Ethernet Controlled Home Automation

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ABSTRACT
This paper presents design and implementation concepts for Internet controlled Home automation system based on Arduino Uno and Ethernet Shield. Arduino UNO Board along with Arduino Ethernet Shield gives it a wireless connectivity. The proposed system operates manually automated in which the user can monitor and control the home appliances from anywhere over the world using the cellular phone through Wi-Fi communication technology. Arduino runs a code to control a Relay board according to the input and also serves a web page through which respective output to the relay board can be controlled. Through relay controller board we can control lamps, tubes or any AC power sockets. The proposed system is shown to be a simple, cost effective and flexible that making it a suitable and a good for the smart home future.

Keywords- Home automation, Arduino Uno, Wi-Fi, Ethernet Shield, Relay board.

1. INTRODUCTION
Imagine how helpful it will be to be able to switch on your air conditioning system ten minutes before you get home on a hot afternoon in January. Home automation has made it possible to have what is often referred to as a ‘smart home’, a home that can detect and identify you, automatically adjust the lighting to your predefined taste, open doors automatically, play your favorite music, water your flowers in the morning, switch on the security lights at night and switch them off in the morning, heat water for bathe and tea, stream to you anywhere in the world via the internet a live video of what is happening in and around your house. It makes it possible to link lighting, entertainment, security, telecommunications, heating, and air conditioning into one centrally controlled system. This allows you to make your house an active partner in managing your busy life.

This is what home automation is about and there is no end to its application. The vision of the system is to provide an efficient internet based system to control everyday home appliances. The system offers users an easy & effective means of controlling their various home appliances from a remote location i.e. without physically being present at home. The system makes use of the
internet to enable remote access to the various home appliances. Home automation refers to the use of computer and information technology to control home appliances and features (such as windows or lighting). Systems can range from simple remote control of lighting through to complex computer/micro-controller based networks with varying degrees of intelligence and automation. Home automation is adopted for reasons of ease, security and energy efficiency. Home automation can also provide a remote interface to home appliances or the automation system itself, via telephone line, wireless transmission or the internet, to provide control and monitoring via a Smartphone or web browser. Powerful microcontrollers are used as parts of most home and office appliances of today.

2. SYSTEM DESIGN
Home automation or smart homes can be described as introduction of technology within the home environment to provide convenience, comfort, security and energy efficiency to its occupants. The core of the home automation system consists of two main hardware components: the PC home server and the Arduino uno board along with Ethernet Shield which is flexible, inexpensive, offers a variety of digital and analog inputs, serial interface and digital and PWM outputs. Arduino UNO Board along with Arduino Ethernet Shield to give it a wireless connectivity. Arduino runs a code to control a Relay board according to the input and also serves a web page through which respective output to the relay board can be controlled. A PC home server hosts the Ethernet Shield and Arduino uno control algorithm that enables the user to access the home appliances through PC using Wi-Fi communication. It communicates with the Arduino Uno microcontroller board through USB data transfer cable. Through relay controller board we can control lamps, tubes or any AC power sockets.

Fig 1: Block Diagram of Internet Controlled Home Automation

3. HARDWARE IMPLEMENTATION
For Hardware Implementation it requires Arduino uno Board along with Ethernet Shield and Relay Controller Board.

Fig 2: Plugging Arduino into computer’s USB port
Setting it up is as simple as plugging the header pins from the shield into Arduino. The Ethernet Shield is based upon the W5100 chip, which has an internal 16K buffer. It has a connection speed of up to 10/100Mb. The board also has space for the addition of a Power over Ethernet (PoE) module, which allows you to power your Arduino over an Ethernet connection. Plug the Arduino into computer’s USB port, and the Ethernet shield into your router (or direct internet connection).

4. RELAY CONTROLLER BOARD
Quantity of the components depends upon how many channels required e.g. if you want to control more than one light then you will have to add that much number of relays on your controller board. Here is the component list which will be needed to build the board.
Relay
Transistor 2N3904
Resistor (10k & 1k)
1N4148 Diode
Led
Connectors

Fig 3: Circuit Diagram of Relay Controller Board

5. CONCLUSION
The system offers users an easy & effective means of controlling their various home appliances from a remote location i.e. without physically being present at home. The system makes use of the internet to enable remote access to the various home appliances. Home automation refers to the use of computer and information technology to control home appliances. Costs mainly include equipment, components, furniture, and custom installation. Ongoing costs include electricity to run the control systems, maintenance costs for the control and networking systems, including troubleshooting, and eventual cost of upgrading as standards change. Increased complexity may also increase maintenance costs for networked devices. Home automation is adopted for reasons of ease, security and energy efficiency. Home automation can also provide a remote interface to home appliances or the automation system itself, via telephone line, wireless transmission or the internet, to provide control and monitoring via a Smartphone or web browser.

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