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M2M Based Industrial Automation using Advanced Microcontroller and IoT with Auto Sensing Technology

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***Abstract* - IOT is the collection of the sensors data through embedded system and this embedded system upload the data on internet. There are many challenges to IOT and industrial Automation for example data and service security, trust and Integrity, information privacy etc, This paper combines the concept of ARM based Industrial workstation and Industrial Automation using IOT. This System uses the ARM as a controller and server, the programming is done In Embedded C language. This work develops the system that will automatically monitor and control the industrial electrical appliances using advanced sensor and controller and it also gives the Emergency alerts to Authorized person without any human interference. Data Acquisition is just the tactic of bringing the real-world data, like voltage, pressure, temperature, humidity, etc., into the PC for processing, storing and analyzing of the manipulated data. Modern industrial controlling and data acquisition system utilizing embedded system modules has played an irreplaceable role during this field.**

Keywords: IoT, DAQ, Multiprocessor, M2M, Industrial Automation, Auto Sensing Technology, ARM, Embedded.

I. INTRODUCTION

DAQ is defined because the process of taking real-world signals like voltage or current signal, into the PC for processing, storing and analyzing of the manipulated data [1]. The real-world signal that we try to research is often represented by physical phenomena. Nowadays, computers with EISA, ISA, PCI or PCMCIA bus is employed for data acquisition in testing and measuring, laboratory applications, industrial automation environments and research by most of the scientists and engineers. Many applications use plug-in boards to acquire data and transfer it onto memory. In some cases, DAQ hardware are often incorporated within the PC and communicated to the external world by parallel or interface. Typically, DAQ plug-in boards are general-purpose data acquisition devices that are compatible for measuring voltage signals.

However, the output signals of the many real-world sensors and transducers must be processed or conditioned before the continual signal is fed to the DAQ device for accurate and effective acquisition of signal. Generally, front preprocessing is additionally termed as signal conditioning. It incorporates the subsequent functions; signal amplification, filtering, and electrical isolation and multiplexing. The negative aspect of this board based DAQ systems are its enormous power consumption and hulking nature. (E.g. they'll consume up to be 10W-15W from a 5V to l0 V power supply). The above drawbacks are the real-world challenges faced by modern electronic circuits and system design.

The existing DAQ system is categorized into three types. The primary category is that the computer-based class, which utilizes a computer-processing power to perform the specified data manipulation, visualization, storage, and/or deciding. Embedded micro controller based systems comes under the second category of DAQ system, which has the benefits like high performance and portability, but they need fixed architecture. However, there exists a 3rd category of DAQs, which involves a hardware reconfigurable Field-Programmable Gate Array (FPGA). The integration of multiple components on one package is allowed in modern high-capacity FPGA, which incorporates processing, storage and input-output capabilities that are necessary for DAQ systems. Therefore, it's not scalable.

Here the proposed system introduces a scalable data acquisition technique during which multiprotocol for the method of knowledge acquisition, built out of the ARM Cortex processor is employed.

II. HARDWARE DESIGN OF THE SYSTEM

The overall hardware design of the system is shown in Figure 1. ARM Cortex-M0 processor board from NXP has been chosen because the main processing unit due to the advanced architecture, performance and low power requirements. This technique is meant to support the usage of the many sorts of protocols. Existing data- acquisition system using ARM processor supports either with wired protocol or

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with wireless protocol only [2]. However, this newly designed system is often used with both wired and wireless protocols, and it can automatically detect the enabled protocol and accordingly transfer the info from the processor. Here this proposed system use humidity, air velocity and light weight sensor acquire the info for industrial and agricultural applications [3].

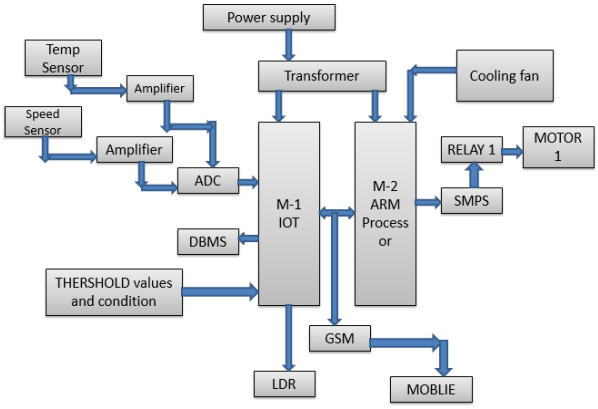

Figure 1: Block diagram of proposed system

From these sensors, acquired data is shipped to the ARM Cortex processor and thru the USB device, it automatically transfers the info either wired or wireless to the PC [4].In the PC, we will monitor the real-time data.

III. HARDWARE REQUIREMENTS

The hardware requirements for this proposed system are: humidity, air velocity and lightweight sensors, ARM Cortex-M0 processor board with RS-232 port and, which supports ZigBee transceiver chips and PC for processing.

3.1 Humidity Sensor

The humidity sensor shown within the following Figure 2 will operate within the frequency range of 500 to 2 KHz, and its reaction time is a smaller amount than 10S. The utmost power supply given to the sensor is 1.5V and its accuracy is going to be ±5%. It's small and lightweight in weight.

Figure 2: Humidity sensor

3.2 Light Sensor

The resistance range of the photo resistor used here as in Figure 3 is within the range of 5 to 10KΩ and operates within the temperature range of -30°C to 70°C. The utmost permissible power dissipation is 70maW. Its temperature coefficient is 0.6, and it's a dark resistance of 1.

Figure 3: Light sensor

3.3 Air Velocity Sensor

The Air Velocity Transducer 8455 shown in Figure 4 is employed for air velocity measurements, beneficial in research and development labs played a crucial role during this system design. The transducer probe located within the upstream is employed for calculating the flow turbulence.

For this experimental setup, DC motor and a lover situated on the highest of the DC motor is employed. DC motor acts as a DC generator during which the fan rotates consistent with the electricity induced by the motor. This will cover a good range of measurement applications (Range: 25–10,000 ft/min) and it's a quick reaction time.

3.4 ARMCortex-M0 Controller

The ARM Cortex-M0 may be a 32-bit general purpose microprocessor which consumes very low power and is of high performance. Operating frequency for the CPU ranges over up to 50MHz. Peripheral components along side LPC1114 ARM micro controller are 64 KB of non-volatile storage, 8 KB of knowledge memory, one RS-232 UART, one I2C-bus interface, two SPI interfaces, which may support Serial SCSI protocol features, two pairs of general-purpose counter/timers, 42 general-purpose I/O pins and a 10-bit ADC.

3.5 Wired Protocol

An RS-232 port was a typical feature of a private computer with this; we will interface the PC to modems, printers, mice, storage devices, power supplies without interrupt, and peripheral devices. Industrial machines or scientific instruments have exclusive usage [5].Power to peripheral devices can't be done via a RS-232 device. Driving the signals at a lesser voltage is that the common deviation

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from the quality. Some of the manufacturers, therefore, built transmitters, which are operated by +5 V and -5 V and labeled as "RS-232 compatible". For USB based connections, corresponding device drivers are utilized, which allows application programs to access the USB-connected devices. USB to RS-232 convertors might not be supported by all software on all PCs, which can cause the reduction in bandwidth side greater latency.

3.6 Wireless Protocol

Monitoring the weather parameters is critical in many agriculture/industrial applications. Furthermore, usage of wireless protocol plays a serious role. To form it simple and price effective ZigBee technology is employed, and its parameters are displayed on the PC. This technique contains two nodes: First is transmitter node and therefore the second is receiver node, and both are often of any number. The transmitter part consists of weather sensors, micro controller and ZigBee transmitter, while the receiver end contains a PC with the ZigBee receiver interface [6]. This technique design with wireless protocol helps an industry to monitor the remote parameters in real time [7]. In addition to the above advantages, use of ZigBee favored a simple installation platform which may be a low-cost solution for low bit rate transmission.

IV. SOFTWARE REQUIREMENTS

The software utilized in DAQ system is predicated on Embedded C language [8] and developed using Keil IDE and Visual basic 6.0 for monitoring the parameters in PC [9].

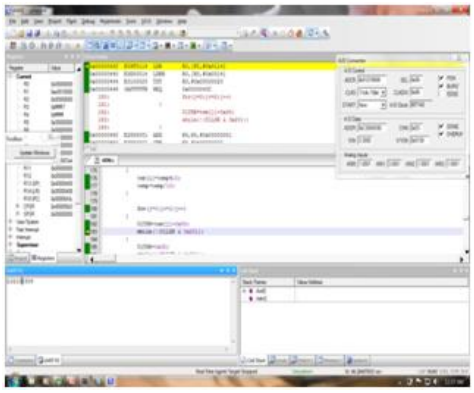

Figure 4: Simulated output of the DAQ

The simulation result from the analog to digital conversion using Keil IDE is shown in Figure 4.

V. EXPERIMENTAL RESULTS

Figure 5 shows the hardware experimental setup of the transmitter section and therefore the receiver section.

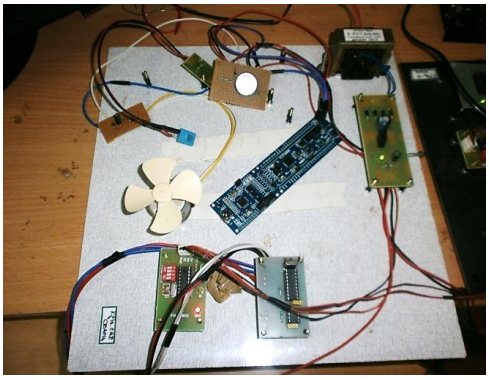

Figure 5: Hardware prototype

The monitoring parameter utilized in the proposed DAQ system is shown within the following Figure.

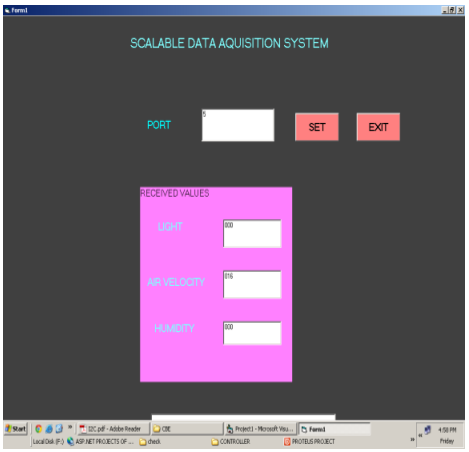

Figure 6: Monitoring of various parameters

The data acquired from the sensors by the controller is transmitted through the ZigBee transmitter module. On the receiver side, the ZigBee receiver interfaced with the PC receives the transmitted data. The received parameters are then handled within the PC. Here the ZigBee are often transmitted up to 80m at a frequency range of 2GHz.The data acquired by the Cortex processor also can be sent to the receiver section by the wired SPI (RS-232) then monitored on the PC.

Comparison of Processors

The following table shows the comparison of varied specifications between ARM 7 and ARM Cortex processor.

TABLE 1
Comparison of Processors

Specifications	ARM7	ARM Cortex
Architecture	Von-Neumann	Harvard
Area (mm^2)	0.62	0.37
Operating Frequency	55MHz	50MHz
Maximum Frequency	85MHz	100MHz
Maximum Latency	29 Cycles	12 Cycles

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VI. CONCLUSIONS

This paper proposed the event of a data-acquisition system using ARM Cortex processor who includes high performance and accuracy. The most functions of the DAQ part are designed and tested during a three-channel DAQ namely humidity, air velocity and lightweight intensity. This particular implementation is often utilized within the field of agriculture/related industries for estimation/prediction of weather supported previously acquired data. Better performances are often achieved by using stand-alone DAQ. It includes automatic recognition of protocol enabled during transmission of knowledge. Here only two protocols are considered, If more protocols are used it'll automatically detect the recognized protocol and transmits the information. Future work includes the information of acquisition system using CAN network in ARM Cortex processor.

REFERENCES

[1] Li S, Luo JR, WuYC, LiGM, Wang F, Wang Y., "Continuous and Real-Time Data Acquisition Embedded System for EAST" *IEEE Transactions on Nuclear Science*, 2010; 57: 696–699.

[2] Sivaguru.S, Sundari.B, Rupavathi.N, "A High Speed Open Access Visible Light Communication System based on Intensity Modulation" published in International Journal of Science Technology & Engineering (IJSTE), Volume 3, Issue 8, pp 1-5, 2017.

[3] XiaodongZ, Xiujuan LI, Jie Z. "Design of Embedded Remote Monitoring System Based on the ARM" *J Modern Electronics Technique*, 2008; 6: 22–23.

[4] Martin S, "PC–based data acquisition in an industrial environment" *In: IEE 1990 PC–Based Instrumentation Conference; 31 January 1990; London:* IEE. pp. 2/1–2/3.

[5] Chen IY, Huang CC, "A Service–Oriented Agent Architecture to Support Telecardiology Services on Demand", *J Medical and Biological Engineering*, 2005; 25: 73–79.

[6] Patel Hiren, Patel Dipak. "GUI Based Data Acquisition System Using ARM–Cortex M3Microcontroller", *International Journal of Computer Science and Information Technologies*, 2012; 3: 3199–3204.

[7] Jie Z, Wen-ying LI, Hong Z, Lin YE, "Electric Parameter Real–time Monitor and Control System Based on GPRS", *J. Electrical Measurement &Instrumentation*, 2005; 11: 34–36.

[8] Sundari.B, Sivaguru.S, "Design and Implementation of Robotic Arm Using IOT" published in SSRG International Journal of Electronics and Communication Engineering (SSRG-IJECE), Volume 5, Issue 8, pp 1-4, 2018.

[9] Sivaguru.S, Sundari.B, "Effective Demosaicking for Bayer Color Filter Arrays with Directional Filtering and Weighting Technique" published in International Research Journal of Engineering and Technology (IRJET), Volume 4, Issue 1, pp 208-211, 2017.

[10] Xiangyang L, Weiqiang Z, Hu J, "Design of intelligent home appliance control system based on ARM and ZigBee", *In: IEEE 2012 Consumer Electronics, Communications and Networks Conference;* 21–23 April 2012; Yichang, China: IEEE. pp. 260–263.

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