RECONFIGURABLE SMART SENSOR INTERFACE for INDUSTRIES USING ARMBASED ON IOT

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ABSTRACT

Configurable Sensor Networks hasbeen employed to collect data about physical phenomenon in various applications such as habitat monitoring. Internet of Things (IOT) has attracted a lot of attention and is expected to bring benefits to numerous application areas including industrial systems, and environmental systems. For data acquisition for IOT representation a sensor interface device is essential for sensor data collection of industrial sensor networks in IOT environments either using GSM or cloud sever. Each sensor connected to the device is required to write complicated and cumbersome data collection code. To solve these problems a new method is proposed to design a reconfigurable smart sensor interface for industry in IOT environment using GSM. Thus it can read data in parallel and in real time with high speed. This proposed work can push data to dedicated web server or can manage to alert the user with GSM facility at hand For this purpose use ARM11 raspberry Pi B+ module alongwith Ph Sensor Turbidity Sensor and Temp Sensor

Keyword *IOT, GSM,*

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1. INTRODUCTION

A sensor is a device that detects events or changes in quantities and provides a corresponding output, generally as an electrical or optical signal; for example, a thermocouple converts temperature to an output voltage. But mercury in glass thermometer is also a sensor; it converts the measured temperature into expansion and contraction of a liquid which can be read on a calibrated glass tube. Internet of Things (IOT) is the interconnection of uniquely identifiable embedded computing devices within the existing Internet infrastructure. Typically, IOT is expected to offer advanced connectivity of devices, systems and services that goes beyond machine - to- machine communications (M2M) and covers a variety of protocols, domains, and applications. The inter connection of these embedded devices (including smart objects), is expected to usher in automation in nearly all fields, while also enabling advanced applications like a Smart Grid. Reconfigurable sensor network which integrates sensor technology, wireless communication technology, embedded computing technology and distributed information management technology, has been under rapid development during recent years .A wireless sensor network is a collection of nodes organized into an interactive network. Each node consists of processing capability (one or more microcontroller's chips) and contains types of memory, with a Zigbee or GSM /GPRS transceiver module and also, each node have a stable power source and the last part of a node, it is accommodate various sensors and actuators. The nodes communicate wirelessly and often self-organize after being deployed in an ad hoc method. Such systems can revolutionize the way we live and work therefore in this project we want to use WSN technology to control and manage energy in building. Reconfigurable smart sensor interface device that integrates data collection data processing, and wired or wireless transmission. The device can be widely used in many application areas of the IOT and WSN to collect various kinds of sensor data in real time. The overall structure of reconfigurable smart sensor interface consists The central hub collects information from the different frequency channels and controls these channels through the Zigbee/GSM/GPRS module. The central hub sends the state information to a server and then a user can monitor and control the present values using the web based user interface. This facility may create some easiness for the users. The system has been designed for measurement of temperature Ph and Turbidity parameters. Important functions to the system are the ease of modeling, setup, and use. From the consumer point of view. With rapid development of IOT, major manufacturers are dedicated to the research of multisensory acquisition interface with use of GSM/GPRS cloud based server or Zigbee network.

2. RELATED WORK

A wireless smart sensor platform targeted for instrumentation and predictive maintenance systems is presented. The Generic smart sensor platform with GSM/GPRS 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 remotely through GSM or web server over the air. Sample implementations for industrial applications and System performance are discussed. This project has used on GSM Technology to push data to the server . This cost is too high and the WSN are controlled by remote access. Radio Frequency Identification and Wireless Sensor Network are two important wireless technologies that have wide variety of applications and provide limitless future potentials. However, RFID and sensor networks almost are under development in parallel way. Integration of RFID and wireless sensor networks attracts little attention from research community. This paper first presents a brief introduction on GSM, and then investigates recent research works, new products/patents and applications that integrate GSM with sensor networks. Four types of integration are discussed. They are integrating tags with sensors, integrating tags with wireless sensor nodes, integrating readers with wireless sensor nodes and sensors interface . New challenges and future works are discussed in the end. GSM technology have relatively low range and are quite inexpensive we envision that the first applications will not have web server to push the data from the system to web server so first we will put alert notification over gsm and receive it on mobile then further develop to push data to server. The applications will allow mobile user to interact with the system in real time and can control Ph parameter from remote location by controlling dozing pump . 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, pH,turbidity, 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 the operation of the system as much as the destruction of a traditional sensor, Which makes the sensor network concept a better approach for industrial use 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 .we have distance comparison between the neighbor nodes and also local level connected from the nearest edges in wireless sensor networks. The proposal of system is to develop a sensor interface device is essential for sensor data collection of industrial Wireless Sensor Networks (WSN) in Internet of Things (IOT) environment. It is planned to style a re-configurable sensible device interface for industrial WSN in IOT atmosphere, during which ARM is adopted as the core controller. Thus, it will scan information in parallel and in real time with high speed on multiple completely different device information. Intelligent device interface specification is adopted for this style. The device is combined with the most recent ARM programmable technology and intelligent device specification. By detecting the values of sensors it can easily find out the Temperature, pH, Turbidity present in the industrial environment for water use under process. So that critical situation can be avoided and preventive measures are successfully implemented. The proposed method overcomes the drawback present in existing system by using wireless sensor network. The designed system is by using ARM 32-bit micro controller which supports different features and algorithms for the development of industrial automation systems. Using ARM controller we can connect all types of sensors and we can connect 8 bit microcontroller based sensor network to ARM controller using different wired or wireless technology. 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 and or GSM GPRS MODEM. The system describes the development of a wireless industrial environment measuring temperature, pH, and turbidity. Where the wireless connection is implemented to acquire data from the various sensors, in addition to allow set up difficulty to be as reduced. By using GSM technology we send the sensors data to authorized person.

3. INTERNET OF THINGS

(IOT) With the advancements in Internet technologies and WSNs, a new trend is forming in the era of ubiquity "IOT" is all about physical items talking to each other, where machine-to- machine (M2M) communications and person-to computer communications will be extended to things with the help of web server or GSM technology. Key technologies that drive the future of IOT are related to smart sensor technologies including WSN nanotechnology, and miniaturization Since IOT is associated with a 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 essential 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 is illustrated as in Fig. 1
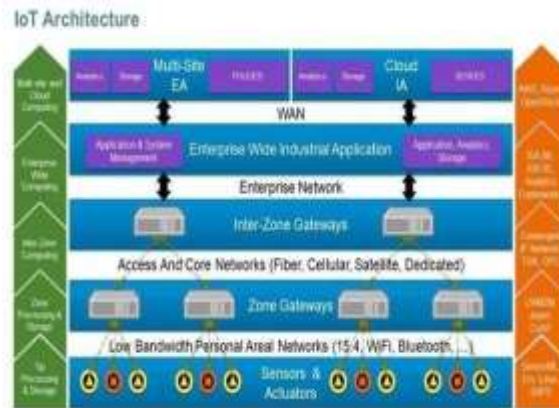
FIG. 1 IOT Architecture

It consists of three layers: perception layer, network layer, and 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, 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. Examples of such a workflow include a environment monitoring system that adopts sensors to temperature and light. Environment monitoring is one of the IoT application fields, where complex water quality information, is used to determine the environmental quality at the same time. However, currently, there are few data collection device that are dedicated to quality monitoring on the market. Such devices can ensure high speed of data acquisition for multiple sensors and adapt to complex and various sensor types well. Thus, we design and implement a WSN data acquisition interface that can be used for process water monitoring.

4. IMPLEMENTATION

The overall structure of reconfigurable smart sensor interface Consists as below A. Raspberry Pi The Raspberry Pi is a credit-card sized computer that plugs into your TV and a keyboard. It is a capable little computer which can be used in electronics projects, and for many of the things that your desktop PC does, like spreadsheets, word-processing and games. It also plays high-definition video. We want to see it being used by kids all over the world to learn how computers work, how to manipulate the electronic world around them, and how to program. The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. It's capable of doing everything you'd expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spreadsheets, word-processing, and playing games.

GSM/GPRS MODEM (SIM 900A) a low-cost, low-power, communication protocol standard device generally used for IOT application all around the industries so far. The low cost allows the technology to be widely deployed in wireless control and monitoring applications, the low power-usage allows longer life with smaller batteries and the mesh networking provides high reliability and larger range. GSM/GPRS has been developed to meet the growing demand for capable wireless communication and control between numerous low power devices. GSM /GPRS is an established set of specifications for wireless personal area networking (WPAN), i.e. digital radio connections between computers and related devices.

5. IMPLEMENTATION DETAILS

The Introduction of the Hardware Architecture The overall structure of reconfigurable smart sensor interface consists of ARM 11 GSM/GPRS MODEM pH Sensor Temperature Sensor, Turbidity Sensor and peripheral circuit, Amplification circuit for amplification signals from the sensor to ADC port of ARM 11 (power supply of 1.8 and 3.3 V (LM1117 chip, voltage regulator and filter circuit), and built in SRAM memory high-speed build in 8-channel ADC LED indicator light, an analog extended interface, and three sensor extended interfaces. Every extended interface among them can connect eight independent sensors, namely, the reconfigurable smart sensor interface device can access eight analog signals and 24 digital signals. Fig. 3 shows the hardware block diagram. The hardware system can also send and receive data besides the basic sensor data acquisition. It can send

data to the control center via GSM/GPRS Modem or can push data to web server.GSM wireless communication module can be connected with the board through the Serial interface or the extensible GPIO interface.
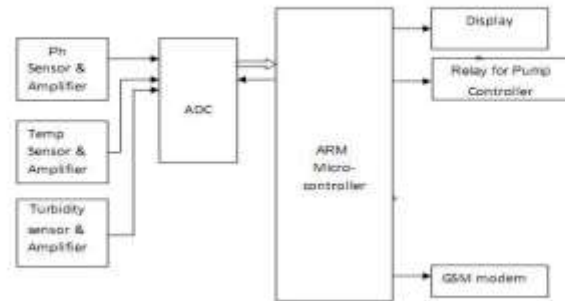

Fig. 3 Block diagram of project

It can be used as wireless data transceiver node when the main controller receives trial or executive instructions. After the data control center finishes further processing for the received data, it needs to feedback related actions to sensor interface device for pH control with the help dozing pump connected with the system so as to maintain the ph value of the water. Data communication function can also control the running status of corresponding peripheral device such as pump connected to the system.

6. EXPERIMENTAL RESULTS

The Working Prototype of the project hardware is show in the Fig.4. When we start system LCD initialization. .After that ADC initialization then system is ready, asking for sensor input. After the sensor connecting to water the IOT system is start then HTTP server Initialization to reading all sensor values now we have taken three output from system for monitoring & controlling .if the value of sensor are more than set parameter we get SMS on GSM & on Server & motor will off output will be shown on web server & GSM.

Fig 4. Working Project Prototype

7. CONCLUSION AND FUTURE WORK

The smart sensor interface for industrial WSN in IOT environment system can collect sensor data intelligently. It was designed based on ARM and the application of GSM/GPRS web server communication. It is very suitable for real-time and effective requirements of the high-speed data acquisition system in IOT environment. The ARM greatly simplifies the design of peripheral circuit, and makes the whole system more flexible and extensible. Different types of sensors can be used as long as they are connected to the system. On setting the values of each sensors then the Temperature, pH, turbidity values are known. The values of Temperature are 67.4c is measured. The turbidity sensor is either Low or Medium, it means Low indicates that there is turbid water then Medium indicates there is a low impurity in water. By this way the critical situation can be avoided. The design system applies interface standard that is used for smart sensors of automatically discovering GSM network. The sensors are not based on protocol standard. The data acquisition interface system can achieve the function of plug

and play with minimum calibration. High execution speed, flexible organization structure, IP design could reuse. It will have a broad space for development in the area of WSN in IOT environment.

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