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Ethernet Based Control of Electrical Appliances with Arduino Uno Interface

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***Abstract*: -- This project is based on the construction of a model simulating a home automation with different operation modes which can be controlled also by Ethernet. To achieve this objective, a scale house that captures different signals, both digital and analog, has been developed. To approach the house to a real web server can be implemented in a device in your own home connected to your pc via a local area network. To capture the signals, the prototype has temperature, lighting, for the regulation and control. The core is an Arduino uno board that allows the application operation and receives, from a web server, operating modes commands and, if it is operating manually, orders to individually controls the different actuators. For the data transmission from the Arduino to the web server, is used communication via Ethernet.**

Keywords: Home automation, Arduino uno, Ethernet,Web Server.

I. INTRODUCTION

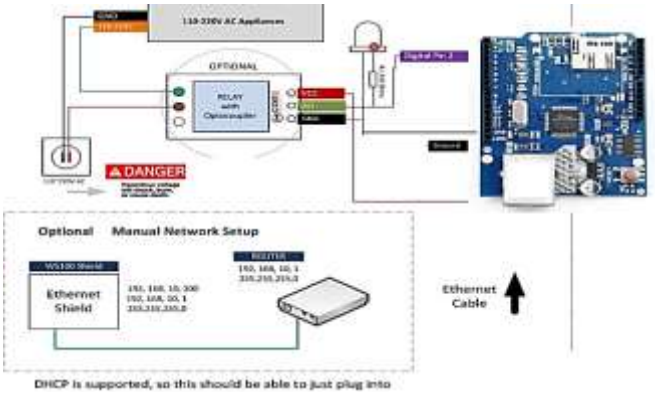
The main aim of this project is to implement a Home automation console that can be easily accessible from distant places through a simple web server running inside the home. The basic functionalities in this proposed system includes automatic control of Lights and other electrical / electronic appliances. Internet-enabled hardware products are slowly becoming popular. A real web server can be implemented in a device in your own home connected to your pc via a local area network. This will allow you to do things like display temperature, control heater/geyser and switch light/fan remotely from any web browser in the house. Arduino uno based devices used at residential locations for the purpose of home automation such as TV ON/OFF control, speed control of fan, lighting control etc. Arduino uno communicate with each other via Ethernet a wired communication. Because thesesystems use hard-wired Ethernet, communication between components is reliable and fast.

II. ARDUINO UNO BOARDS

A micro-controller is a small computer on a single integrated circuit Containing aprocessor core, memory, and programmable input/output peripherals The important Part forus is that a micro-controller contains the processor (which all computers have) and memory,and some input/output pins that you can control. (often called GPIO –General Purpose Input Output Pins)

The board contains everything needed to support the microcontroller; simply connect it to a computer with a micro-USB cable or power it with a AC-to-DC adapter or battery to get started. The Due is compatible with all Arduino shields that work at 3.3V and are compliant with the 1.0 Arduino pin out

III. CIRCUIT DIAGRAM



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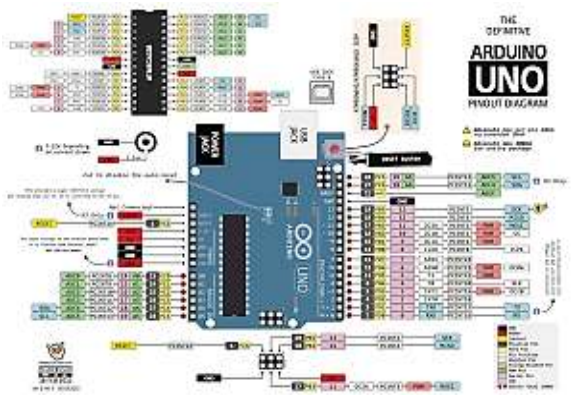
Technical specification	
Microcontroller	ATmega-328
Operating	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB of which 0.5 KB used by boot loader
SRAM	2 KB
EEPROM	1 KB
Clock Speed	16 MHz



Pin configuration of UNO board

IV. HARDWARE IMPLEMENTATION

A. System Architecture

The proposed Ethernet Based Home Appliances Control system architecture consists of PICMicrocontroller, Ethernet Controller-W5100, Relay Board.

B. Operation

This section explains the operation and interfacing of each modules present in the Ethernet Based 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 is as

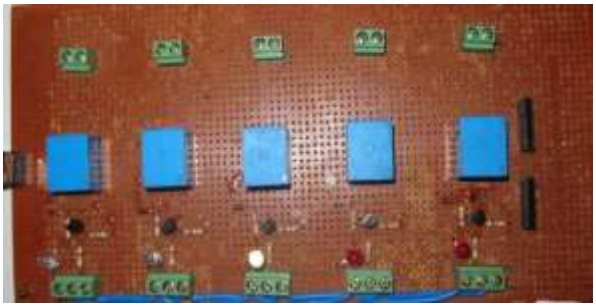
3) Ethernet Controller:

The Arduino Ethernet Shield V1 allows an Arduino board to connect to the internet. It is based on the Wiznet W5100ethernet chip (datasheet). The Wiznet W5100 provides a network (IP) stack capable of both TCP and UDP. It supports up to four simultaneous socket connections. Use the Ethernet library to write sketches which connect to the internet using the shield. The ethernet shield connects to an Arduino board using long wire-wrap headers which extend through the shield. This keeps the pin layout intact and allows another shield to be stacked on top.

The most recent revision of the board exposes the 1.0 pinout on rev 3 of the Arduino UNO board. The Ethernet Shield V1 has a standard RJ-45 connection, with an integrated line transformer and Power over Ethernet enabled. There is an onboard micro-SD card slot, which can be used to store files for serving over the network. It is compatible with all the Arduino/Genuino boards. The on-board micro SD card reader is accessible through the SD Library. When working with this library, SS is on Pin 4. The original revision of the shield contained a full-size SD card slot; this is not supported. The shield also includes a reset controller, to ensure that the W5100 Ethernet module is properly reset on power-up. Previous revisions of the shield were not compatible with the Mega and need to be manually reset after power-up.

- IEEE802.3af compliant
- Low output ripple and noise (100mVpp)
- Input voltage range 36V to 57V
- Overload and short-circuit protection
- 9V Output
- High efficiency DC/DC converter: 75% @ 50% load
- 1500V isolation (input to output)

V. RESULT



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In this project, the results of the proposed system to control the devices over internet through Ethernet connectivity using Arduino Uno microcontroller is presented. Figure x shows the login page which we designed using HTML language as a home page, after entering the embedded web server IP address (192.168.XX.XXX). 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 Lights are considered for demo purpose Load. After login, the next control webpage as shown in figure x, on this page we can control 3 devices just by clicking the menus on the web page, initially all Lights, will be in off State i.e., '0' state is as shown in figure 3.

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.

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 is connected 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.

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