

ARM Based Embedded Web Server For Data Acquisition System

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ABSTRACT

The basic aim of the project is to develop an embedded web server using ARM7 processor, a Real Time Operating System and ENC28J60 Ethernet controller chip. An Embedded based Data acquisition and Control System will help the user to monitor the data with a standard web browser. User will be monitoring the data collected by the sensors like temperature, humidity, level and can remotely control the same. Through the Ethernet we could acquire the different real-time parameters, based on this information we also can implement control through internet. It consists of application program written in Embedded C in Keil Integrated Development Environments for accessing data through the serial port and updating on the embedded web server and on the web page simultaneously.

Keywords: EWS, OS, DAS, LAN, ADC

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I. INTRODUCTION

Data acquisition systems (DAS) with remote accessibility are in great demand in industry and consumer applications. In some applications, humans have been replaced by unmanned devices that will acquire data and relay the data back to the base. There are data-acquisition and controlling devices that will be a substitute for a supervisor in a multisite job operation. With the ability to access the application remotely, corporation can eliminate the need of a service person at the application and thus save the labor time and money. The early phase of the project focuses on passing the inputs to water in steel vessel at a required temperature, so as to constantly maintain a set temperature in the vessel. It mainly focuses on level, temperature, %RH. Thus the temperature in the steel vessel is constantly monitored. The automation is further enhanced by constant monitoring using WEBPAGE which is stored in LPC2148 by means of ETHERNET. By means of threshold values set to various parameters in WEBPAGE the whole process is controlled as required. This project has proved to be very efficient practically as the need for automation grows day by day.

II. EXPERIMENTAL PROCEDURE

A. Literature Survey

- 1) "ARM Embedded Web Server Based on DAC System", 2011 IEEE by M Poongothai: This paper describes the principle for designing a system for Internet-based data-acquisition system and control by using Advanced RISC Machine (ARM7/9) processor and in-built web server application with General Packet Radio Service (GPRS) technology. The main core of the system is an embedded hardware working on a NUT OS, an industrial grade RTOS for hard time applications.
- 2) "Design and Implementation of an Embedded Web server Based on ARM", 2010 IEEE by Mo Guan and Minghai Gu: In this paper, the embedded web server, which uses Samsung Corporation's ARM9-S3C2440AL processor as core is designed, it uses Linux as its OS and the system hardware architecture is presented.
- 3) "Design of ARM Based Data Acquisition & Control Using GSM & TCP/IP Network", 2013 IEEE by Suraj Patinge and Yogesh Suryawanshi: In this paper, they have proposed a design of ARM based DAS and control using GSM and TCP/IP network. The paper describes, an

Embedded System which can be used as a WEB server with all data backup in SD card. By entering the IP address of the LAN on browser the administrator and user get web page on screen contains all the current status of the devices.

B. Data Acquisition System

Interactive Internet-based systems provides a way to monitor using standard web browsers and a PC. The target systems can be monitored independent from the location and the platform since standard web browsers can be used on the client side. A data-acquisition system is connected to web clients via the Internet. The data acquisition system needs to relay the acquired parameters to the requesting clients. Digitally acquired data are stored in web server's data base. Whenever the client needs to access data, it sends the request to server; this request is taken by the router, which is connected to the internet. The web server processes the request made and finally connects to the desired web server, access the requested data and sends the data to the client.

C. System Specifications

- Temperature : 0 to 1024 C
- Humidity : 20%-95%.
- Level Sensor : 0-100%
- Power Supply : 3.3V, 5V, 12V.
- Ethernet module supports half and full duplex mode.
- Memory : 40kB of on-chip static RAM and 64kB/512kB on-chip Flash Memory.

D. Hardware Requirements

In the proposed system we have used LPC2148. It has special feature such as, 40 kb on chip static RAM. Our system requires large memory to store web page. Also it has two 10 bit ADC which is used for variable parameter conversion. Main advantage of LPC2148 is this ARM controller is suitable for HTML language which we have used for source coding. LPC2148 receive the input from temperature sensor, humidity sensor and level sensor.

Temperature sensor is used to evaluate the temperature of boiler. This analog input is given to the ADC of LPC2148.

Humidity sensor measured the humidity of boiler, humidity means moisture in the air which is important parameter in the overall operation of boiler. The output of the humidity sensor is also given to the ADC of LPC2148.

Level sensor is also used to measure the water level of boiler. It is indicated in the form of level1, level2, level3. The output of the level sensor is also given to the 10bit ADC of LPC2148. It converts the analog input which is coming from level sensor, temperature sensor, humidity sensor into digital signal for further processing of signals.

The parameter which is sensed by the all sensor are stored in RAM of LPC2148 in the form of web page. This webpage can be access by user using Ethernet controller .We have used ENC28J60 module of Ethernet .It uses most widely used installed Local area network (LAN) technology. It uses serial interface for microcontroller so microcontroller can then control remotely any hardware. The module consists of all required components for the Ethernet controller, a 3.3v voltage regulator and RJ-45 jack with integrated transformer. LAN and Boiler system to

each other through Ethernet. The output of Ethernet controller is given to the PC i.e. the accessed webpage is displayed on PC.

Power supply is used to provide the voltage of 3.3V to the system using LM317.5V power supply is also used for the LPC2148.

III.FIGURE

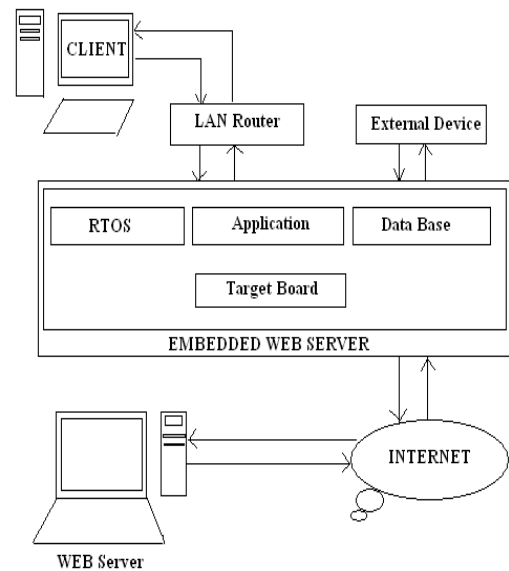


Fig. 1. System Architecture

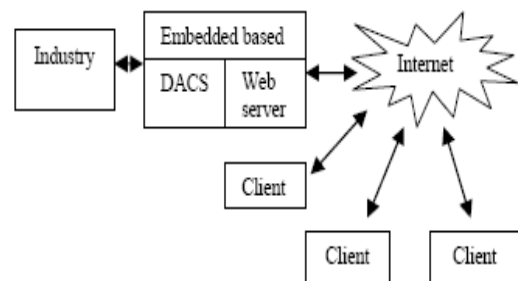


Fig. 2. Embedded Web Server(EWS) Architecture

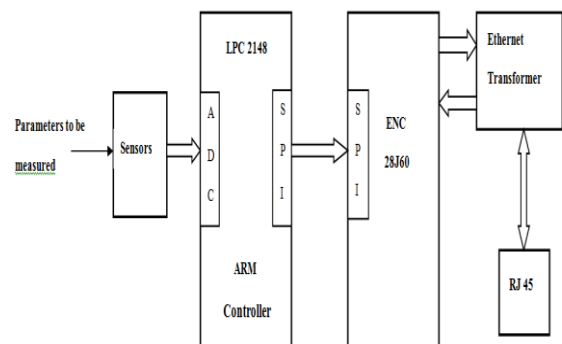


Fig.3. Block Diagram

IV. ADVANTAGES

- It reduces cost using free webpage instead of using PLC+SCADA.
- We can access all the parameters of boiler from any PC using HTTP server.
- This system is very flexible to users.
- Compact system

V. APPLICATIONS

- Automation automobile industry.
- Bottle filling plant.
- Boiler automation.

VI. CONCLUSION

We have implemented this system using HTTP server, we have seen that we can access real time parameters like temperature, humidity, different level of boiler.

The automation process help the company having the power plant to reduce the amount of errors that occur reduction in the human resources, increase efficiency and most importantly it is very cost effective. Also, stored webpage can easily available and easily accessible by controlled person anywhere in LAN area. Many important data should be stored as a record for the future.

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