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Small Scale Industrial Parameter Monitoring Through Ethernet

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Abstract— in today's world networking is important part of industrial automation in monitoring of industrial process Parameters. Embedded Ethernet is nothing but a microcontroller which is able to communicate with the network currently device with microcontroller has been widely used in industrial field. A design of Processor-based embedded Ethernet interface is presented. In the design, an existing SPI serial device can be converted a network interface peripheral to obtain compatibility with the network. By typing the IP-Address of LAN on the web browser. Adopting Ethernet interface control mode, the remote network monitoring of power network is realized under Windows. Intelligent Electrical Industry will be connected to the Internet and require a microcontroller to communicate with the other network devices. The accuracy of data collection is depends on type of sensor and process whose parameter is to be monitor.

Keywords— Embedded Ethernet, Arduino, Web Server.

I. INTRODUCTION

In world numerous factors, temperature, pressure, humidity are most important and the most difficult to control environmental factors. In addition in recent years, energy and environmental problem becomes the hot topics that people concern. In some industrial have to control it. Temperature monitoring and control is important in industrial environments. Sensors are widely used for measurement of temperature. Usually, a temperature sensor converts the temperature into an equivalent voltage output so we need energy conservation and environmental protection. Monitoring and control is very important in realizing industrial automatization and high efficiency. With the development of modern industry, the requirement for industrial monitoring system is getting higher. The system is process real time data. It is also required controlling related instruments to change those environment factors such as temperature, pressure, humidity, speed, motion etc. and monitoring remote distance. .In wire communication, one clear limitation is we have to put wire ground. This can difficult to hide, and time consuming in buildings that are already constructed such as wiring at working place. Another limitations that applies to industrial environments is metal conductors wired between places that potentially have different ground potential rise (GPR) can cause equipment failures when ground voltage at one side of the wire becomes significantly higher than at the other end. Wireless communications and fiber optic communications have been used to prevent the GPR issue. Because of difficult wiring, limitation of control range of the system and high maintenance cost, these systems cannot be use widely. So, we use embedded technology& Ethernet technology for monitoring & controlling action .We will replace SCM (single chip microprocessors) with microprocessors, which will greatly improve the overall performance of the system. The application of Ethernet and embedded technology makes the remote monitoring possible and give the stability, reliability, security, and real-time of the data transmission at display at web server . It will effectively improve the flexibility, efficiency and maintainability of the control system and reduce the cost of the equipment maintenance. Base on these reasons, the system will meet the requirement of the microcontroller system.

II. WEB BASED SUPERVISION AND CONTROL SYSTEM

In recent years, the Internet and networks have proved to be powerful tools for distributed collaborative works. Recent advances in computing, communications, sensing, and software technologies have created a new environment which offers great opportunities for the field of control to expand its applications and its contributions to the economic growth and more developed societies. The rapid growth of communication networks provides several major opportunities and challenges for systems and control. In recent years, the Internet and networks have proved to be powerful tools for distributed collaborative works Web based automation is a recent development in the industrial sector. The implementation of industrial process control is made possible by the use of Internet. The function of Web-based equipment monitoring system is to collect data information of the onsite equipment, publish it through a Web form, and remotely send the data in the form of the user-defined data transmission style. The data will be published through web server. The remote computer will collect the data and display it to on the web page, and it indicates level for example temperature in the boiler etc., all these information's will display on the web page which also allows all these control the appliances.

In the scheme of the system, the remote I/O data acquisition modules are developed as embedded web servers having static IP. which can be widely used to diversified industries such as electric power, petroleum, chemical, metallurgy, steel, transportation and so on. This system is mainly used for the

concentrative controlling and monitoring of a variety of electrical and thermal signals such as voltage, current, thermal resistance, thermocouple in the production process.

The 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 interconnection 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.

Integration with the Internet implies that devices will utilize an IP address as a unique identifier. However, due to the limited address space of IPv4 (which allows for 4.3 billion unique addresses), objects in the IoT will have to use IPv6to accommodate the extremely large address space required. Objects in the IoT will not only be devices with sensory capabilities, but also provide actuation capabilities (e.g., bulbs or locks controlled over the Internet). To a large extent, the future of the Internet of Things will not be possible without the support of IPv6; and consequently the global adoption of IPv6 in the coming years will be critical for the successful development of the IoT in the future.

III. HARDWARE IMPLEMENTATION

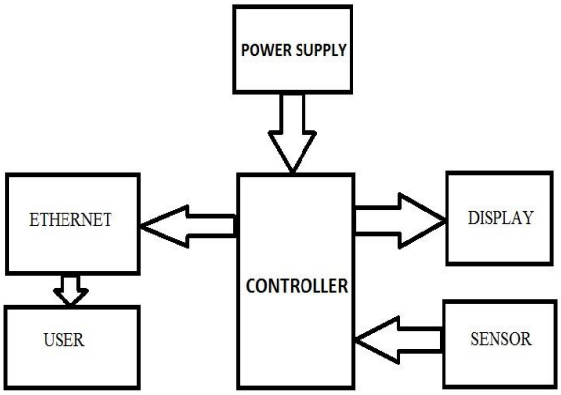

Fig.1. Block Diagram Of System

The hardware mainly consist of

A. Sensor
B. Ethernet controller
C. Interfacing
D. Processor
E. LCD
F. PC

A. SENSOR

Sensors are used to collect the data form actual industrial field. Sensor is the device which converts the one form of energy in to another form. It is used to sense various parameters like Temperatures, Pressure, Force, Flow, Light etc. Sensor are classified in to different types depending on there working or changing parameter with reference to measured variable.

-Sensor whose resistance is changes with measured variable.
-Sensor which produces voltage with measured variable.
-Sensor whose electrical output is changes with measured variable.
-Thermister for measurement of temperature.
-Photoresister for light measurement.
-Strain gauge for mechanical strain measurement.All - paragraphs must be indented. All paragraphs must be justified, i.e. both left-justified and right-justified.

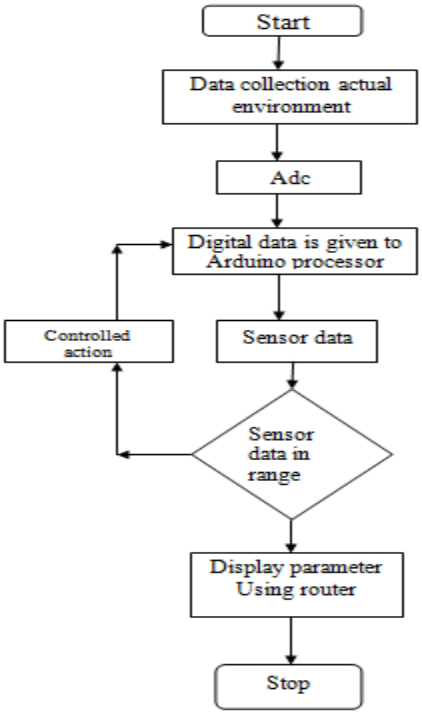

Fig.2.Figure System Implementation Chart For System

In figure we show controlled action this action will take at a time where alter monitoring show critical condition, At time critical condition will related action mechanism will run and after that critical condition will in normal then further processer monitoring start.

LM 35 Temperature Sensor:
As per system requirements for measuring Temperature the Precision Centigrade Temperature Sensor LM 35 is selected as shown in Fig.5.The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors

calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies.
The operating range of this sensor is 4-30 volts. It gives 10mv/0c output. Rated for full −55° to +150°C range.

Level Sensor:
As per system requirements for measuring level of liquid selected Level Sensor .This level sensor gives the output in the form of resistance. So, by using constant current source supply converted that value into voltage.
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Speed Sensor MOC 7811:
MOC 7811 shows Speed Sensor. It has internally LED & transistors. It gives output in between ground & +vs. By measuring pulses in between these two outputs we measured the speed of device in rpm. That output of speed sensor is directly connected to the interrupt pin of LPC 2148

B. ETHERNET CONTROLLER:

Fig. 3 shows Serial to Ethernet module which is used in system. The Serial-to-Ethernet (S2E) module is a simple product that provides serial to Ethernet communications. Existing systems that lack Ethernet connectivity Client can access this serial to Ethernet Module on remote location through IP address.TCP/IP protocol is used for communication to the client on remote location.

Fig.3. Ethernet Module

The MDL-S2E module provides the following features:

- LM3S6432 microcontroller.
- 10/100 Mbit Ethernet port.
- Two serial ports, configured as data communication equipment (DCE), include RTS/CTS for flow control.
- Module supports 5 V and 3.3 V supplies.
- Protocols include ARP, IP, ICMP, UDP, TCP, HTTP, DHCP, and Telnet.
- Multiple mounting options.

Ethernet:

Ethernet is one of the most common high-speed interfaces found in homes and offices, and there are some automobiles where Ethernet is being used to transport a variety of high-speed data. Like the CAN bus, Ethernet is a packetized system, where information is transferred in packets between nodes on various parts of the network. Also like the CAN bus, Ethernet is bidirectional, and the speed possible on any individual link decreases as the number of nodes on the system increases. Still, Ethernet can transport data over a link 100 times faster than a CAN bus.Ethernet is good for midbandwidth communications in applications such as navigation systems and control. It can be used in much the same way as a CAN bus while providing Much more bandwidth. Ethernet would be an ideal Choice to replace the CAN bus, but since Ethernet's cost per node is higher, it probably will not replace but rather will augment the CAN bus.
Industrial Ethernet technologies are currently the most formidable challenge to CAN as the low-cost industrial networking technology of choice. Ethernet technologies will eventually replace the majority of CAN applications, at least in regards to new developments, starting at this very moment in certain areas such as industrial control including motion control and, especially, robotics.

Serial Peripheral Interface (SPI):

The serial communication is performed by means of two pins that are SI and SO as shown in Figure. SCLK provides clock synchronization and CS is the chip select. This communication technique can be implemented between processor and peripherals that have SPI interface. Serial Peripheral Interface Bus in which serial data communication is performed in master/slave mode. In which master device initiates the data frame. This is a full duplex mode of point to point communication. The serial clock, SCLK generated by the master device which is used by the slave. The SS is the Slave Select signal. It is required in active low state for the slave to have communication with master. This is a four wire communication as shown in Figure 4. The SDO or Serial Data Output signal send by the master and after receiving the clock pulse, the slave device responds back with SDI or Serial Data Input signal.

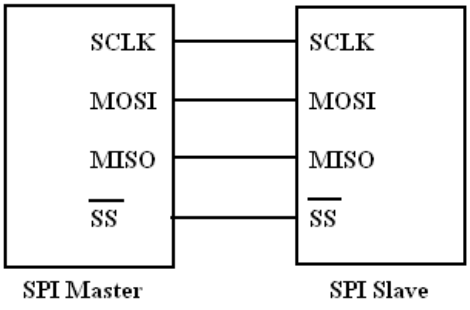

Fig.4. Spi Interface

When SPI protocol is used between the two devices, the Ethernet Controller generates the data
frame and acts as the master while the Arm processor acts as the slave device

- SPI interface: It serves as a primary controller and act as communication channel between ENC28J60.
- Control register: Are used to control and monitor the ENC28J60.
- Dual port RAM buffer: It acts as an arbiter to control the access to RAM buffer, when requirement is made from DMA to transmit and receive the blocks.
- Bus interface: It interprets data and commands received via SPI
- MAC module: It implements IEEE 802.3 compliant MAC logic.

PHY module: It encodes and decodes data obtained from the twisted pair. The controller communicates with Ethernet controller via its ADC lines, to initialize the chip, Poll it for packet status and Send/receive the data.

C. INTERFACING

Interfacing is use to provide proper communication between microcontroller and external device. This may be the parallel or serial communication. So we got level of liquid in the form of voltage. That voltage is amplified by using differential amplifier.

D. PROCESSER

An Arduino is an open-source microcontroller development board. In plain English, you can use the Arduino to read sensors and control things like motors and lights. This allows you to upload programs to this board which can then interact with things in the real world. With this, you can make devices which respond and react to the world at large. For instance, you can read a humidity sensor connected to a potted plant and turn on an automatic watering system if it gets too dry. Or, you can make a stand-alone chat server which is plugged into your internet router.
An Arduino board consists of an Atmel 8-bit AVR microcontroller with complementary components that facilitate programming and incorporation into other circuits. An important aspect of the Arduino is its standard connectors. Most boards include a 5 volt linear regulator and a 16 MHz crystal oscillator .An Arduino's microcontroller is also pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory, compared with other devices that typically need an external programmer. This makes using an Arduino more straightforward by allowing the use of an ordinary computer as the programmer.

E. LCD

A liquid-crystal display (LCD) is a flat panel display or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly.
LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.
LCDs are used in a wide range of applications including computer monitors and signage. They are common in consumer devices such as DVD players, gaming devices, clocks, watches, calculators, and telephones, and have replaced cathode ray tube (CRT) displays in most applications.

F. Personal computer (PC)

A user is a person who uses a computer or network service. A personal computer (PC) is same as general-purpose computer. Which used to display parameter of sensor. In other hand, that used to monitoring controlled action in industries.

IV. SOFTWARE DESCRIPTION

The Arduino integrated development environment (IDE) is a cross-platform application written in Java, and derives from the IDE for the Processing programming language and the Wiring projects. It is designed to introduce programming to artists and other newcomers unfamiliar with software development.

V. RESULT

In result number of thing is including such as below:

1. Alert monitoring system . it is one of function of this system .if we describe it ,any of sensor is critical condition then it show user. That immediate controlled person will take action on it.
2. If number of pc use then we connected controller with lan and number of person shows result (each person have login password).
3. If number of controller used and give unique ip then we extend the limit of sensor.
4. In this paper we show that small scale industry then one controller use sufficient to cover it. Two or more controller use then increased limit
5. This is not enough to monitoring in lan pc connected bus iot is also used to remote monitoring

In this we set ip of the system whish show below

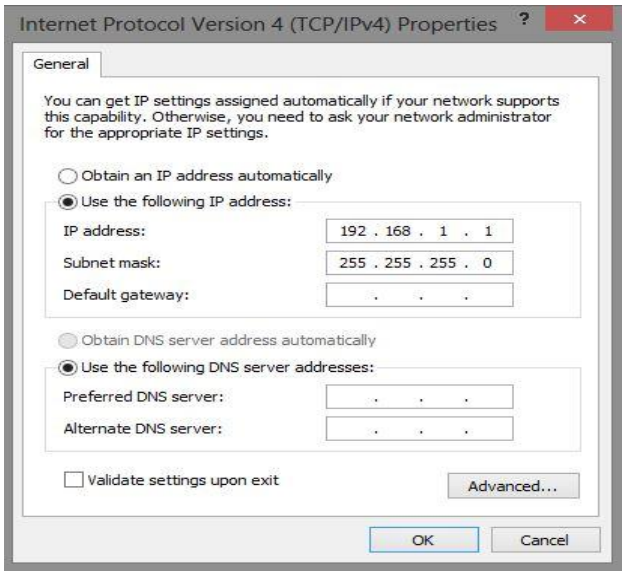

Fig.5. Ip Setting In Network

Web base monitoring will show in below fig.6 and other alert and controlling function management by remote application .In small scale industry replace by home application then this system work powerful tools for home monitoring for critical condition. We can say key parameter controlling, monitoring, graphical view which easily understands by user.

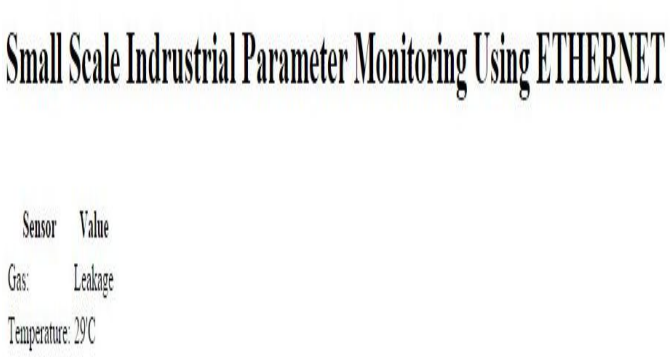

Fig.6. Web Base Management

VI. CONCLUSION

This is small, simple and low-cost system improves industrial parameter monitoring and controlling process. Flexible Embedded network system with Ethernet controller .web server in the system provides access to the parameters under the control of system through a device web page. A web server can be embedded into any appliance and connected to the LAN. So the appliance can be monitored and controlled from remote places through the browser on a desktop.

We can design real time monitoring & controlling of industrial parameters with the help of Ethernet. That provides authentication, encryption, and integrity services for wireless system that increases security level of the system. Total reliability of the system. Our system can be extended for sensing malfunctioning in industrial machines and making corrective measures in it. More and more automation is being handled via remote communication.

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