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An Efficient Real Time Monitoring Of Industries using Arduino Due Microcontroller

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Abstract— Nowadays monitoring is extremely necessary in product based industries and Nuclear Power Plants, additionally periodic transmission of correct and reliable measurements is central to safe, economical and economic operation. Numerous sensors are being employed to measure temperature, pressure, gas etc. These detector values should be in real time and correct so as to avoid faults. In the proposed system, sensors are interfaced with the Arduino Due microcontroller which is based on the Atmel SAM3X8E ARM Cortex-M3 CPU. It is the first Arduino board based on a 32-bit ARM core microcontroller. The detector values measured from industry or plant is sent to the controller. Then the measured values are compared with the threshold value already stored in controller. In case of mismatch the workers will be informed to take corrective measures by displaying the measured sensor values in personal computer via hyper terminal. This is a new approach using Arduino Due microcontroller in order to avoid serious disasters in atomic power plants and industries. If required the measured values are displayed in web.

Index Terms: **ARM (Advanced RISC Machine), RISC (Reduced Instruction Set Computer), CPU (Central Processing Unit).**

I. INTRODUCTION

The monitoring task in Nuclear Power Plants and product based industries are of crucial importance with respect to safety and economical operation. The operators have a good vary of variables to look at and analyze. The number of variables and their behavior confirm the time they need to require correct selections. The complexes of such aspects in an exceedingly atomic power Plant influences each the plant operational potency and the general issues of safety. Usually embedded system could be a computing system with a fervent perform inside a bigger mechanical or electrical system, usually with period of time computing constraints. Typically embedded system includes hardware and mechanical elements to manage several devices in common use. The program directions written for embedded systems are noted as computer code and keep in storage or nonvolatile storage chips. The AVR microcontroller from Atmel square measure low price general purpose micro-controller, with a wonderful ASCII text file, fully-featured compiler. These controllers are low price, low power consumption that's solely a number of milliamps at 3.3 or 5V. It consists of hardware interrupts used to measure the state of a pin and in period of time to search out once it changes, hardware timers/counters, digital I/O permit interaction with the planet of physical science, Analog to Digital Conversion permit interaction with dozens of sensors that output analog voltages between zero and 5V. There are two main branches of AVR chips and they are ATTINY and ATMEGA branches The Arduino Due microcontroller that supported the Atmel SAM3X8E ARM Cortex-M3 central processor replaces the standard eight-bit 16MHz ATmega328 microcontroller with a 32-bit ARM Cortex-M3 running at 84MHz. The Due, designed to require over from the ATmega328-based Uno, replaces the eight-bit microcontroller with a 32-bit ARM Cortex-M3 processor running at 84MHz - a big increase in power. The Atmel SAM3X8E, the carve the center of the new Due, is claimed to be ready to handle sampling rates from the integrated analogue or digital inputs of up to one mega samples per second from fifteen kg samples per second of the Uno and Leonardo.

II. EXISTING SYSTEM

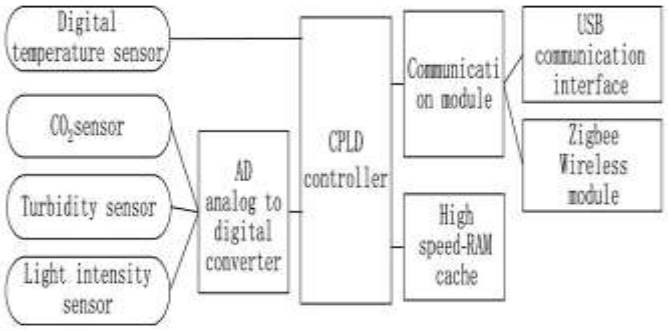

Fig.1 System's block function design.

In 2014 Qingping Chi in et al.., proposed an"A Reconfigurable Smart Sensor Interface for Industrial WSN in
IoT Environment"

Stated that

- A sensor interface device for sensor data collection of
industrial wireless sensor networks (WSN) environments .
- Complex Programmable Logic Device (CPLD) is the core controller. and using the analog to digital converter
sensors are interfaced to it.
- The communication module used to transmit the data both in wire and wireless standards.

III. PROPOSED SYSTEM

Arduino DUE board with ARM cortex M3 is used as an embedded controller to interact with the sensors along with PC.

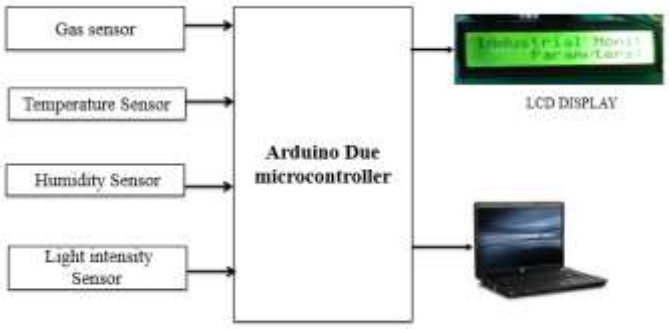

Fig. 2. Block diagram of Industrial Monitoring

A. Embedded System Platform

The key elements in this system contains embedded system platform which incorporates Arduino Due Board.

B. Arduino Due Board

Arduino is an open-source computer hardware and software company, project and user community that designs and manufactures kits for building digital devices and interactive objects that may sense and manage the physical world. The project relies on a family of microcontroller board styles factory-made primarily using numerous 8-bit Atmel AVR microcontrollers or 32-bit Atmel ARM processors. The Due is Arduino's initial ARM-based Arduino development board. This board relies on a strong 32-bit CortexM3 ARM microcontroller created programmable through the acquainted Arduino IDE. It will increase the computing power offered to Arduino users keeping the language as compatible as attainable in order that several programs are migrated in an exceedingly matter of minutes. The Arduino Due has 54 digital input/output pins (of that twelve will be used as PWM outputs), 12 analog inputs, four UARTs (hardware serial ports), associate 84 MHz clock, a USB-OTG capable affiliation, two DAC (digital to analog), 2 TWI, an influence jack, associate SPI header, a JTAG header, a push button associated an erase button. There are also some cool options like DACs, Audio, DMA, associate experimental multi-tasking library and more.

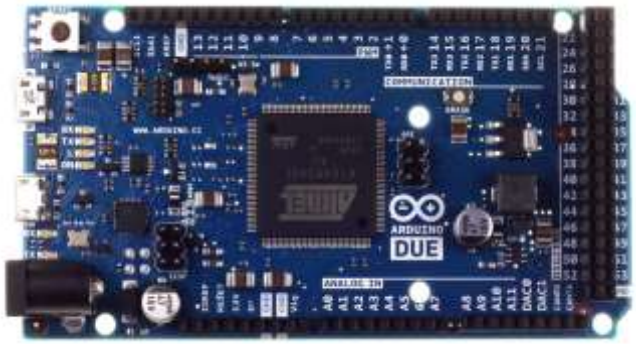

Fig. 2. Arduino DUE Board

These systems give sets of digital and analog I/O pins that may be interfaced to varied extension boards and different circuits. The boards feature serial communications interfaces, together with USB on some models, for loading programs from personal computers. For programming the microcontrollers, the Arduino platform provides associate integrated development atmosphere supported the process project, which incorporates support for C and C++ programming languages.

The Cortex-M3 processor could be a high performance 32-bit processor designed for the microcontroller market. It offers important edges to developers, together with outstanding process performance combined with quick interrupt handling, increased system rectify with intensive break point and trace capabilities, economical processor core, system and recollections, ultra-low power consumption with integrated sleep modes, platform security, with integrated memory protection unit.

III. SENSOR UNITS

A. DHT11

DHT11 Digital Temperature and wetness detector could be a composite detector measures the temperature

and wetness and provides digital signal output. Application of a fervent digital modules assortment technology and the temperature and wetness sensing technology, to make sure that the merchandise has high reliability and excellent long-term stability. The detector includes a resistive sense of wet parts and NTC temperature measure devices, and connected with a superior 8-bit microcontroller.

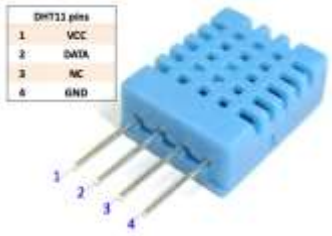

Fig. 3. DHT11 Digital Temperature and Humidity Sensor

B. MQ-5

LPG and natural gas detector that ensures optimum safety and security in the industries and domestic sector. These simple to put in square measure extremely appropriate for police work the presence of gas, LPG, fumes, cigarette smoke and town gas. The detector during this system is extremely reliable and is given a straightforward drive circuit for facilitating easy operations.

Fig. 4. LPG and Natural Gas Sensor

C. LDR

Fig. 5. LDR

A photoresistor or Light-Dependent resistance (LDR) could be a light-controlled rheostat. The resistance of a photoresistor decreases with increasing incident light-weight intensity and it exhibits electrical conduction. A photoresistor is formed of a high resistance semiconductor. Within the dark, a photoresistor will have a resistance as high as a number of mega ohms, whereas within the light-weight, a photoresistor will have a resistance as low as a number of hundred ohms.

IV. RESULTS AND DISCUSSION

An embedded system based real time monitoring and control system for industries is designed. In the existing system, Complex Programmable Logic Device(CPLD) is used as a core controller and sensors are interfaced to it. In CPLD there is no in built Analog to Digital Converter to get the analog inputs from the sensors and also communication modules are not present in it. Hence CPLD is limited in function and logic density compared with a microcontroller. Microcontrollers are more versatile than a CPLD and also denser logic functions may be performed in it while comparing a CPLD.

The proposed system is designed using Arduino Due microcontroller which based on the Atmel SAM3X8E ARM Cortex-M3 CPU in the Arduino environment. Especially this microcontroller is having 54 digital input/output pins (of that twelve will be used as PWM outputs), 12 analog inputs and also having one hardware UART and three hardware USARTs for TTL (3.3V) serial communication. Hence the proposed system is of low cost while comparing the existing one.

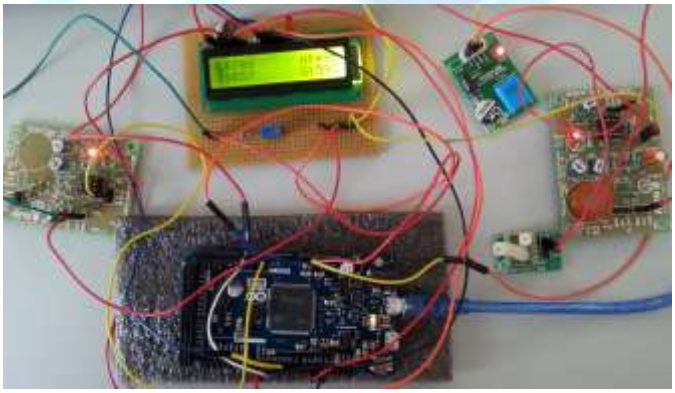

Fig. 6. Hardware connection.

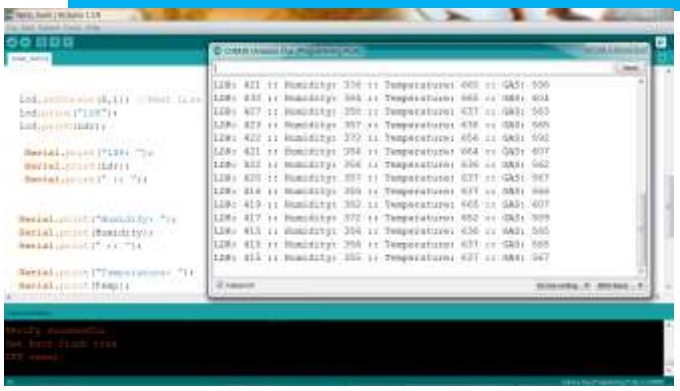

Fig.7. Serial Monitor output.

The simulation is completed in Arduino IDE using embedded c coding. Then the code is uploaded into the board via USB cable connecting the pc and board where the sensors are connected in its analog ports. The measured values are seen via serial display present in IDE.

Fig.8. Serial output.

The measured values are also displayed terminal serial display which is programmed using Visual Basic 8.0 using C# coding. If needed the mismatch in the measured and threshold values will be informed to the workers away from industry via SMS by connecting GSM shield with the Arduino board. In future the values will be displayed in Internet of Things.

VI. CONCLUSION

For Nuclear Power Plants and large scale industries, monitoring and controlling systems are of crucial importance with respect to safety and efficient operation. Since the system operation principally depends on high level programming, we can extend the system as our interest. In this system, all the measured sensor values are sent to the analog channel of the Arduino Due microcontroller and displayed. The performances of the channels are distinguished on the basis of its accuracy. The accuracy indicates however closely the sensor can measure the actual or real world parameter value. The more accurate a sensor is, better it will perform. Then temperature value displayed in LCD is compared with the standard temperature. 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. Future enhancements include merging the resultant output with the cloud server.

REFERENCES

[1] Qingping Chi, Hairong Yan, Chuan Zhang, Zhibo Pang, and Li Da Xu,"A Reconfigurable Smart Sensor Interface for Industrial WSN in IoT Environment" *IEEE Transactions on Industrial Informatics*, vol. 10, no. 2, pp.1417-1425,May 2014.

[2] 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.

[3] Pedro Cheong, Ka-Fai Chang, Ying-HoiLai, Sut-KamHo, Iam-Keong Sou and Kam-Weng Tam, "A ZigBee-Based Wireless Sensor Network Node for Ultraviolet Detection of Flame" *IEEE Transactions on Industrial Electronics*, vol. 58, no. 11,pp.5271-5277, Nov. 2011.

[4] F. Salvadori et al., "Monitoring in industrial systems using wireless sensor network with dynamic power management" *IEEE Trans. Instrum. Meas.*, vol. 58, no. 9, pp. 3104–3111, Sep. 2009.

[5] Wu He, Gongjun Yan, and Li Da Xu,Senior Member, IEEE "Developing Vehicular Data Cloud Services in the iot Environment" IEEE Transactions On Industrial Informatics, Vol. 10, No. 2, May 2014.

[6] Boyi Xu, Li Da Xu,Senior Member, IEEE, Hongming Cai, Cheng Xie, Jingyuan Hu, and Fenglin Bu "Ubiquitous Data Accessing Method in IoT-Based Information System for Emergency Medical Services" IEEE Transactions On Industrial Informatics, Vol. 10, No. 2, May 2014.

[7] Charalampos Doukas and Ilias Maglogiannis "Bringing IoT and Cloud Computing towards Pervasive Healthcare", Sixth International Conference on Innovative Mobile and Internet Services in Ubiquitous Computing, 2012.

[8] Weili Han, Yun Gu, Yin Zhang, Lirong Zheng,"Data driven quantitative trust model for the Internet of Agricultural Things", International Conference On Internet of Things (IOT),Oct 2014.