www.ijecs.in
International Journal Of Engineering And Computer Science ISSN:2319-7242
Volume 3 Issue 2 February, 2014 Page No. 3971-3977

An Ethernet Based Monitoring and Controlling Of Home Appliances Using Rabbit Processor

Patil Ketan C , Patil Rohan A , Musale Shrikant K , Prof. D.B. Rane
Department of Electronics Engineering
Pravara Rural Engineering College, Loni

ABSTRACT:
The aim of home automation is to control home devices from a central control point. In this paper, we present the design and implementation of a low cost but yet flexible and secure internet based home automation system. The communication between the devices is wireless. The protocol between the units in the design is enhanced to be suitable for most of the appliances. The system is designed to be low cost and flexible with the increasing variety of devices to be controlled. Networking is a major component of the processes and control instrumentation systems as the network's architecture solves many of the Industrial automation problems. There is a great deal of benefits in the process of industrial parameters to adopt the Ethernet control system. Hence an attempt has been made to develop an Ethernet based remote monitoring and control of home appliances. In the present work the experimental result shows that remote monitoring and control system (RMACS) over the Ethernet.

KEYWORDS: Home Automation, Rabbit Processor, Ethernet, TCP/IP, Web Server

I. INTRODUCTION

The aim of home automation is to control home devices from a central control point. In this paper, we present the design and implementation of a low cost but yet flexible and secure internet based home automation system. The communication between the devices is wireless. The protocol between the units in the design is enhanced to be suitable for most of the appliances. The system is designed to be low cost and flexible with the increasing variety of devices to be controlled. In this paper presents the way to provide Ethernet internet connectivity to Rabbit Processor based embedded systems. This system uses Rabbit Processor to store the main application source code, web pages and TCP/IP stack which is a vital element of the system software. An Ethernet controller chip, ENC28J60 is used to handle the Ethernet communications and it is interfaced with the Rabbit Processor using SPI protocol. Configurations like IP address and other details are set using RS232 interface. The site can be

viewed on any system with Internet/LAN connection by configuring the specific IP address and by giving User Login ID, password. There are several I/O pins available at the Rabbit Processor which are used to interface with sensors, LCD displays, Motors and relays for monitoring and controlling AC appliances. Nowadays, Internet has spread worldwide and most of the internet connections use Ethernet as media for data transfer. In industries or in home appliances, most of the time we need to monitor and control different parameters using microcontrollers, but the microcontroller doesn't have the port of intrnrt connection; So that we used the Rabbit processor whics have ethernet port exist on it. The popularity of home automation has been increasing greatly in recent years due to much higher affordability and simplicity through Smartphone and tablet connectivity. The concept of the "Internet of Things" has tied in closely with the popularization of home automation. Ethernet provides inexpensive, relatively high speed network access to individual users and low delay that can support many applications. This implementation is an attempt to connect an embedded device to an Ethernet. Using Ethernet based system we can control various home appliances from anywhere across the world. The existing system which uses the GSM,GPRS, Bluetooth, Zigbee Infrared and RFID technology which are having its own limitations.

II. THE PROPOSED SYSTEM

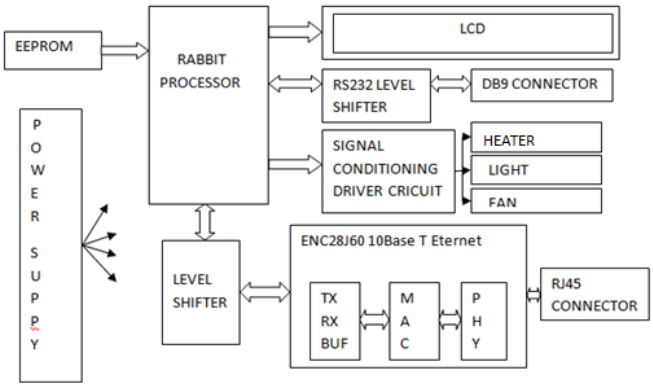

Fig.1 Basic functional block diagram

III. HARDWARE IMPLEMENTATION

A. System Architecture

The proposed Ethernet Based Home Appliances Control system architecture consists of Rabbit processor, Ethernet Controller-ENC28J68, Relay Board, and DC motor and 16x2 LCD display.

B. Operation

This section explains the operation and interfacing of each modules present in the EthernetBased Home Appliances Control system architecture.The whole circuit can be divided into following sections:-

1) **Power supply modules:** This module is basically designed to achieve 12V, 1A and 5V, 500mA and 3.3V. The design consists of a transformer which is used to step down the AC voltage, IN4007 diodes used to form a bridge rectifier to convert AC to DC, capacitor 1000uF which used as a filter circuit, 7812 regulator to obtain a 12V DC and followed by 7805 regulator to obtain a 5V DC, at the output of the regulator a 330 ohm resistance and LED is connected as Power ON indicator. LT1086CT (3.3V) regulator is used to generate 3.3V which is required for Ethernet Controller.

2) **Rabbit processor:** In the present study a 16-bit Rabbit processor is used as a processing tool for. It has 8-bit external data bus and an 8-bit internal data bus, address lines (A0–A18) and the data lines (D0–D7), the onboard 512K flash memory and 512K SRAM chips, EPROM. 1Mbyte serial flash is also available to store data on Web pages. Rabbit processor is having six serial ports [9] for asynchronous communication.

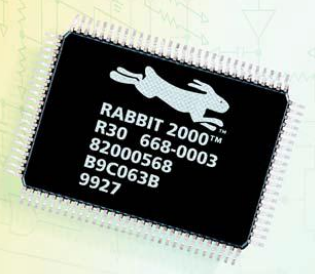

Fig. 2 Rabbit Processor

Summary of Rabbit Advantages

- The glueless architecture makes it is easy to design the hardware system.
- There are a lot of serial ports and they can communicate very fast.

Precision pulse and edge generation is a standard feature.

- Interrupts can have multiple priorities.
- Processor speed and power consumption are under program control.
- The ultra low power mode can perform computations and execute logical tests since the processor continues to execute, albeit at 32 kHz.
- The Rabbit may be used to create an intelligent peripheral or a slave processor. For example, protocol stacks can be off loaded to a Rabbit slave. The master can be any processor.
- The Rabbit can be cold booted so unprogrammed flash memory can be soldered in place.
- You can write serious software, be it 1,000 or 50,000 lines of C code. The tools are there and they are low in cost.
- If you know the Z80 or Z180, you know most of the Rabbit.
- A simple 10-pin programming interface replaces in-circuit emulators and PROM programmers.
- The battery backable time/date clock is included.
- The standard Rabbit chip is made to industrial temperature and voltage specifications.

3) **Ethernet Controller:** The ENC28J60 is Microchip's first incursion into the Ethernet controller arena, this new device includes all MAC & PHY IEEE 802.3 10BaseT functions, 8KB of dual access

RAM packet buffer and a SPI serial interface, all in a convenient 28-pin package SPDIP. It takes just few components to get the ENC28J60 up and running and connected to a host rabbit processor with support for the industry standard SPI interface. Ethernet controller is interfaced with Rabbit processor with the help SPI serial bus protocol. The Serial Peripheral Interface Bus or SPI bus is a synchronous serial data link standard that operates in full duplex mode. Devices communicate in master/slave mode where the master deviceinitiates the data frame. Multiple slave devices are allowed with individual slave select (chip select) lines. SPI is often

referred to as SSI (Synchronous Serial Interface). To begin a communication, the bus master first configures the clock, using a frequency less than or equal to the maximum frequency the slave device supports. Such frequencies are commonly in the range of 1–100 MHz, the master then transmits the logic 0 for the desired chip over chip select line.

IV. SOFTWARE IMPLEMENTATION

1) **Front End Design:** HTML is a format that tells a computer how to display a web page. The documents themselves are plain text files with special "tags" or codes that a web browser uses to interpret and display information on your computer screen. HTML stands for Hyper Text Markup Language; an HTML file is a text file containing small markup tags. The markup tags tell the Web browser how to display the page. An HTML files must have an htm or html file extension.

Example of HTML program:

```
<html>
<head>
<title> WEB ENABLED SMART HOUSE
</title>
<h1 text=red ><center > WEB BASED HOME APLLIANCES CONTROL
<br><center > Login Page
</head>
<h4>
<body bgcolor=lightblue text=black>
<form name=f1 method=get action="4">
<center> Enter username(MAX 16 char's):
<input type=text name=0>
<br>
<center> Enter Password: (MAX 8 char's):
<input type=password name=1>
<br>
<input type=submit value=Login>
</form>
</body>
</html>
```

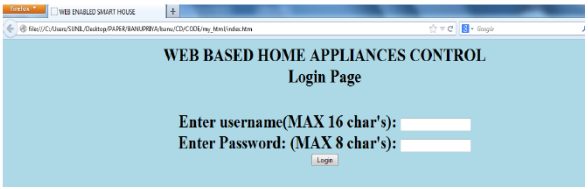

Fig. 2 Home page using HTML

2) LwIP Stack:

LwIP protocol is a set of open source TCP/IP protocol stack for embedded systems.

LwIP is a few lines of code to implement the TCP/IP protocol stack developed by Adam Dunkels at the Computer and Networks Architectures (CNA) lab at the Swedish Institute of Computer Science (SICS). LwIP consists of several modules to implementing the TCP/IP protocols such as IP, ICMP, UDP, and TCP and a number of additional support modules. The support modules consists of the operating system emulation layer, network interface functions, the buffer and memory management subsystems and functions for computing the Internet checksum. The objective of the LwIP stack is to reduce memory requirement and code size, making it suitable to use in small foot prints. It requires 10KB of RAM and 40KB of ROM. LwIPuses Application Program Interface (API) in order to reduce processing and memory demands

V. EXPERIMENTAL RESULTS

In this section, the results of the proposed system to control the devices over internet through Ethernet connectivity using PIC controller is presented. Figure 2 shows the login page which we designed using HTML language as a home page, after entering the embedded web server IP address (192.168.1.101). Once the home page is loaded, the user need to provide username and password to facilitate the further access to control home appliances. This ensures the security feature to user.access. In the proposed system four devices are considered for demo purpose Light, Heater and the speed of the DC motor control. After login, the next control webpage as shown in figure 7, on this page we can control 3 devices just by clicking the menus on the web page, initially all devices Light, heater and the speed of the DC will be in off State i.e., '0' state is as shown in figure 3.

1) **DC Motor Control:**

Here, on this web page we are controlling DC motor speed, by giving suitable speed between 10 to 100 percent on the web page as shown in the figure 11 we can control the speed, initially Speed State ='0' now as we enter 50, the state changed to '50'.

Fig. 3 Control webpage using HTML

1) Light Control:

Here, on this web page we are controlling Light, just by clicking the light menu on the webpage as shown in the figure 9, initially Light State ='0' now the state changed to '1' and also we can see the light ON state on the hardware design module.

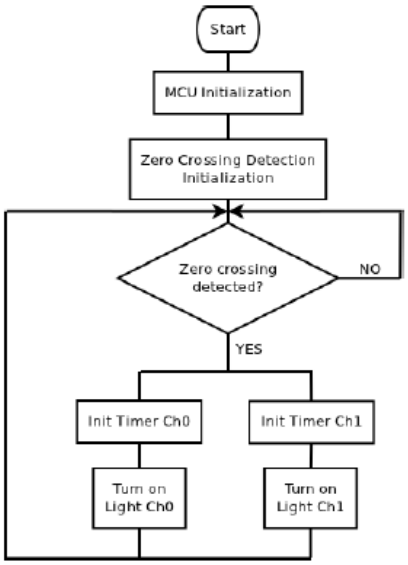

Fig. 4 Flow chart of light control

2 Heater Control:

Here, on this web page we are controlling Geyser, just by clicking the Geyser menu on the web page as shown in the figure 10, initially Geyser State ='0', now the state changed to '1' and also we can see the light ON state on hardware design, here we using Red light instead of geyser just for demo purpose because we can control any AC appliance through relay

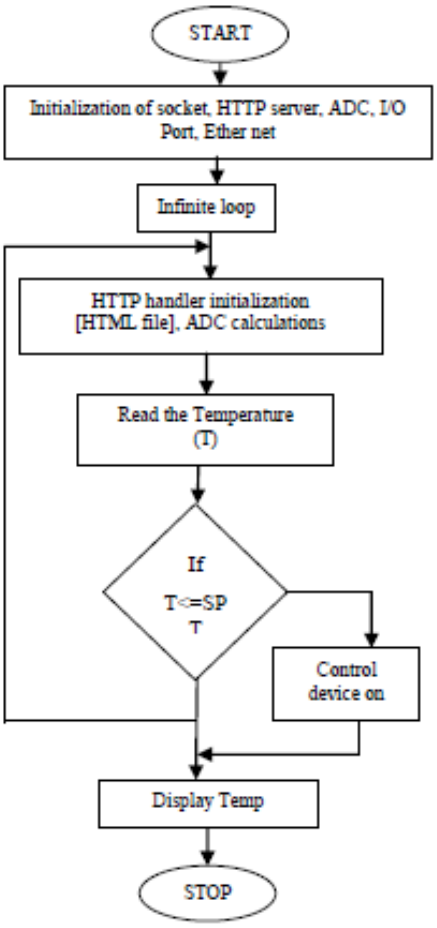

FIG. 5 FLOW CHART OF HEATER OF CONTROL

VI. CONCLUSION

In this paper we presented concepts and a prototype system for home automation which can fit into a home appliance using Ethernet. Internet-enabled hardware products are slowly becoming common place. Ethernet's potential as a network for distributed measurement and control is virtually unlimited. As Ethernet provides inexpensive, relatively high speed network access to individual users and low delay that can support many applications. Ethernet continues to be enhanced with greater performance, higher determinism, and lower cost implementations and even consolidate control network applications. A real web server is implemented in a device in your own home, which isconnected to your pc via a local area network. If we compared Ethernet Technology with other technologies like Bluetooth, Zigbee, IR, RF-ID and GSM, it is having low response time, having very high speed, secured and also reliable. In future the separate embedded web server can be designed with Wi-Fi and Ethernet, which is co-existence technology on a single-chip. So the home appliances can also control from Wi-Fi enabled smart device such as smart phones with high graphical interface.

REFERENCES

[1] Ryan J.L, "Home automation", Electronics & Communication Engineering IEEE Journal, volume 1, issue 4, Page 185 – 192, 2002.

[2] Inoue M, Uemura K, Minagawa Y, Esaki, Mitsunobu, Honda Y, "A Home Automation System", Consumer Electronics, IEEE Transactions,volume CE-31, issue 3, Page 516 –527,2007.

[3] Van Der Werff, M.; Gui, X.; Xu, W.L., "A mobile-based home automation system", Mobile Technology, Applications and Systems, 2005 2nd International Conference, Page: 5 pp. – 5, 2005.

[4] Gill, K.; Shuang-Hua Yang ; Fang Yao ; Xin Lu "A zigbee-based home automation system", volume 55, Issue 2, Page 422 – 430, 2009.

[5] Felix, C.; Raglend, I.J., "Home automation using GSM", Signal Processing, Communication, Computing and Networking Technologies (ICSCCN), Page: 15 – 19, 2011.

[6] Nunes, R.J.C., " A Web-based approach to the specification and programming of home automation systems",Electrotechnical Conference,MELECON, volume: 2, Page: 693 – 696,2004

AUTHOR BIOGRAPHY

Mr. Ketan C. Patil B.E. student, Department of Electronics Engineering, P.R.E.C, LONI, MAHARASHTRA, INDIA.

Mr. Rohan A. Patil B.E. student, Department of Electronics Engineering, P.R.E.C, LONI, MAHARASHTRA, INDIA.

Mr. Shrikant K. Musale B.E. student, Department of Electronics Engineering, P.R.E.C, LONI, MAHARASHTRA, INDIA.

Prof. D.B.Rane, Department of Electronics Engineering, P.R.E.C, LONI, MAHARASHTRA, INDIA