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Implementation of a Reconfigurable Smart Sensor Interface for Industrial WSN in IOT Environment

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Abstract: 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, Vibration, Gas present in the industrial environment. So that critical situation can be avoided and preventive measures are successfully implemented.

Keywords: Wireless Sensor Networks (WSN), RFID, ARM.

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… 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. 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].We have distance comparison between the neighbour nodes and also local level connected from the nearest edges in wireless sensor networks.

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. 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 RFID, and then investigates recent research works, new products/patents and applications that integrate RFID 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 wireless devices, and mix of RFID and sensors. New challenges and future works are discussed in the end. RFID readers have relatively low range and are quite expensive, we envision that the first applications will not have RFID readers deployed ubiquitously. The applications which allow mobile readers to be attached to person‟s hands, cars or robots will be good candidates.

III. PROPOSED SYSTEM

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. The system describes the development of a wireless industrial environment measuring temperature, humidity, atmospheric pressure, soil moisture;

water level and light detection. 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 Wi-Fi technology we send the sensors data to authorized person. To design a reconfigurable smart sensor interface device that integrates data collection, data processing, and wired or wireless transmission together. 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. To program IP core module in its ARM as shown in Fig.1. Therefore, our interface device can automatically discover sensors connected to it, and to collect multiple sets of sensor data intelligently, and parallel with high-speed.

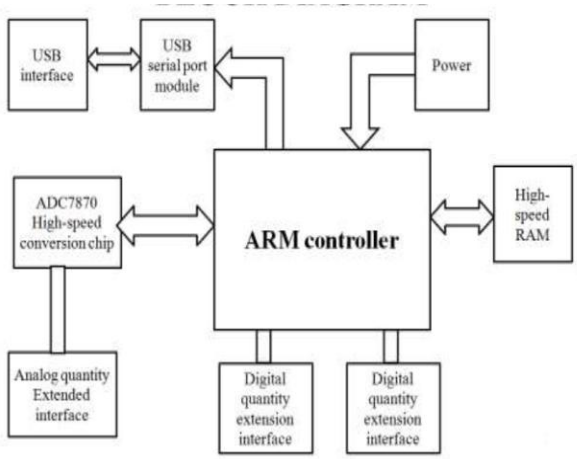

Fig.1. Block Diagram of the Project.

ARM is the core controller of the interface device. It is used to control data acquisition processing, and transmission intelligently, and make some preprocessing work for the collected data. The driver of chips on the interface device is also programmed inside the ARM. Multiple scalable interfaces are designed on the equipment. It can be extended to 8-channel analog signal interface and 24-channel digital signal interface. This ensures that our device can connect with a number of sensors among the application of industrial IoT or WSN and guarantees the diverse collection of the information. In terms of data transmission, our design can achieve communication through Universal Serial Bus interface. Therefore, we can choose different transmission mode of the device in different industrial application environments. The designed device collects analog signal transmitted from color sensors, light intensity sensors, and other similar sensors through an analog signal interface. It can also collect digital signal transmitted from the digital sensors, such as temperature sensors, digital humidity sensors, and so on, through a digital signal interface. The ADC module and signal interface on the interface device are controlled by the ARM, which makes it possible to collect the 8-channel analog signals and 24-channel digital signals circularly, and sets these collected data into the integrated Static Random Access Memory on the interface device. The collected data can be transmitted to the host computer side by way of USB serial communication so that the user can analyze and process the data.

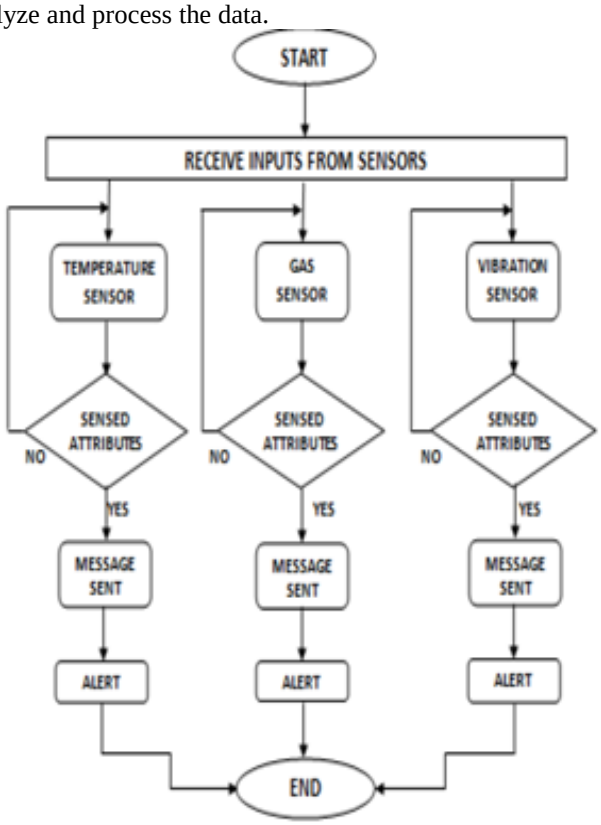

Fig.2.

IV. RESULTS AND DISCUSSION

Proteus VSM uses ISIS schematic capture software to provide the environment for design entry and development. The ISIS software combines ease of use with powerful editing tools. It is capable of supporting schematic capture for both simulation and PCB design. Designs entered in to Proteus VSM for testing can be net-listed for PCB layout either with Proteus PCB Design products or with third party PCB layout tools. ISIS also provides a very high degree of control over the drawing appearance, in terms of line widths, fill styles, fonts, etc. These capabilities are used to provide the graphics necessary for circuit animation. The Proteus VSM includes the ProSPICE which is an established product that combines uses a SPICE3f5 analogue simulator kernel with a fast event-driven digital simulator to provide seamless mixed-mode simulation. The use of a SPICE kernel allows the designer to utilize any of the numerous manufacturer-supplied SPICE models now available and around 6000 of these are included with the package as shown in Fig.3. Proteus VSM includes a number of virtual instruments including an Oscilloscope, Logic Analyzer, Function Generator, Pattern Generator, Counter Timer and Virtual Terminal as well as simple voltmeters and ammeters. The Advanced Simulation Option allows the designer to take detailed measurements on graphs, or perform other analysis types such as frequency, distortion, noise or sweep analyses of analogue circuits. This option also includes Conformance Analysis - a unique and powerful tool for Software Quality Assurance. After loading the hex file into the microcontroller then the circuit is ready to execute the

process to achieve the output. Then we can execute the simulation as shown in Figs.4 to 7.

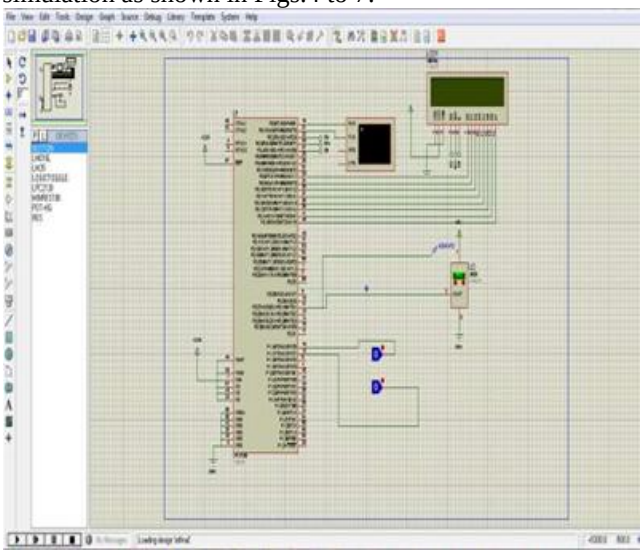

Fig.3. Schematic Representation of the Project.

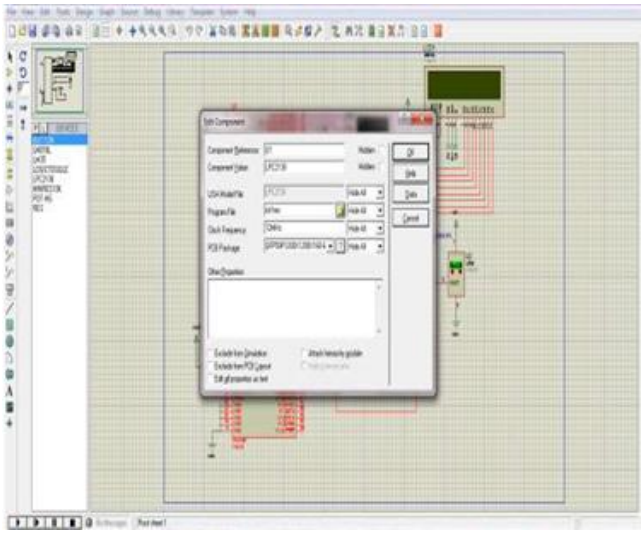

Fig.4. Loading the hex file.

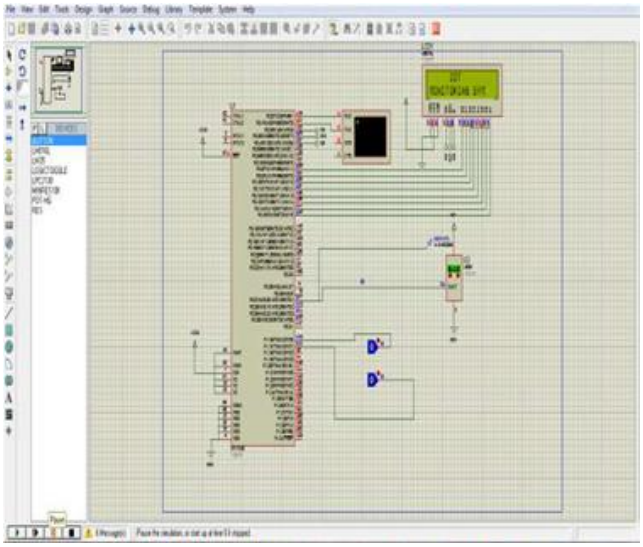

Fig.5. IOT Monitoring.

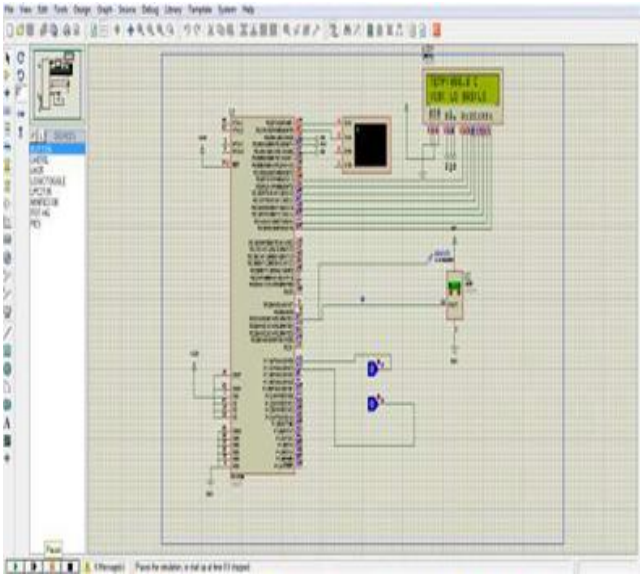

Fig.6. Temperature Smart Sensor.

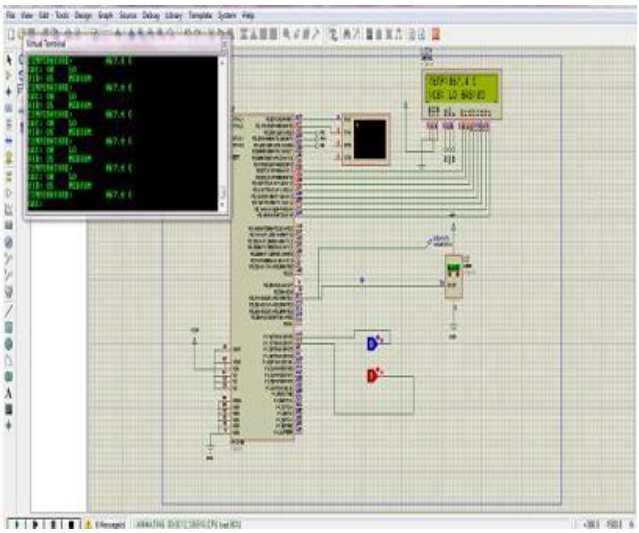

Fig.7. .Displaying the output in virtual terminal.

V. 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 wireless 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, Gas, Vibration values are known. The values of Temperature is 67.4c is measured. The Vibration and Gas sensor is either Low or Medium, it means Low indicates that there is no gas and vibration, then Medium indicates there is a Gas and Vibration present. By this way the critical situation can be avoided. The design system applies interface standard that is used for smart sensors of automatically discovering network. The sensors are not based on protocol standard. The data acquisition interface system

can achieve the function of plug and play. 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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