden and have not provided a consistent and accurate results expected by the employees and their industries. The main aim of our project is to concentrate upon the development of an automated setup for the measurement and monitoring of temperature of any industrial environment, for example boilers, refrigerators and heaters etc. Adapting a technology like SCADA (Supervisory Control and Data Acquisition) and ZIG BEE one can achieve the above mentioned objective effectively, and thus saving a lot of manpower.

INTRODUCTION

Supervisory Control and Data Acquisition (SCADA) is a process control system that enables a site operator to monitor and control processes that are distributed among various remote sites. A properly designed SCADA system saves time and money by eliminating the need for service personnel to visit each site for inspection, data collection/logging or make adjustments. Data Acquisition and Control Systems have gained much larger importance in the Industrial field because of the rapid Technological advancement and Security reasons. Whether it is an Industrial workshop, Defense go-down or experimental lab of the power plant accurate monitoring of the parameters is the need of the day. It could be the alcohol, humidity, gas and vibration detecting sensor waiting for our command to provide us with information about the measured parameter of the particular area where they are installed. Advantage of the system is that the engineer or worker not only can obtain accurate data about the industrial parameters in remote area, but also there is no need to be physical present over there.

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The amount of computation required to process the data detected by sensors is much greater than that of the mechanical devices. Many of those approaches have been implemented to focus in detection of the single parameter such as Gas, vibration, humidity and alcohol dedicating the entire system to only one parameters. A gas detector is a device that detects the presence of gases in an area, often as part of a safety system. This type of equipment is used to detect a gas leak and interface with a control system so a process can be automatically shut down. A gas detector can sound an alarm to operators in the area where the leak is occurring, giving them the opportunity to leave. This type of device is important because there are many gases that can be harmful to organic life, such as humans or animals.

Humidity sensor mostly used in places where there is need to control the humidity such as food preservation industries, clothing etc. This capacitive atmospheric humidity sensor consists of a non-conductive foil, which is covered on both sides with a layer of gold. The dielectric constant of the foil changes as a function of the relative humidity of the ambient atmosphere and, accordingly, the capacitance value of the sensor is a measure for relative humidity. This alcohol sensor is suitable for detecting alcohol concentration on your breath, just like your common Breathalyzer.
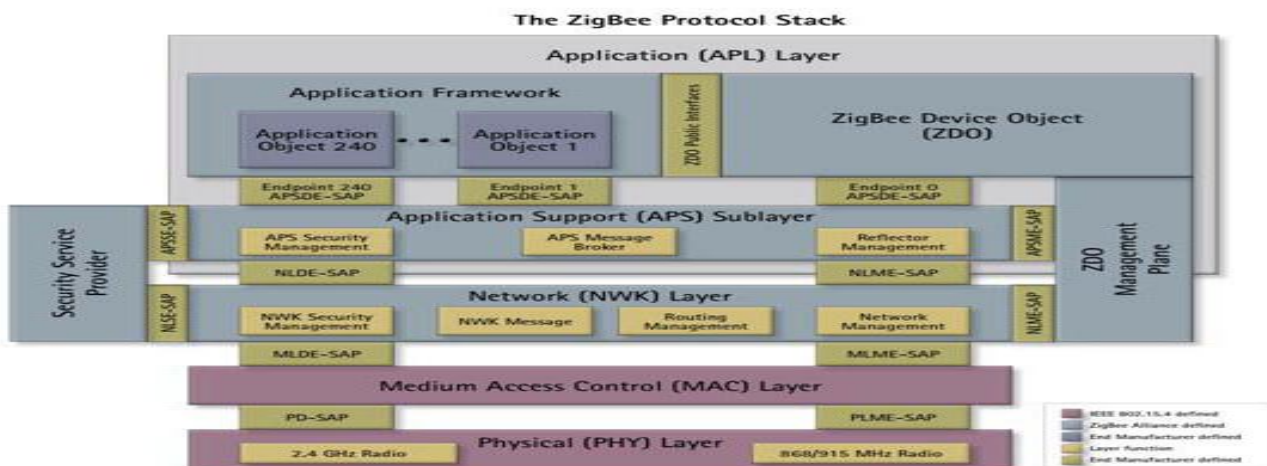
It has a high sensitivity and fast response time. Sensor provides an analog resistive output based on alcohol concentration. The drive circuit is very simple, all it needs is one resistor. A simple interface could be a 0-3.3V ADC. The Mini sense 100 from Measurement Specialties is a low-cost cantilever-type vibration sensor loaded by a mass to offer high sensitivity at low frequencies. Useful for detecting vibration and 'tap' inputs from a user. A small AC and large voltage (up to +/-90V) is created when the film moves back and forth. A simple resistor should get the voltage down to ADC levels. Can also be used for impact sensing or a flexible switch. In the Metals industry, our vibration sensors and 4-20mA vibration transmitters (loop powered sensors) protect key assets, including rolling mills and cooling towers. In Pharmaceuticals, the complete fan and motor assemblies in air handling units are protected by our vibration sensors.

Increasingly, embedded systems developers and system-on-chip designers select specific microprocessor cores and a family of tools, libraries, and off-the-shelf components to quickly develop new microprocessor-based products and applications. ARM is one of the major options available for embedded system developer. Over the last few years, the ARM architecture has become the most pervasive 32-bitarchitecture in the world, with wide range of ICs available from various IC manufacturers. ARM processors are embedded in products ranging from cell/mobile phones to automotive braking systems. A worldwide community of ARM partners and third-party vendors has developed among semiconductor and product design companies, including hardware engineers, system designers, and software developers. ARM7 is one of the widely used micro-controller family in embedded system application. This section is humble effort for explaining basic features of ARM-7.ARM is a family of instruction set architectures for computer processors based on a reduced instruction set computing (RISC) architecture developed by British company ARM Holdings. A RISC-based computer design approach means ARM processors require significantly fewer transistors than typical processors in average computers. This approach reduces costs, heat and power use. These are desirable traits for light, portable, battery-powered devices—including smartphones, laptops, tablet and notepad computers), and other embedded systems. A simpler design facilitates more efficient multi-core CPUs and higher core counts at lower cost, providing higher processing power and improved energy efficiency for servers and supercomputers.

WORKING

ZIGBEE is a wireless technology that is used with microcontroller in many applications like home appliances, agriculture field, robotics etc. ZIGBEE with microcontroller is also used for irrigation purpose where they have used the two modules among them one is sensor module which includes the controller AT89C2051 and that is interfaced with soil moisture sensor and temperature sensor and also with ZIGBEE module. Second module is substation module which includes controller interfaced with LCD, solenoid valves, another ZIGBEE module etc. Sensor module continuously check the status of the sensors attached with that and sends the current status via ZIGBEE to substation module and then substation module compares the status with data stored and take the action according to the predefined program. The system is specified to operate in one of the three license free bands at 2.4 GHz, 915 MHz for North America and 868 MHz for Europe. In this way the standard is able to operate around the globe, although the exact specifications for each of the bands are slightly different. At 2.4 GHz there are a total of sixteen different channels available, and the maximum data rate is 250 kbps. For 915 MHz there are ten channels and the standard supports a maximum data rate of 40 kbps, while at 868 MHz there is only one channel and this can support data transfer at up to 20 kbps. The modulation techniques also vary according to the band in use. Direct sequence spread spectrum (DSSS) is used in all cases. However for the 868 and 915 MHz bands the actual form of modulation is binary phase shift keying. For the 2.4 GHz band, offset quadrature phase shift keying (O-QPSK) is employed.

In view of the fact that systems may operate in heavily congested environments, and in areas where levels of extraneous interference is high, the 802.15.4 specification has incorporated a variety of features to ensure exceedingly reliable operation. These include a quality assessment, receiver energy detection and clear channel assessment. CSMA (Carrier Sense Multiple Access) techniques are used to determine when to transmit, and in this way unnecessary clashes are avoided. The data is transferred in packets. These have a maximum size of 128 bytes, allowing for a maximum payload of 104 bytes. Although this may appear low when compared to other systems, the applications in which 802.15.4 and Zig Bee are likely to be used should not require very high data rates.

The ZigBee Protocol Stack

The standard supports 64 bit IEEE addresses as well as 16 bit short addresses. The 64 bit addresses uniquely identify every device in the same way that devices have a unique IP address. Once a network is set up, the short addresses can be used and this enables over 65000 nodes to be supported. It also has to suppurate the data as per the parameters at receiver and send the data based on the parameter and there address, an optional super frame structure with a method for time synchronization. In addition to this it is recognized that some messages need to be given a high priority. To achieve this, a guaranteed time slot mechanism has been incorporated into the specification. This enables these high priority messages to be sent across the network as swiftly as possible.
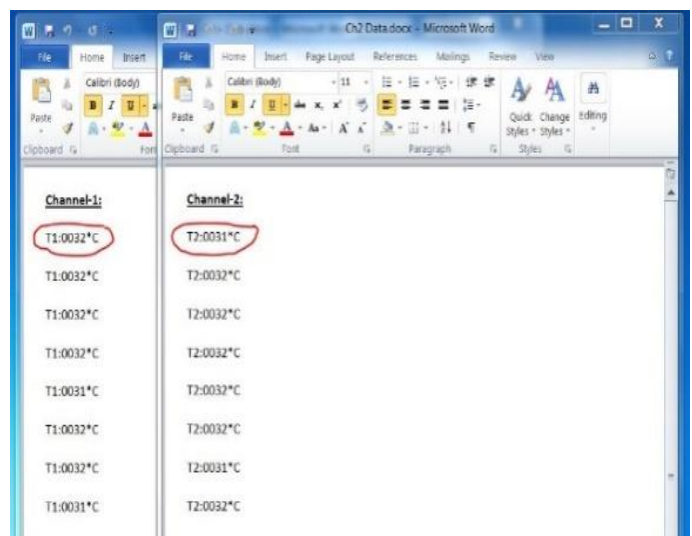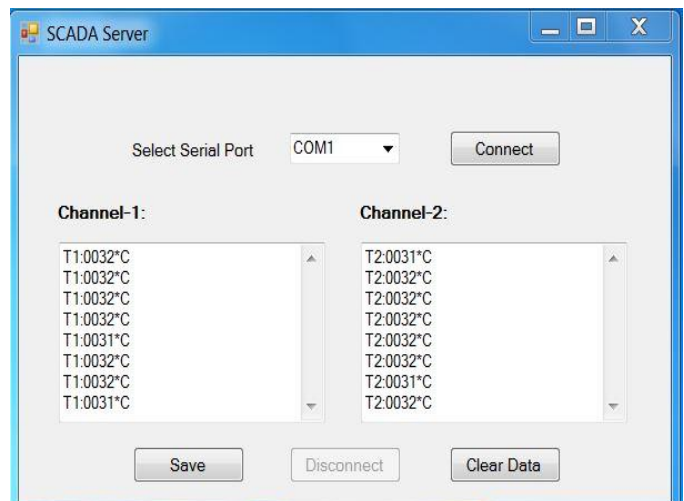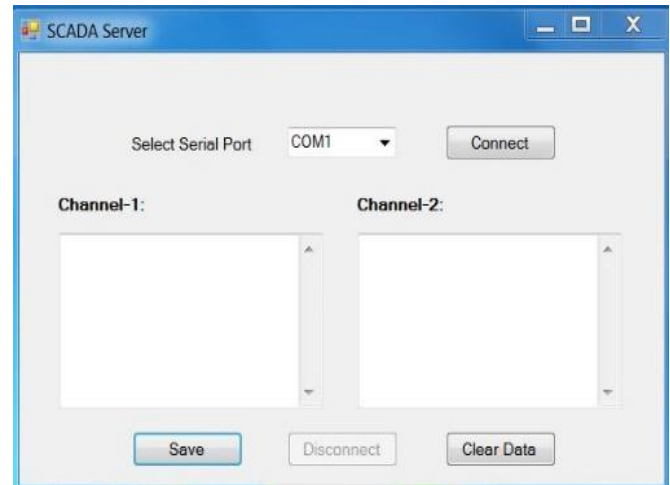
The physical and MAC layers defined by 802.15.4, the Zig Bee standard itself defines the upper layers of the system. This includes many aspects including the messaging, the configurations that can be used, along with security aspects and the application profile layers. There are three different network topologies that are supported by Zig Bee, namely the star, mesh and cluster tree or hybrid networks. Each has its own advantages and can be used to advantage in different situations. The star network is commonly used, having the advantage of simplicity. As the name suggests it is formed in a star configuration with outlying nodes communicating with a central node. Mesh or peer to peer networks enable high degrees of reliability to be obtained.

They consist of a variety of nodes placed as needed, and nodes within range being able to communicate with each other to form a mesh. Messages may be routed across the network using the different stations as relays. There is usually a choice of routes that can be used and this makes the network very robust. If interference is present on one section of a network, then another can be used instead. Finally there is what is known as a cluster tree network. This is essentially a combination of star and mesh topologies. Both 802.15.4 and Zig Bee have been optimized to ensure that low power consumption is a key feature. Although nodes with sensors of control mechanisms towards the center of a network are more likely to have mains power, many towards the extreme may not. The low power design has enabled battery life to be typically measured in years, enabling the network not to require constant maintenance.

RESULTS AND CONCLUSION

This project help to study, a parameter monitoring system for induction machines based on Zig bee protocol is achieved and tested successfully. The system developed is capable to perform such operations as running the motor though RF, stopping it, measuring, monitoring and controlling the most parameters of the industry like alcohol, humidity, gas, vibration All of these values can be transferred to the host computer, displayed on the interface, represented graphically; Monitoring and controlling the basic parameters of the induction motors were examined and achieved in various ways. A new Zig Bee technology is a new wireless protocol is used for the communication. This protocol is widely used various areas for its better reliability, low power consuming profile, excellent Capability, high flexibility and low cost. So

it's significant to embed the Zig Bee protocol into the WSN system that widely applied now in every area. The system achieved can be used for industrial applications. The whole system may be very useful to colleges and research institutes that have vocational, technical, and industrial education.

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