Interfacing of reconfigurable sensors
Using FPGA for Industrial WSN in IoT

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ABSTRACT

This paper discusses the ongoing research being carried out on an autonomic Smart sensor interface device which is essential for sensor data collection of industrial wireless sensor networks in IoT environments. The current connect number, sampling rate, and signal types of sensors are generally restricted by the device. While, in the Internet of Things environment, every sensor connected to the device is required to write complicated and cumbersome data collection programming code. In this paper, to solve above these problems, a new method is proposed to design a functional smart sensor interface for industrial WSN in IoT environment, in this field programmable gate array device is adopted as a core-controller. The performance of the proposed system is verified and good effects are achieved in practical application of IoT to industrials environment monitoring.

Keywords: FPGA, Sensors, ZigBee, IoT.

I. INTRODUCTION

Wireless sensor networks (WSNs) have become a hot research topic in recent years clustering is considered as an effective approach to reduce network overhead and improve scalability. Wireless sensor network is one of the pervasive networks which sense our environment through various parameters like heat, temperature, pressure, etc. [1]. Since sensor networks are based on the dense deployment of disposable and low-cost sensor nodes, destruction of some nodes by hostile action does not affect a military operation as much as the destruction of a traditional sensor, which makes the sensor network concept a better approach for battlefields [2]. The transmission between the two nodes will minimize the other nodes to show the improve throughput and greater than spatial reuse than wireless networks to lack the power controls. Adaptive Transmission Power technique to improve the Network Life Time in Wireless Sensor Networks using graph theory [3].

II. RELATED WORK

A wireless smart sensor platform targeted for instrumentation and predictive maintenance systems is presented. The generic smart sensor platform with „plug-and-play” capability supports hardware interface, payload and communications needs of multiple inertial and position sensors, and actuators, using a RF link for communications, in a point-to-point topology. The design also provides means to update operating and monitoring parameters as well as sensor/RF link specific firmware modules “over-the-air”. Sample implementations for industrial applications and system performance are discussed. In this project has used on Zigbee. This cost is too high and the WSN are controlled by remote access.

III. LITERATURE SURVEY

WIRELESS SENSOR NETWORKS (WSN) has been employed to collect data about physical phenomena in various applications such as habitat monitoring, and ocean monitoring, and surveillance [1]-[3]. 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 [4]-[5]. WSN systems are well-suited for long-term industrial
IV. PROPOSED SYSTEM

An embedded system based monitoring and control system for Nuclear Power Plants and large scale industries is designed. In the existing system, Complex Programmable Logic Device is used as a core controller and sensors are interfaced to it. But CPLD is limited in function and logic density compared with a FPGA. FPGA’s are more versatile than a CPLD and also denser logic functions may be performed in it while comparing a CPLD. Hence in the proposed system microcontroller is used as a core controller.

The programming module is implemented using VHDL coding. The system mainly consists of two units and they are monitoring and control unit. The monitoring unit is placed near the plant the control unit is far away from the plant. The monitoring unit consists of sensors, FPGA and Zigbee. The measured sensor values of the plant or industry are sent to the controller and they are transmitted to the control unit via Zigbee. The control unit consists of the Zigbee and computer. The transmitted values from the monitoring unit are received via Zigbee and they are compared with the threshold values in the controller and they are displayed in the computer and then sent via WAN to the Internet if needed. In case of mismatch the workers will be informed to take corrective measures.

Fig. 1 Block Diagram

A. Sensor

A sensor is a device used for the detection of changes in quantities and it provides a corresponding output, generally as an electrical or optical signal. In everyday, sensors are used in objects such as touch-sensitive elevator buttons and lamps which dim or brighten by touching the base. With advances in micro machinery and easy-to-use microcontroller platforms, the uses of sensors have expanded beyond the more traditional fields of temperature, pressure or flow measurement. A sensor's sensitivity indicates how much the sensor's output changes when the input quantity being measured changes. Making the sensor smaller often improves its performance of measuring and it can be designed to have a small effect and also introduces many advantages. The smallest change it can detect in the quantity that it is measuring is the resolution of a sensor. Various sensors used here are for measuring temperature, gas, humidity, light intensity and pressure.

B. Zigbee

Zigbee is a specification for a suite of high-level communication protocols used to create personal area networks built from small, low-power digital radios. Zigbee is used in applications that require low data rate, long battery life and secure networking. Zigbee has a data rate of 250kbit/s, best suited for intermittent data transmissions from a sensor or input device. Applications include wireless light switches, electrical meters with in-home-displays, traffic management systems, and other consumer and industrial equipment that require short-range low-rate wireless data transfer. The technology defined by the Zigbee specification is intended to be simpler and less expensive than other
wireless personal area networks such as Bluetooth or Wi-Fi. ZigBee protocols are intended for embedded applications requiring low data rates and low power consumption.

V. SIMULATION RESULT

![Simulation Result Image]

V. CONCLUSION

In this system, all the measurement is sent to the analog channel of the Spartan3 microcontroller and displayed. The performances of the channels are distinguished on the basis of its accuracy. The accuracy indicates how closely the sensor can measure the actual or real world parameter value. The more accurate a sensor is, better it will perform. This system is time saving, portable, affordable, consumes less power and can be made easily available so that the user can use this system whenever and wherever.

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