

# DESIGN ACCESSIBLE DISPLAY TO CONTROL HOME AREA NETWORK

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**Abstract-** Now a day's so many automation technologies are being introduced for the elderly and peoples with disabilities, especially those who live alone. In this paper, we present the design and implementation of a low cost but yet flexible and secure internet based home automation system. The system is designed to be low cost and flexible with the increasing variety of devices to be controlled. This paper represents design of smart display for accessible communication with home appliances like Light, fan, heater, irrigation system and solar power consumption system. The communication between the devices is wireless. Integrating web servers to these intelligent devices will aid in controlling them over the Internet and also in creating effective user interfaces in the form of web pages. Assigning multiple functionalities to a single button on an appliance help manufacturers economize user interfaces, but, this can easily create confusion for the users. Since the cost of web-based interfaces is considerably low, they can be used to provide the infrastructure for the design of simple and more user-friendly interfaces for household appliances. Also, a web page based interface is much easier to change, when needed, as compared to a hardware interface. Hence an attempt has been made to develop an Ethernet based remote monitoring and control of home appliances. The main benefits of this approach include its lightweight design, automatic configuration, and, utilization of widely available and tested network protocols of TCP/IP and HTTP. The validity of the approach has been verified through a prototype system working with real appliances.

**Index terms-** Home automation, TCP/IP, Ethernet, Embedded web server, accessible display device.

## 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 Atmega2560 microcontroller based embedded systems. This system uses Atmega2560 m-microcontroller to store the main application source code, web pages and TCP/IP stack which is a vital element of the system software. An Ethernet shield controller chip, W5100 is used to handle the Ethernet communications and it is interfaced with the microcontroller using SPI protocol. The site can be viewed on any system with Internet/LAN connection by configuring the specific IP address. There are several I/O pins available at the Atmega2560 which is 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 internet connection; So that we used the Ethernet shield W5100. 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. RELATED WORK

The related research object of automation for various industries and home area network is the performance of

wireless communication link in multiple mobility scenarios. Detailed analysis of network communication performance has been comprehensively disclosed in different author’s papers. Each one has made a great effort to develop the practical test platform and it took a time to evaluate accessible display designs for home area networks.

Laisa C. P. Costa[1] has introduce home automation using Bluetooth The work was developed starting with an interface design proposal, based on the research on accessible interfaces state of the art. The interface was deployed targeting Tablets and Smart Phones interoperability. It was integrated to control a home gateway prototype. In order to evaluate the design, ten interviews with people with disabilities were conducted in Brazil.

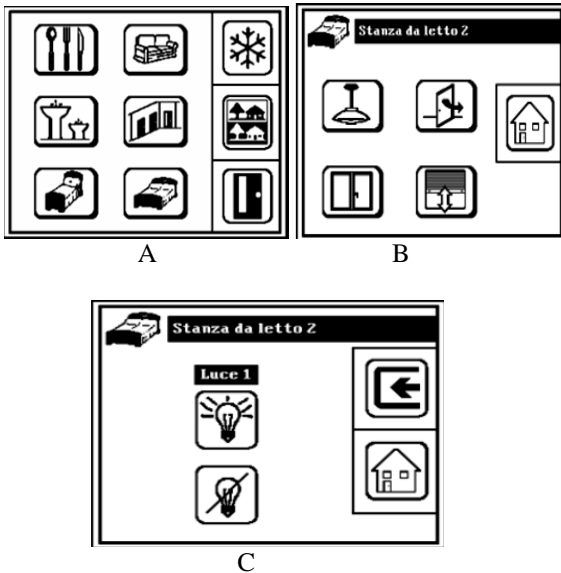


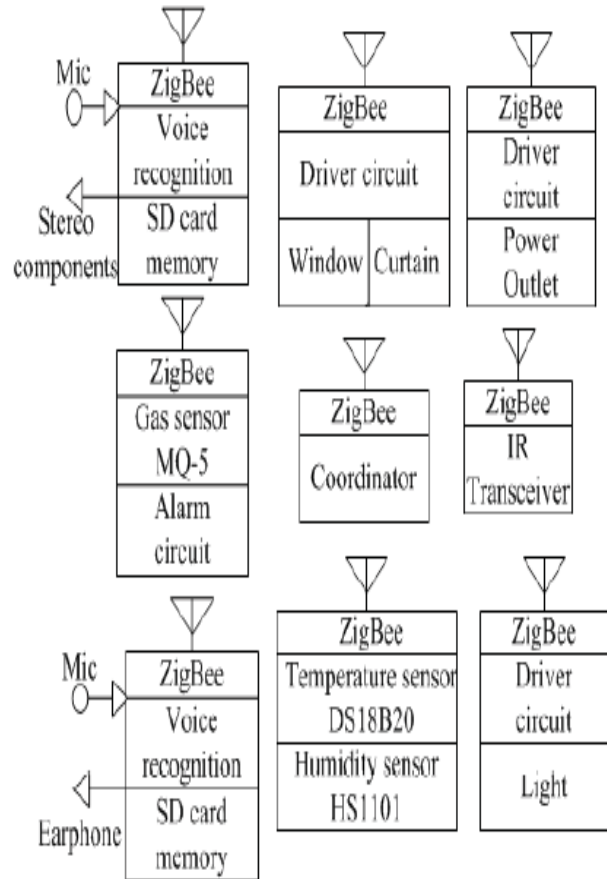
Fig-1: Three screens of a home automation interface, each one representing a different level of the interface. Screen “A” presents icons representing the rooms, screen “B” presents icons with the items to be controlled, and screen “C” presents the commands available.

Elena Mainardi [2] idea was focused on the design and the realization of a portable touch screen interface for disabled people, used to control low cost powerline demotic systems. The infrared protocols are used for interfacing. Figure 1 represents all the rooms of apartment. When an icon which indicated room is selected, a new screen is presented containing all the items available to control in that room. In order to inform which room is selected at the moment, it is shown at the top of the screen, while on the right side of it is a “home” icon that allows the user to come back to the main menu.

The voice control systems in the state of the art are suitable for interactions with menu screens. Some

works present systems based on a hardware-software co-design that allows speaker-independent speech recognition at an accuracy rate of 95%, without voice training [3]. This interface was tested in a home automation environment using a ZigBee-based wireless sensors and actuators network.

Fig-2: System Architecture



The proposed voice control system architecture is shown in Figure 2. This system is realized on the basis of a wireless sensor and actuator network based on ZigBee protocol. The home automation network is composed of voice recognition module(s), several sensor nodes, actuator and a network coordinator. Each node or module is added to the ZigBee network.

### III. SYSTEM OVERVIEW

The accessible display design for home area network that we present in this paper integrates a wireless Fieldbus with an existing wired Fieldbus and further consists of a wireless sensor network that collects

information about the situation of monitored persons. The monitoring data is sent to accessible display such as a home gateway PC or smart phone using Ethernet protocol. The smart phone in turn exchanges all information with a microcontroller through Ethernet. The overall structure of the interface is shown in figure 3.

The heart of development kit is microcontroller. It forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written. **Liquid-crystal display (LCD)** is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

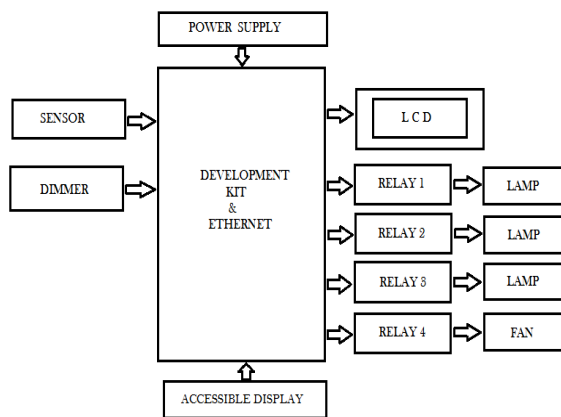


Fig-3: System Overview

The design of entire system consisted of two part which are hardware and software. The hardware is designed by the rules of embedded system, and the steps of software consisted of three parts. Ethernet based wireless technology which consists of transmitter at the site location and receiver at control panel. Information received at the receiver will be send to the Ethernet through the router. So the people living at home with internet connection can see the received data. The system uses a compact circuitry built around microcontroller Programs are developed in Embedded C. Flash magic is used for loading programs into Microcontroller.

#### IV. CONCLUSION

Despite working with a considerably varied group of users, with different needs, an interface suitable to them was achieved. Our interface integrates accessible interface ideas in a single portable interface that can contribute to people with disabilities' autonomy at home. Despite being a potential solution to improve the autonomy of people with impairments, the interviews have shown that home automation is not even considered as a possible solution to these people's reality. They consider home automation a high technology solution out of their reach.

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