# DESIGN OF VOICE CONTROLLABLE AND WIRELESS NETWORK FOR SMART HOME

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## ABSTRACT

This paper proposes the design of voice controllable & wireless network for smart home. Research presented in this paper focuses mainly to understand the speech or voice of user and to control the home appliances through voice command remotely. The main concern in systems development is the integration of technologies to increase customer satisfaction. This paper presents a design of ARM processor-based embedded system and Ethernet interface. The protocol between the units in the design is enhanced to be suitable for most of the appliances. Ethernet is used for communication with network. Voice command is given to microphone for controlling devices. With help of this smart home system  we can make people life more convenient, more comfortable and more safe The user can give a voice command in order to perform certain actions such as switching lights on/off, getting the status of any appliance etc. System is designed to be low cost and flexible with the increasing variety of devices to be controlled.

**Keywords:**  Cortex M3 Microcontroller; Ethernet controller; Embedded C; Smart homes; microphone

## 1.     INTRODUCTION

Wireless technologies have been developing rapidly in these years. The obvious advantage of wireless transmission is a significant reduction and simplification in wiring and harness. Many communication technologies, such as Bluetooth and ZigBee, GSM/GPRS (General Packet Radio Service), etc., have been developed for different situations. In smart home system the basic tasks of turning on or off certain devices and beyond, either remotely or in close proximity. The control of the devices when completely taken over by the machines, the process of monitoring and reporting becomes more important. In previous work, much research has been done using wireless technologies. Literature search indicates related work based on voice controllable commands which can control devices remotely such as

Nguyen et al. [1] proposed a Home appliance control system. Infrared ray and power line communication are used to control the home appliances system. This system helps user to checks the status of appliances and controls them remotely from everywhere. And this is done through their cellular phone or Internet. The simple approach to control the home appliances is given in this paper.

Haque et al. [2] proposed a system that controls the home appliances using the personal computer. This system is developed by using the Visual Basic 6.0 as programming language and Microsoft voice engine tools for speech recognition purpose. Appliances can be either controlled by timer or by voice command.

Khiyal et al. [3] proposed a system for controlling home appliances remotely that is useful for the people who are not at home mostly. The main objective of the system is to provide security and control the home appliances such as AC, lights and alarms. The system is implemented by SMS technology that is used to transfer data from sender to receiver over GSM network. One or more computers can be used to control the home appliances. System send an alert SMS to authorized user when any

intrusion is detected and user can in turn respond in order to overcome the situation. Moreover user can send SMS to system to get the status of home appliances and controlling them.

Smart home is not a new concept in today's world, it is used to provide convenience for user to remotely control and monitor the appliances and it provides a better use of electricity. As by the growth of PC (personal computers), internet, mobile phone and wireless technology makes it easy for a user to remotely access and controls the appliances. Many of users used internet, wireless technology to communicate and control home appliances, in addition to that Bluetooth and GSM technology is also used for controlling the home appliances.

Proposed method reduces the wiring and complexity of the system. System has been developed to monitor the Appliances remotely by simply running the mobile application and giving voice command or through PC. It is affordable to everyone, cheap and easy to install. As there is no wired communication between the remote user and appliances control module and the electronic devices used to control are easily available making it a cost effective solution.

Based on these observations, we propose to develop voice controllable smart home system by using embedded system. In this we are using ARM processor as main hardware component. The design of the system is presented in the next sections.

The paper is organized in such a way that: section 2 discusses system design,it shows two parts hardware design and software design section 3 discuss result, section 4 discuss conclusion and future enhancement and finally references are given in section 5.

## 2. SYSTEM DESIGN

Many embedded system can have different designs based on the requirement. Design of system is based on the specifications given by customer. System design shows two parts first is hardware design and second is software design. In first part we will see all detail about hardware components.

### A. HARDWARE DESIGN

Figure1 shows number of devices or home appliances which are connected to Cortex M3 microcontroller. Voice command is given through microphone and this analog input is given to Cortex M3 microcontroller. Figure.1 shows a model from where user with a Mobile or touch pad or laptop giving voice command, the software application convert the voice into text.
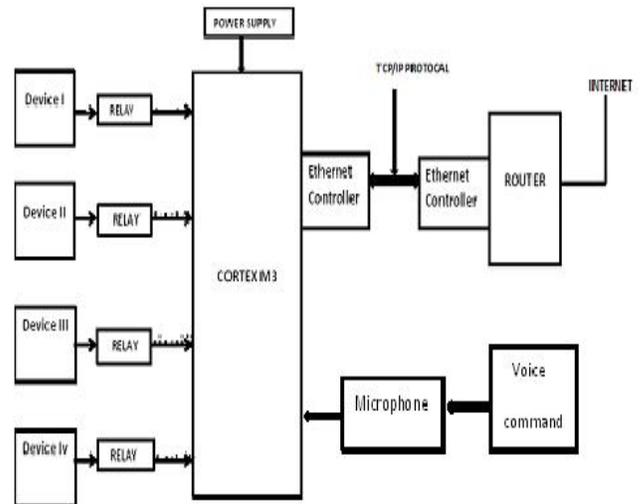


**Figure 1:** Proposed Block Diagram

All devices are AC devices, here we will use relays to switch AC devices. There are number of devices we can connect to home automat system. In this project we will connect only four devices to home automation system. First device is bulb which user should be able to switch ON or OFF remotely. Second device is Motor, in this user will be able to control speed of motor. Third device is LED which used to control the brightness of LED light. Fourth device is heat sensing device in this we will use one rotator or wheel. These all devices are controlled by user remotely.
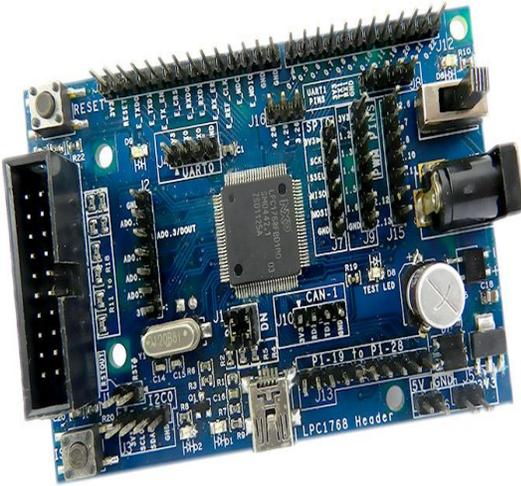
**Figure 2:** LPC1768 Development Kit

The most important component of hardware design is LPC 1768.The LPC1768 are ARM Cortex-M3 based microcontrollers for embedded applications featuring a high level of integration and low power consumption.

Another hardware is project component used in this project is Arduino. Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. With the help of this we can convert voice command into ByteOutputStream. Ethernet controller is used for interfacing between processor and internet. Every voice message will have a specific command number.

### B. SOFTWARE DESIGN

This application is develop in Embedded C language. Keil Integrated development environment is used for writing programs, debugging and simulation. This application uses bloom software. This software must be installed on host machine. Bloom is a serial port to TCP/IP socket redirector. Its role is to transfer data from a serial port to an open TCP/IP socket connection and vice versa. It provides the software bridge needed to enable networked applications to communicate with serial devices, and vice versa. This application shows two

important parts. First part is to recognize speech or voice of user. This is done through speech reorganization engine. Second is to control the appliances remotely according to the user demand. This can be done through relay based circuit that is attached with host computer. In this we have used Sensor Monkey online service for streaming real-time sensor data live over the Internet. It can be used for delivering high-throughput, low-latency sensor data over the web.

The working of the system is explained with help of flowchart. The publish step of the flowchart publishes the current device status to client device of the user.Figure 3 shows flowchart for project. First step in flow chart is Initialize ADC. Input signal provided to devices is analog in nature. To covert analog signal to digital signal ADC module is initialized.

The next step in which UART is initialized is required for communication purpose. UART is usually an individual (or part of an) integrated circuit used for serial communications over a computer or peripheral device's serial port. Controller should be set for 9600 baud rate in order to receive and transmit data. Next step is to define General Purpose Input Output (GPIO) pins. GPIO pins are used for getting input or getting commands from user.

However, before getting commands from user, Controller checks for status of all its deployed devices. Controller publishes the device status to the client program at User end, thus completing a feedback loop. This is important because it helps the User get a real-time device health status and assists in taking informed corrective decisions, if required. This feedback loop runs infinitely to achieve continuous monitoring of home appliances.
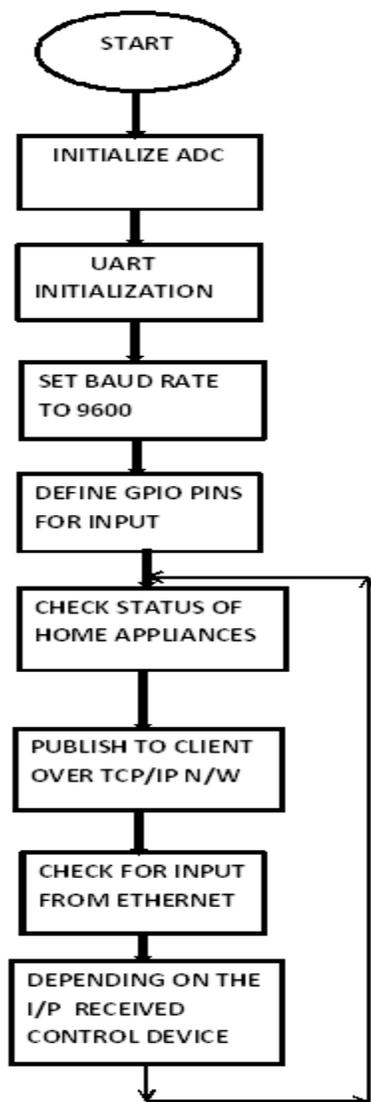
## 4. CONCLUSION AND FUTURE ENHANCEMENT

Controlling home appliances with wireless technology has revolutionized our way of living. Home owners can come to an ideal environment coming from their daily activities. Technique used in this system is not complex. The communication link between the appliances and remote user plays an impotent roll in automation. In future many more features can be added in it like home appliances can be controlled by using voice call by implementing more secure and efficient techniques.

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Fig 3.FlowChart

## 3. RESULTS AND DISCUSSION

Design in this paper monitors status of various devices remotely. In proposed system user gives voice command to mobile application which convert the command into text, this text is read by the micro controller. After the complete reception the concern operation is performed, microcontroller save the status of the device and sends a feedback on the successfulness or the failure of the concerned operation. Similarly a user can control all devices in smart home.

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