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DATA ACQUISITION SYSTEM FOR INDUSTRIAL APPLICATIONS BASED ON WSN

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ABSTRACT: A sensor interface device is essential for sensor data collection of industrial wireless sensor networks (WSN) in IOT environments. However, the current connect number, sampling rate, and signal types of sensors are generally restricted by the device. Meanwhile, in the Internet of Things (IOT) environment, each sensor connected to the device is required to write complicated and cumbersome data collection program code. Here we are using the RF technology as remote for to controlling or managing the vehicle movements. Remote has the RF transmitter through this transmitter we are transmitting the signal in air based on antenna.in vehicle section RF receiver will receives that signal using antenna and do the operations. In this paper, to solve these problems, a new method is proposed to design a reconfigurable smart sensor interface for industrial WSN in IOT environment, in which complex programmable logic device (CPLD) is adopted as the core controller. Thus, it can read data in parallel and in real time with high speed on multiple different sensor data. The standard of IEEE1451.2 intelligent sensor interface specification is adopted for this design. It comprehensively stipulates the smart sensor hardware and software design framework and relevant interface protocol to realize the intelligent acquisition for common sensors. A new solution is provided for the traditional sensor data acquisitions. The device is combined with the newest CPLD programmable technology and the standard of Zigbee. Performance of the proposed system is verified and good effects are achieved in practical application of IOT to water environment monitoring.

Keywords: *Microcontroller, Sensors, GPRS Module, PC and Zigbee.*

I. INTRODUCTION

Wireless sensor networks (WSN) have been employed to collect data about physical phenomena in various applications such as habitat monitoring, and ocean monitoring, and surveillance. As an emerging technology brought about rapid advances in modern wireless telecommunication, Internet of Things (IoT) has attracted a lot of attention and is expected to bring benefits to numerous application areas including industrial WSN systems, and healthcare systems manufacturing WSN systems are well-suited for long-term industrial environmental data acquisition for IoT representation. Sensor interface device is essential for detecting various kinds of sensor data of industrial WSN in IoT environments. It enables us to acquire sensor data. Thus, we can better understand the outside environment information. However, in order to meet the requirements of long-term industrial environmental data acquisition in the IoT, the acquisition interface device can collect multiple sensor data at the same time, so that more accurate and diverse data information can be collected from industrial WSN. With rapid development of IoT, major manufacturers are dedicated to the research of multisensor acquisition interface equipment. There are a lot of data acquisitions multiple interface equipments with mature technologies on the market. But these interface devices are very specialized in working style, so they are not individually adaptable to the changing IoT environment. Meanwhile, these universal data acquisition interfaces are often restricted in physical properties of sensors (the connect number, sampling rate, and signal types). Now, micro control unit (MCU) is used as the core controller in mainstream data acquisition interface

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device. MCU has the advantage of low price and low power consumption, which makes it relatively easy to implement. But, it performs a task by way of interrupt, which makes these multisensor acquisition interfaces not really parallel in collecting multisensor data. On the other hand, FPGA/CPLD has unique hardware logic control, real-time performance, and synchronicity, which enable it to achieve parallel acquisition of multisensor data and greatly improve real-time performance of the system. FPGA/CPLD has currently becomes more popular than MCU in multisensor data acquisition in IoT environment. However, in IoT environment, different industrial WSNs involve a lot of complex and diverse sensors. At the same time, each sensor has its own requirements for readout and different users have their own applications that require different types of sensors. It leads to the necessity of writing complex and cumbersome sensor driver code and data collection procedures for every sensor newly connected to interface device, which brings many challenges to the researches.

II. HARDWARE SYSTEM

Micro controller: This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

ARM7TDMI: ARM is the abbreviation of Advanced reduced instruction set computing Machines, it's the name of a class of processors, and is that the name of a form technology too. The reduced instruction set computing instruction set, and related decode mechanism are much simpler than those of complex Instruction Set computer (CISC) designs.

Liquid-crystal display (LCD) is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals don't emit light directly. LCDs are available to display arbitrary pictures or fixed pictures which can be displayed or hidden, like preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

BLOCK DIAGRAM:

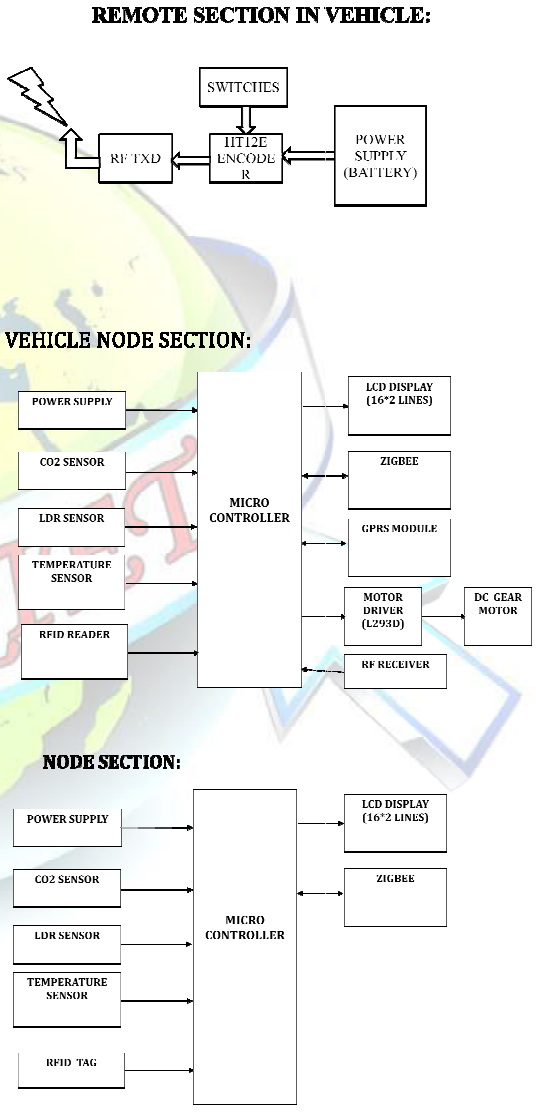

Fig.1. Block diagram

The proposed system describes the development of a wireless industrial environment measuring temperature and light detection. Where the wireless

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connection is implemented to acquire data from the various sensors, in addition to allow set up difficulty to be as reduced. By using 2G, 3G, 4G network of GPRS technology we send the sensors data to authorized web server.

III. METHODOLOGY

ZIGBEE:

Zigbee modules feature a UART interface, which allows any microcontroller or microprocessor to immediately use the services of the Zigbee protocol. All a Zigbee hardware designer has to do in this case is ensure that the host's serial port logic levels are compatible with the XBee's 2.8- to 3.4-V logic levels. The logic level conversion can be performed using either a standard RS-232 IC or logic level translators such as the 74LVTH125 when the host is directly connected to the XBee UART. The X-Bee RF Modules interface to a host device through a logic-level asynchronous Serial port. Through its serial port, the module can communicate with any logic and voltage Compatible UART; or through a level translator to any serial device.

Data is presented to the X-Bee module through its DIN pin, and it must be in the asynchronous serial format, which consists of a start bit, 8 data bits, and a stop bit. Because the input data goes directly into the input of a UART within the X-Bee module, no bit inversions are necessary within the asynchronous serial data stream. All of the required timing and parity checking is automatically taken care of by the X-Bee's UART.

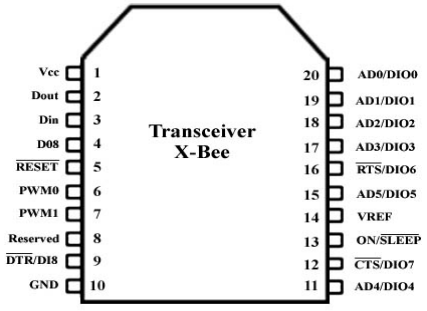

Fig.2: ZIGBEE pin diagram

LDR:

LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1000 000 ohms, but when they are illuminated with light resistance drops dramatically. The animation opposite shows that when the torch is turned on, the resistance of the LDR falls, allowing current to pass through it. This is an example of a light sensor circuit: When the light level is low the resistance of the LDR is high. This Consequently the LED does not light. However, when light shines onto the LDR its resistance falls and current flows into the base of the first transistor and then the second transistor. The LED lights on. The preset resistor can be turned up or down to increase or decrease resistance, in this way it can make the circuit more or less sensitive.

Fig:3:LDR

prevents current from flowing to the base of the transistors.

GAS SENSOR:

- The sensor MQ-3 is Gas/Smoke sensor. It is sensitive to LPG, Hydrogen, Smoke, Methane, Propane, Alcohol, Butane and other industrial combustible gases.
- MQ303A is a semiconductor sensor for Alcohol detection. It has very good sensitivity and fast response to alcohol, suitable for portable alcohol detector.

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Fig:4: GAS sensor

Features:

- High sensitivity
- Fast response and resume
- long life and low cost
- Mini size

THERMISTOR:

The word thermistor is an acronym for thermal resistor, i.e., a temperature sensitive resistor. It is used to detect very small changes in temperature. The variation in temperature is reflected through appreciable variation of the resistance of the device. Thermistor with both negative-temperature-coefficients (NTC) and positive temperature coefficient (PTC) are available, but NTC thermistors are more common. The negative-temperature coefficient means that the resistance increases with the increase in temperature.

Fig.5: Thermistor

RFID TECHNOLOGY:

Radio Frequency Identification (RFID) is a silicon chip-based transponder that communicates via radio waves. Radio Frequency Identification is a technology which uses tags as a component in an integrated supply chain solution set that will evolve over the next several years. RFID tags contain a chip which holds an electronic product code (EPC) number that points to additional data detailing the contents of the package. Readers identify the EPC numbers at a distance, without line-of-sight scanning or involving physical contact. Middleware can perform initial filtering on data from the readers. Applications are evolving to comply with shipping products to automatically processing transactions based on RFID technology RFID Reader Module, are also called as interrogators. They convert radio waves returned from the RFID tag into a form that can be passed on to Controllers, which can make use of it. RFID tags and readers have to be tuned to the same frequency in order to communicate. RFID systems use many different frequencies, but the most common and widely used & supported by our Reader is 125 KHz.

Fig:6: RFID Reader

Tags are classified into two types based on operating power supply fed to it.

1. Active Tags
2. Passive Tags

Active Tags: These tags have integrated batteries for powering the chip. Active Tags are powered by batteries and either have to be recharged, have their batteries replaced or be disposed of when the batteries fail.

Passive Tags: Passive tags are the tags that do not have batteries and have indefinite life expectancies.

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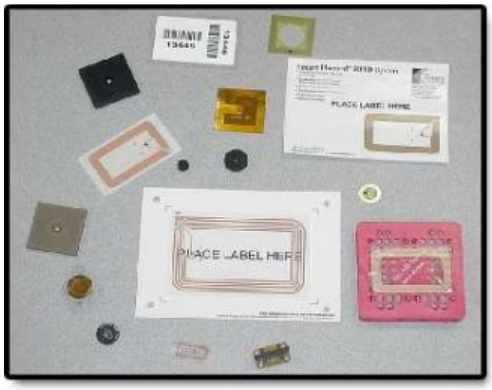

Fig.7: Different types of tags

GPRS MODEM:

GPRS (general packet radio service) is a packet-based data bearer service for wireless communication services that is delivered as a network overlay for GSM, CDMA and TDMA (ANSI-I36) networks. GPRS applies a packet radio principle to transfer user data packets in an efficient way between GSM mobile stations and external packet data networks. Packet switching is where data is split into packets that are transmitted separately and then reassembled at the receiving end. GPRS supports the world's leading packet-based Internet communication protocols, Internet protocol (IP) and X.25, a protocol that is used mainly in Europe. GPRS enables any existing IP or X.25 application to operate over a GSM cellular connection. Cellular networks with GPRS capabilities are wireless extensions of the Internet and X.25 networks. [7] discussed about a method, Sensor network consists of low cost battery powered nodes which is limited in power. Hence power efficient methods are needed for data gathering and aggregation in order to achieve prolonged network life. However, there are several energy efficient routing protocols in the literature; quiet of them are centralized approaches, that is low energy conservation. This paper presents a new energy efficient routing scheme for data gathering that combine the property of minimum spanning tree and shortest path tree-based on routing schemes. The efficient routing approach used here is Localized Power-Efficient Data Aggregation Protocols (L-PEDAPs) which is robust and localized. This is based on powerful localized structure, local minimum spanning tree (LMST). The actual routing tree is constructed over this topology. There is also a solution involved for route maintenance procedures that will be executed when a sensor node fails or a new node is added to the network.

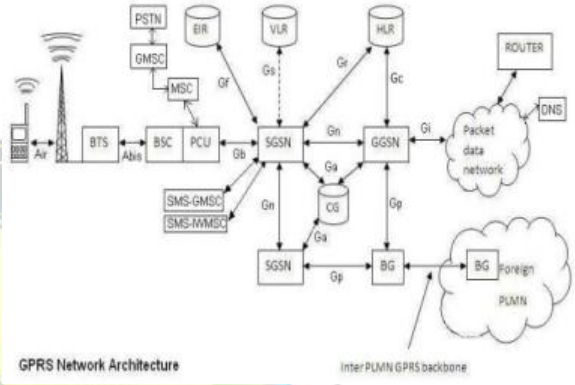

Fig:8: RFID Reader

RF transmitter and Receiver:

RF transmitters are electronic devices that create continuously varying electric current, encode sine waves, and broadcast radio waves. RF transmitters use oscillators to create sine waves, the simplest and smoothest form of continuously varying waves, which contain information such as audio and video. Modulators encode these sign wives and antennas broadcast them as radio signals. There are several ways to encode or modulate this information, including amplitude modulation (AM) and frequency modulation (FM). The ST-TX01-ASK is an ASK Hybrid transmitter module. The ST-TX01-ASK is designed by the Saw Resonator, with an effective low cost, small size, and simple-to-use for designing.

- Frequency Range: 315 / 433.92 MHZ.
- Supply Voltage: 3~12V.
- Output Power: 4~16dBm
- Circuit Shape: Saw

RF receivers are electronic devices that separate radio signals from one another and convert specific signals into audio, video, or data formats. RF receivers use an antenna to receive transmitted radio signals and a

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tuner to separate a specific signal from all of the other signals that the antenna receives. Detectors or demodulators then extract information that was encoded before transmission. There are several ways to decode or modulate this information, including amplitude modulation (AM) and frequency modulation (FM).

Description:

The RX04 is a low power ASK receiver IC which is fully compatible with the MitelKESRX01 IC and is suitable for use in a variety of low power radio applications including remote keyless entry. The RX04 is based on a single-Conversion, super-heterodyne receiver architecture and incorporates an entire phase-locked loop (PLL) for precise local oscillator generation.

IV. CONCLUSION

This paper describes a reconfigurable smart sensor interface for industrial WSN in IoT environment. The system can collect sensor data intelligently. It was designed based on ZIGBEE protocol by combining with CPLD and the application of wireless communication. It is very suitable for real-time and effective requirements of the high-speed data acquisition system in IoT environment. The application of CPLD greatly simplifies the design of peripheral circuit, and makes the whole system more flexible and extensible. Application of ZIGBEE protocol enables the system to collect sensor data intelligently. Different types of sensors can be used as long as they are connected to the system. Main design method of the reconfigurable smart sensor interface device is described in this paper. Finally, by taking real time monitoring of water environment in IoT environment as an example, we verified that the system achieved good effects in practical application.

REFERENCES:

[1] S. Li, L. Xu, X. Wang, and J. Wang, "Integration of hybrid wireless networks in cloud services oriented enterprise information systems,"
Enterp. Inf. Syst., vol. 6, no. 2, pp. 165–187, 2012.

[2] Q. Li, Z. Wang, W. Li, J. Li, C. Wang, and R. Du, "Applications integration in a hybrid cloud computing environment: Modelling and platform," Enterp. Inf. Syst., vol. 7, no. 3, pp. 237–271, 2013.

[3] L. Wang, L. D. Xu, Z. Bi, and Y. Xu, "Data cleaning for RFID and WSN integration," IEEE Trans. Ind. Informat., vol. 10, no. 1, pp. 408–418, Feb. 2014.

[4] Y. Fan, Y. Yin, L. Xu, Y. Zeng, and F. Wu, "IoT based smart rehabilitation system," IEEE Trans. Ind. Informat., vol. 10, no. 2, pp. 1568–1577, 2014.

[5] W. He, G. Yan, and L. Xu, "Developing vehicular data cloud services in the IoT environment," IEEE Trans. Ind. Informat., vol. 10, no. 2,
pp. 1587–1595, 2014.

[6] M. T. Lazarescu, "Design of a WSN platform for long-term environmental monitoring for IoT applications," IEEE J. Emerg. Sel. Topics Circuits Syst., vol. 3, no. 1, pp. 45–54, Mar. 2013.

[7] Christo Ananth, S.Mathu Muhila, N.Priyadharshini, G.Sudha, P.Venkateswari, H.Vishali, "A New Energy Efficient Routing Scheme for Data Gathering ",International Journal Of Advanced Research Trends In Engineering And Technology (IJARTET), Vol. 2, Issue 10, October 2015), pp: 1-4.

[8] Z. Pang et al., "Ecosystem analysis in the design of open platformbased in-home healthcare terminals towards the internet-of-things," in
Proc. IEEE 15th Int. Conf. Adv. Commun. Technol. (ICACT), 2013, pp. 529–534.

[9] L. Benini, "Designing next-generation smart sensor hubs for the Internetof- Things," in Proc. 5th IEEE Int. Workshop Adv. Sensors Interfaces (IWASI), 2013, p. 113.

[10] Y. Chen and V. Dinavahi, "Multi-FPGA digital hardware design for detailed large-scale real-time electromagnetic transient simulation of
power systems," IET Gener. Transmiss. Distrib., vol. 7, no. 5, pp. 451–463, 2013.

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