

Research Article

# A Design of Embedded based Web Server or Monitoring and Controlling Agricultural Field

Sushma M. Gawali<sup>Å\*</sup> and Snehal M. Gajabhiye<sup>Å</sup>

<sup>Å</sup>Department of Electronics and Telecommunication, Government College of Engineering Amravati, Maharashtra, India

Accepted 25 May 2014, Available online 01 June 2014, Vol.4, No.3 (June 2014)

## Abstract

web server is design. The embedded based web server is located at the agricultural field so that 24 hours monitoring of agricultural parameter that is temperature and soil moisture is possible with the help of standard web browser. In this paper the agricultural field monitoring and control system based on sensors, relay and embedded web server for sending the sensors reading to the Internet is described. Here the design of embedded web server, software and hardware requirement of embedded web server is presented.

**Keywords:** Embedded web server, ARM Processor, Ethernet controller.

## 1. Introduction

Agriculture is an essential for production of food and raw materials. So it is necessary to monitor the agricultural parameter remotely for maximized production and to save labor time. Therefore it is necessary to add facility of science and technology in agricultural field. For monitoring and controlling agricultural parameter for almost anywhere using standard browsers on workstation computer the system should be designed. The web server is required to provide the information to the user on the standard browser. It is not possible to use the PC based server at the agricultural field for monitoring agricultural parameter due to large space, high cost and uninterrupted power supply. It is important to design an embedded based web server to monitor the agricultural parameter so that user can see this data on the standard browser when he enters the IP address of that embedded web server.

Web server is a system which provides access to the end devices for the client by uploading web pages as per client request. It is central functional unit that host web pages. Embedded web server is the web server that host web page and it is made by using ARM processor and ENC28J60 Ethernet controller chip. They used standard TCP/IP and HTTP network protocol.

Temperature and moisture is important parameter in agricultural field. Change in temperature also changes rate of transpiration and rate of photosynthesis. Salinity and PH of irrigation water is affected by soil moisture. If soil moisture is reduced, then the concentration of soluble salts of sodium, calcium, magnesium and potassium in the soil solution increases due to this the plant growth affect.

## 2. Hardware Design

The architecture of system which is design is shown in figure. Mainly it consist of three parts first is sensors second is embedded web server and last is client (farmer) for monitoring parameter. In the first part two sensors are used LM35 temperature sensor and moisture sensor. In the second part the ARM processorLPC2148 and Ethernet controller ENC28J60 is used. Here embedded web server is mainly used to convey moisture sensor and temperature sensor reading to a web browser. Embedded web server is also used to control moisture level of agricultural field.

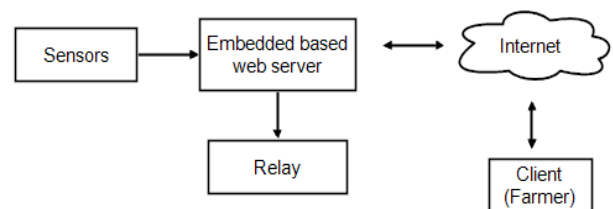


Fig.1 System Overview

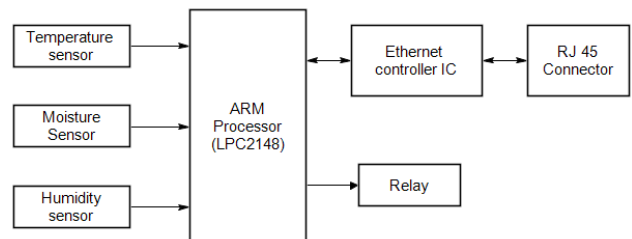


Fig.2 Block Diagram of Embedded web Server

The overview of interconnection between various devices in the design is shown by the block diagram in figure. Here ARM processor is used for simultaneous processing of information from temperature sensor and moisture

\*Corresponding author: Sushma M. Gawali

sensor and also to send or receive data over the Internet via Ethernet controller IC ENC28J60. RJ45 connector is used to connect the module to either 10 Mbps or 100 Mbps hub. The relay is used to control moisture level. If moisture is less then motor will be ON to provide the water to the plant via relay. By using web browser the user can browse home page of system and monitor the sensor reading.

### 3. Software Design

Keil software is used to write program in embedded C language for hardware functionality. A transmission control protocol/Internet (TCP/IP) software stack is necessary for internet communication over Ethernet. Therefore this layer of IEEE802.3 standard is implemented in embedded C language

#### 3.1 Client server communication

When farmer want to monitor the agricultural field parameter he enter the configured IP address of embedded web server which is placed at agricultural field on the web browser then he can monitor agricultural parameter through display HTML web page. Firstly password validation is perform by comparing logged in password with stored password in program. If client is authorized one, now he can see temperature and moisture reading on web page, now if moisture value is less than 50 then motor will be ON via relay otherwise it will be OFF. The program flow chart is shown in figure.

#### 3.2 TCP/IP Protocol

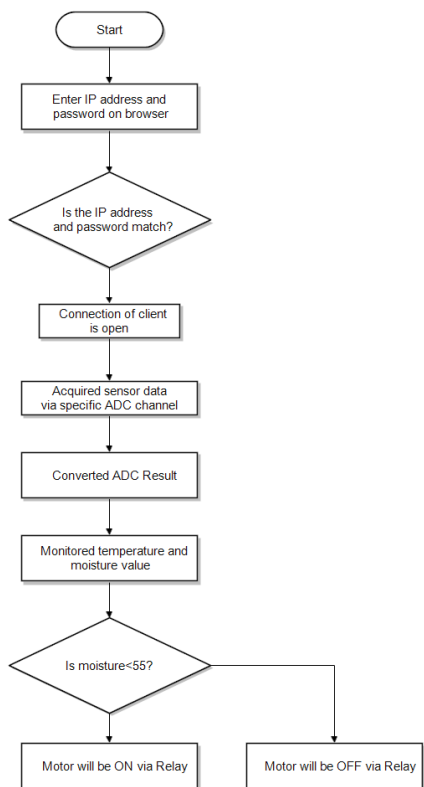


Fig.3 Basic Flow of developed system

The basic communication language of Internet is TCP/IP protocol. TCP/IP is two layer programs. The higher layer is transmission control protocol which is used to manage assembling of message into smaller packets so that they are transmitted over Internet and when it is receive on other PC then the TCP layer of that side is used to reassembles the packet into original message. The lower layer is internet protocol which is used to handle address part of each packet so that packet will be received by right receiver.

### 4. Result and Discussion

Figure 4 shows the simulation result of ARM based Embedded Web Server in Keil software.

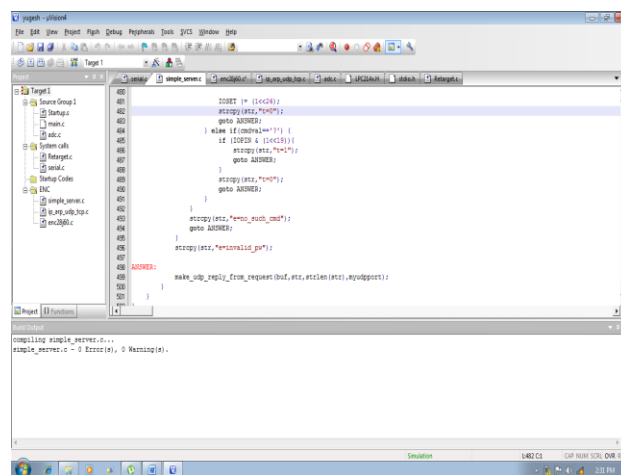


Fig. 4 Simulation result of program

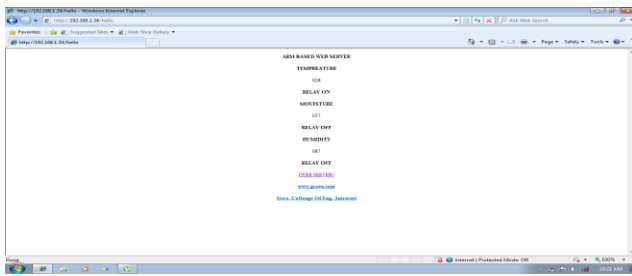
Figure 5 is simple web page which is display when configured IP address is enter on the web browser. This page is requested by client to server. Through internet the request is processes and then server response the request with web page. Here first data gives information about temperature sensed in agricultural field along with status of relay and second data display the value of moisture in agricultural field along with status of relay. If moisture is less than 55 then motor will be on via relay and if moisture is more than 55 then motor will be off via relay. Third data gives information about humidity.

Hence, result show that client (farmer) can access agricultural field from any remote place via its own local browser. In agricultural field ARM7 processor along with ENC28J60 Ethernet controller IC acts as data acquisition and control system and as web server, so the size of system is less than PC based web server and also less power is required for system.

### Conclusion

In this paper we have presented embedded web server for data acquisition in agricultural monitoring. The developed experimental system, based on ARM based web server collect the moisture, temperature and humidity data from the sensor. On the other side this web server is connected to internet through Ethernet. This system operated by data

acquisition mode to acquire the moisture, temperature and humidity value from sensor and control mode to control the moisture through relay.



**Fig. 5** Web page which monitored agricultural field status

## References

- Deepak C. Karia, Vispi Adajania(2011), Embedded web server application based automation and monitoring system, *International conference on Signal Processing, Communication, computing and networking technologies(ICSCCN)* .
- Fang Hongping, Fang KangLing(2010), The Design of Remote Embedded Monitoring System based on Internet *International Conference on Measuring Technology and Mechatronics Automation*.
- Hong-Taek Ju, \_ Mi-Joung Choi and James W. Hong(2000), An efficient and lightweight embedded Web server for Web-based network element management, *International Journal of Network Management*, pp. 261– 275.
- Manivannan M(2011), Design of on-line Interactive Data Acquisition and control system for Embedded Real time Application, *IEEE Trans.Proceedings of ICETECT*.
- Mo Guan and Minghai Gu(2010), Design and Implementation of an Embedded Web Server Based on ARM, *IEEE International conference on software Engineering and Service Sciences*.
- Qinma Kang, Hong HE, Hongrum Wang(2006), Study on Embedded web server and Realization, *1<sup>st</sup> international symposium on pervasive computing and application*.
- Rajan and Aby K. Thomas(2012), ARM Based Embedded Web server for industrial Application, *International conference on computing and control Engineering (ICCCE)*.
- S.B.Chavan, P.A.Kadam, and S.R.Sawant(2009), Embedded web server for monitoring Environmental parameters, *ISSN 0020-4412, Instruments and Experimental Techniques* , Vol. 52, No. 6, pp. 784787 .
- Soumya sunny p, Roopa M(2012), Data Acquisition and control system using aeembedded web server, *International Journal of Engineering Trends and Technology*-Volume3 Issue 3.
- Srinivas Raja, G. Srinivas Babu(2011), Design of Web based Remote Embedded Monitoring system, *International Journal of Technology and Engineering system(IJTES)*, Vol2(2).