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An Internet Based Interactive Embedded Data Acquisition System

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Abstract: Remote Monitoring, Control and intelligent is one of the most important criteria for maximum production and process plant availability. With the development of modern industry, the requirement for industrial monitoring system is getting higher. The main core of the system is an embedded hardware. The embedded device communicates through General Packet Radio Service (GPRS),which makes it accessible from anywhere in the world througha web server built into the embedded device. In addition, GPRSprovides a bidirectional real-time data transfer allowing interaction.The proposed system eliminates the need for server softwareand maintenance. A novel approach is introduced to minimize theoperational costs while operating with a large amount of data.The system is demonstrated to be suitable for different embeddedapplications by attaching several real-time modules throughappropriate interface

Keywords: Data acquisition, GPRS, Internet, Real time Data

I. INTRODUCTION

DAQ (Data Acquisition) is the process of bringing a real-world signal into the computer, for processing, analysis, storage and data manipulation. Today, most scientists and engineers are using personal computers with ISA, EISA, PCI or PCMCIA bus for data acquisition in laboratory to test and measurement, and industrial automation. As instrumentation field entering into a fourth generation, i.e. remote controlling based on Ethernet and Internet. It is boon to instrument having such provision for remote controlling. Data Acquisition System (DAQ) plays a vital role in instrumentation where interfacing with PC. Embedded systems control many devices in common use today and are usually build dedicated to perform a specific task. Design engineers can optimize it to reduce the size and cost of the product and increase the reliabilityA typical Data acquisition system (DAS) consists of individual sensors with the necessary signal conditioning, data conversion, data processing, multiplexing, data handling and associated transmission, storage and display data. DAS is very useful in keeping track of data from sensors recording values from the environment in real time .In order to optimize the characteristics of the system in terms of handling capacity and cost .Analog data is generally acquired and converted into digital form for the purpose of processing, transmission, display and storage. The Primary goal of building an Internet connected Data Acquisition system is to build a DAS which would be able to acquire the necessary data from sensors , at correct speed and at a correct time and upload and record the values up on an external server through internet . So that a system values can be monitored from anywhere without the need of special equipment to receive and display information in condensed, understandable and legible manner. A user may also be able to diagnose the problem and could even set it right .The information can easily be accessed and controlled by PC or PDA with internet access, which in turn can be connected to a local low cost local area network (LAN) to transfer sensor values directly to a data logger or computer. The accessibility of this information is significantly curtailed by this need for proximity. However, developments in the Internet protocol, TCP/IP, which is the universal communication standard, looks, set to change all of this. In order to allow communications to be directed, every physical location on the Internet (server or client) requires an IP address. Software have been designed to run in PDA or PC that passes messages received on an IP network to the logger hardware via a serial port or USB or through GPRS , Bluetooth , Zigbee etc.

II. HARDWARE IMPLEMENTATION

The block diagram of the system of DAQ is shown in the above fig.1. The system consists of the following units viz. Camera, GPS, GPRS, ARM9 processor.

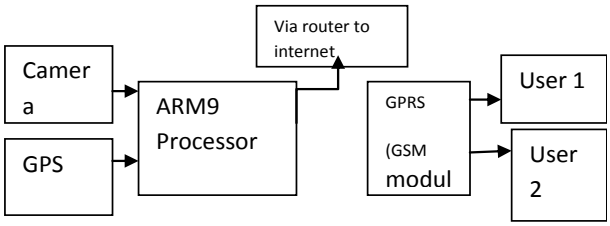

Fig No.1: Remote Monitoring & Control of Industrial

Parameters through ARM9 processor & GSM Module
ARM9 Processor
The general hardware structure of the remote I/O data acquisition and control system based on ARM9 processor .The remote I/O data acquisition and control system based on embedded ARM platform has high universality. Sensors are used for process monitoring and for process

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control. Each I/O channel can select a variety of electrical and non-electrical signals like current, voltage, resistance etc. Multiple sensors can be used to measured data are stored in external memory, we can directly show this data on LCD display connected to port 0 & the memory is act as a data base during accessing web server. We can interface GUI with this processor.

GPS (Global positioning system)

A GPS receiver is fully-functional satellite navigation system. More than two dozen GPS satellites are in medium earth orbit, transmitting signals allowing GPS receivers to determine the receiver's location, speed and direction. Each of these 3,000- to 4,000-pound solar-powered satellites circles the globe at about 12,000 miles (19,300 km), making two complete rotations every day. The orbits are arranged so that at anytime, anywhere on earth, there are at least four satellites "visible" in the sky. The location of at least three satellites above it The distance between the receiver and each of those satellites The GPS receiver figures both of these things out by analyzing high-frequency, low-power radio signals from the GPS satellites. Better units have multiple receivers, so they can pick up signals from several satellites simultaneously. Radio waves being electromagnetic energy travel at the speed of light (about 186,000 miles per second, 300,000 km per second in a vacuum). The GPS receiver system uses a micro strip patch antenna, followed immediately by a low noise amplifier. These two together form an integrated active antenna, having an overall gain of 26dB. This antenna is interconnected to the receiver through a 50 ohm RF cable of 10m length. The M, activation of GPS is simple and is achieved by providing it with a 12 v power supply.NMEA 0183 (or NMEA) is a combined electrical and data specification for communication between marine electronics and GPS receivers. The NMEA protocol is a means by which marine instruments and GPS receivers can communicate with each other. It has been defined by, and is controlled by, the US based National Marine Electronics Association. The NMEA standard uses a simple ASCII, serial communications protocol that defines how data is transmitted in a "sentence“ or a string. The standard also defines the contents of each sentence (message) type so that all listeners can parse messages accurately: Each message starting character is a dollar sign. The next first five characters identify the type of message. All data fields that follow are comma-delimited. The first character that immediately follows the last data field character is an asterisk.

The asterisk is immediately followed by a two-digit checksum.

III. SOFTWARE IMPLEMENTATION

LINUX Operating System

A lot of the advantages of Linux are a consequence of Linux' origins, deeply rooted in UNIX, except for the first advantage, of course:

Linux is free:

As in free beer, they say. If you want to spend absolutely nothing, you don't even have to pay the price of a CD. Linux can be downloaded in its entirety from the Internet completely for free. No registration fees, no costs per user, free updates, and freely available source code in case you want to change the behavior of your system. Most of all, Linux is free as in free speech. The license commonly used is the GNU Public License (GPL). The license says that anybody who may want to do so, has the right to change Linux and eventually to redistribute a changed version, on the one condition that the code is still available after redistribution. In practice, you are free to grab a kernel image, for instance to add support for teletransportation machines or time travel and sell your new code, as long as your customers can still have a copy of that code. Linux is portable to any hardware platform.

A.KEIL ARM

µVision is a window-based software development platform that combines a robust and modern editor with a project manager and make facility tool. It integrates all the tools needed to develop embedded applications including a C/C++ compiler, macro assembler, linker/locator, and a HEX file generator. The µVision IDE and Debugger is the central part of the Keil development tool chain and has numerous features that help the programmer to develop embedded applications quickly and successfully. The Keil tools are easy to use, and are guaranteed to help you achieve your design goals in a timely manner.

B. FLASH MAGIC

Flash Magic is loaded being performed. This means that other applications that need to use the COM Port, such as debugging tools, may be used while Flash Magic is Windows software from the Embedded Systems Academy that allows easy access to all the ISP features provided by the devices Flash Magic provides a clear and simple user Under Windows, only one application may have access the COM Port at any one time, preventing other applications from using the COM Port. Flash Magic only obtains access to the selected COM Port when ISP operations are being performed. This means that other applications that need to use the COM Port, such as debugging tools, may be used while Flash magic is loaded. To download the hex file into the microcontroller board we use a programmer called flash magic tool.

C. HTTP PROTOCOL

The protocol used for the communication between web server and web browser is Hyper Text Transfer Protocol or HTTP protocol. This protocol defines all the basic frame work of web communications by handling requests and also by providing control information to be transferred between browser and server. To obtain a web document, the browser and server should establish a connection at Port. Establish a connection. To open a web document, client and server should establish their connection to port. This is done by means of sockets. Client will open a socket and bound it on a port. If successful, a virtual document is created where we can read and write. In the

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server side, firstly the socket is created and it is bound to the server address. Now the socket is converted to listening socket to hear the client request. After this the connection to the client is established. To handle multiple requests, server carries out several processes that prevent the communication interference.

IV. CONCLUSION

This system will provide a ubiquitously accessible; real timeremotely monitored and controlled solution for automationof industries. Also use of Raspberry Pi Processor, web server, GSM module, Sensors & actuators provide existing possibilities. Thus this solution can be customized to suit any other industrial requirements related to monitoring and control provided by industrial sensor. It helps equipment's maintenance and the sensor equipment improve the work efficiency. We describe the design process of sensor monitor system based on GPRS, the functional modules composing the monitor system, communication of monitor system and test results of system. The monitor system is use of the advantages of GPRS, monitors operational status of equipment real time and achieves the collected data. It helps equipment's' maintenance and the sensor equipment improve the work efficiency.

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