

A Review on Parallel Data Acquisition for Industrial WSN in IoT Environment

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Abstract: IoT is Internet of Things in which all physical things are organized with each other. For the expansion of IoT the interface device is crucial which will have high capability to connect sensors. The network of sensor is used for IoT as wireless sensor network and to collect the data from remote areas ZigBee module is used. The data collected through ZigBee is sent for further processing to another ZigBee at central data acquisition point. Here data is coming from different ZigBee, so to process it for further transferring through HTTP high speed controller is required. Initially single core controller was used, which have limited data rate. Now to boost data rate Zybo development board is used, which has dual core processor, so data can be acquired and processed in parallel. In addition to this programming is simpler and embedded Linux can be used as an operating system, which is free of licence.

Keywords: WSN, IoT, Embedded Linux, ZigBee, Zybo.

I. INTRODUCTION

Wireless Sensor Networks (WSN) has been in use to collect data about physical phenomena in various applications such as territory monitoring, and ocean monitoring, and surveillance. As a budding technology brought about rapid advances in modern wireless telecommunication, Internet of Things (IoT) has fascinated 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 the development in Internet technologies and WSNs, a new trend is forming in the era of ubiquity .IoT is all about physical things talking to each other, where machine-to-machine (M2M) communications and person-to-computer communications will be extended to things. Key technologies that drive the future of IoT are related to smart sensor technologies including WSN, nanotechnology, and tininess Since IoT is associated with large number of wireless sensor devices, it generates a huge number of data .Sensor data acquisition interface equipment is one of the key parts in IoT applications. Data collection is the vital application of WSN and more importantly it is the foundation of other advanced applications in IoT environment. IoT is a major drive to support service composition with various applications.

The architecture of IoT consists of three layers:

1) Perception layer; 2) Network layer; and 3) application layer .The design of data acquisition interface is mainly applied to the perception layer of IoT. The perception layer of IoT is mainly composed of sensors, RFID readers, cameras, M2M terminals, and various data collection terminals. The data acquisition interface is responsible for the integration and collaboration of various environments and collection of sensor data

II. LITERATURE SURVEY

Qingping Chi et al. [1], planned a new system to design a reconfigurable elegant sensor interface for industrial IoT, by using complex programmable logic device. CPLD is taken as the core controller which reads data in parallel and in real time with high speed on multiple diverse sensor data. Problems like the present connect node, sampling rate, and whether the output of sensor is analog or digital are solved by the use of CPLD. With this the necessity of writing complicated and lengthy program code for data collection is solved in some extent. To collect the data in intelligent way the standard of IEEE1451.2 intelligent sensor interface specification are used.

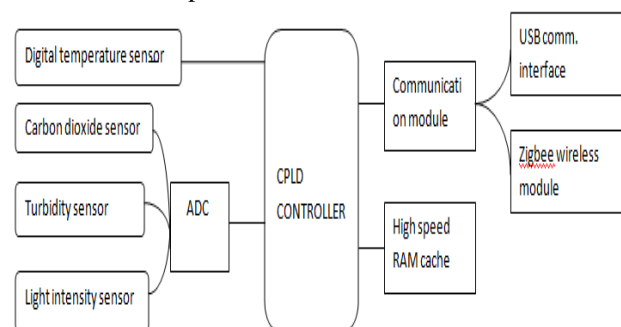


Fig.1 Block diagram of WSN using CPLD as a core controller

This system is based on IEEE1451 protocol and 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 system achieved good effects in practical application in taking real time monitoring of water environment in IoT environment as an example and also more flexible and extensible.

Shifeng Fang et al. [2], presents an integrated approach to water resource management based on geo-informatics including technologies such as Remote Sensing (RS), Geographical Information Systems (GIS), Global Positioning Systems (GPS), Enterprise Information Systems (EIS), and cloud services. This paper also introduces a prototype IIS called WRMPIS i.e. Water reserve Management project Information System that integrates functions such as data acquisition, data management and sharing, modelling, and knowledge management. This system provides preeminent management for water security and flood for human society which is future for human life. This system is combination of Snowmelt Flood Forecasting Enterprise Information System i.e. SFPEIS, which is based on the Water Resource Management Enterprise Information System. This system contains operational database, Extraction-Transformation-Loading (ETL), information warehouse; in which it contains information management that allows any participant play the role as a sensor as well as a contributor to the information warehouse, temporal and spatial analysis, simulation/forecast models to predict the atmospheric condition, knowledge management is useful for the taking decision; which is provided by both users and communal play the role of providing data and knowledge, and other functions. This system is a prototype water resource management IIS which integrates geo-informatics, EIS, and cloud service. This system provides the fundamental significance of a systematic approach toward IISs for successful resource and environment management.

Cheong, P. et al. [3], paper presents ultraviolet flame detection with the help of ZigBee based wireless sensor network node for the ultraviolet. In this system, there is one sensor node; which consists of a ZnSSe UV photo detector, current sensitive front end including a high gain current to voltage amplifier with 120 dB and a logarithm converter, a transceiver operated at a 2.4GHz industrial, scientific, and medical band(ISM). The passive photo detector is designed or set in such a way that it will have a cut off at 360 nm and system can detect the flame at the speed of 70 ms for emission of flame into picoamperes. With this the system also contains mixed signal processing for the speed of flame detection is as fast as 70 ms and ZigBee transmits data from the sensor to the central processor system or to the application layer. The power consumption of system's sensor node is on an average of 2.3mW from a 3.3V supply. This system is tested under the condition such that the luminous flame was imaged onto the sensor node with different angles ranging from -30° to 30° and distances of 0.1, 0.2, and 0.3m enabling

effective fire safety applications.

Gaurav Tiwari and Riyaz Kazi [7], present Autonomic Smart Sensor Interface for Industry in IOT Environment. Sensors are generally constrained by the device because of the present connect number, sampling rate, and signal types. If required to connect devices required to write complicated and bulky data collection programming code. This problem is solved by designing the smart sensor interface for industrial WSN in IoT environment, in this field programmable gate array device (FPGA) is adopted as a core-controller. Fig.2 and fig.3 shows the proposed system i.e. Autonomic Smart Sensor Interface for Industrial in IOT Environment

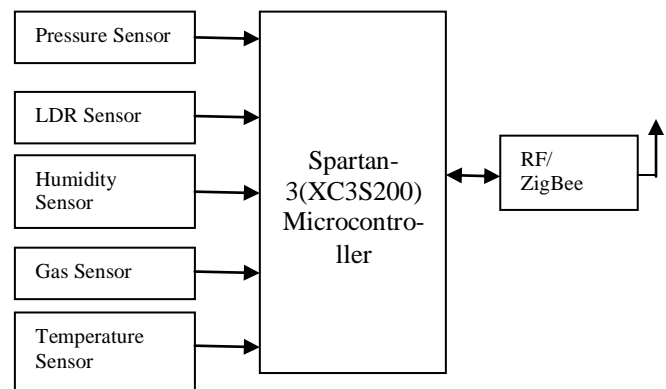


Fig.2 Block diagram of WSN using FPGA

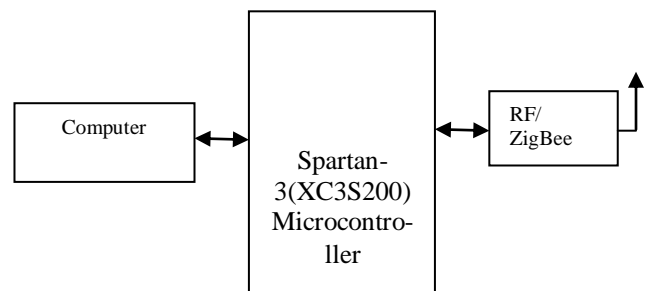


Fig.3 Block diagram for connecting FPGA to computer

Sensor data is read in parallel way using Field programmable gate array device as interface. As data is read in parallel, the speed of the system is increased significantly. The standard of IEEE1451.4 intelligent sensor interface specification is adopted for this design.

R. Karpaga Priya, T. Karpoora Eswari, and K. Akilakumari [5], presents an Industrial WSN in IOT surroundings Interface with Smart Sensor Using ARM. This system is to develop a sensor interface device is essential for sensor data collection of industrial Wireless Sensor Networks i.e. WSN in Internet of Things (IoT) environment. In the proposed system ARM is adopted as the core controller at the time of interfacing for industrial WSN in IoT ambiance so that it will check data in parallel and in real time with high speed on various totally diverse device information and for this smart device interface arrangement is adopted. Special Sensors are used to provide the values of Temperature, Vibration, Gas present in the industrial environment, so that serious situation can be avoided and precautionary measures are effectively

implemented. The result of the system gives values of Temperature is 67.4c. If Vibration and Gas sensor is either Low or Medium, it means Low indicates that there is no gas and vibration, and then Medium indicates there is a Gas and Vibration present.

Bharani M, Elango S., Ramesh S.M., Preetilatha R. [6], presents monitoring system for industries by interfacing sensors with ATmega Microcontroller as an embedded system. In this system various sensors are being used for measuring the temperature, pressure, gas etc. Different sensors are interfaced with the microcontroller ATmega328p which gives a high-performance. Atmel 8-bit AVR RISC- based microcontroller combines 32KB flash memory with read-while-write capabilities, 1024B EEPROM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable, a byte-oriented 2-wire serial interface, serial port, a 6-channel 10-bit A/D, programmable watchdog timer with internal oscillator, and five software selectable power saving modes. With the help of ZigBee the measured values are sent from monitoring station to the controlling station and then sent via WAN to the Internet if needed. Received values are compared with the threshold value if any mismatch is found then the workers will be informed to take curative measures.

S. Pandikumar and R.S. Vetrivel [8], presents GSM based design of smart home controlling system in IoT Environment. This system enables the users to control and monitor smart devices through internet and also it creates an interface between users and smart home by using GSM and internet technologies, or it can say that it creates GSM based wireless communication from the web server into the smart home. Users give commands through web then the users inputs are converted into GSM-SMS commands, then these commands are sent to embedded system module. This embedded system directly connect with devices through GSM network, and finally the user commands are parsed and executed by microcontroller to control any electronic objects like home appliances, lights, etc. and it sends the acknowledgement.

III. PROPOSED METHOD

In the proposed method, two things are formulated as technologies, implementation method:

A. Technologies

A wireless sensor network (WSN) of spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, LDR, Fire, etc. and to cooperatively pass their data through the network to a main location. The more modern networks are bi-directional, also enabling control of sensor activity. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance; today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring.

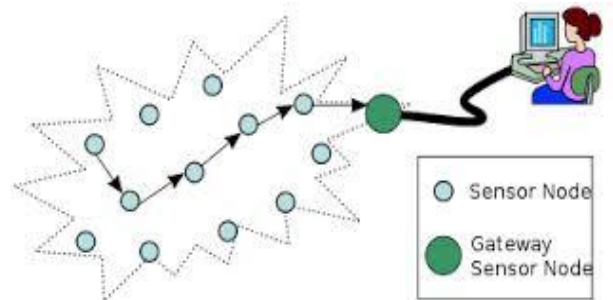


Fig.4 Wireless sensor network

B. Implementation method

We are designing advanced embedded system by using wireless sensor network and Internet of Things. We are going to design a system by using ARM 11/ARM9 and 8051 which supports different features and algorithms for the development of industrial automation systems. In these project we are using two systems for two-way communication, One system consist of Microcontroller-Atmel (89s52) is used for interfacing sensors to read data ,relays for controlling devices and ZigBee is used for wireless communication to transfer sensor data to ARM 9/ARM11 controller. Second system consists of ARM9/ARM11, Ethernet controller which is in built in Zybo development board and ZigBee module. In second System, ZigBee collects sensor data from first system and transfer the data to Internet through Embedded web-server technology. We can access the data through Remote location computer. Any abnormal conditions we can control devices through remote computer. Many open source libraries and tools are available for ARM-Linux wireless sensor network development and controlling. We can monitor and control the wireless sensor network remotely using internet and web-server.

IV. CONCLUSION

Recently applications of Internet are increasing rapidly and IoT is the new era of the internet in which things related to daily life are connected to internet. Monitoring and controlling can be done from the remote areas. This paper provides requirement of WSN and data acquisition point for IoT as a mature technology. The system architecture of IoT along with its different application domains are discussed here. From Literature Survey one another method, as the use of Zybo development board in Industrial IoT is proposed for high data rates and parallel data processing system.

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BIOGRAPHY



Ganesh H. Bhise is a PG student of Electronics System and communication department, Government College of Engineering, Amravati. He received Bachelor of Engineering degree in 2013 from Shivaji University, Kolhapur MS, India. His area of interest is WSN for industrial IoT.