Design and Implementation of an Advanced Home Automation System using Android and GSM Technologies

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Abstract:

Automation has created a bigger hype in the electronics. The major reason for this hype is automation provides greater advantages like accuracy, energy conversation, reliability and more over the automated systems do not require any human attention. Any one of the requirements stated above demands for the design of an automated device. The energy conversation is very important in the current scenario and should be done to a maximum extent where ever it is possible.

Energy can be effectively conserved if we can control the home electrical appliances like lights, fans, refrigerators, AC, TV's etc. The main purpose of this paper is to design an advanced electrical devices monitoring and controlling at home or offices remotely using GSM modem and android mobile. User can monitor the status and also control multiple electrical devices by sending suitable formatted SMS predefined message to the ARM-7 LPC2148 microcontroller based control system.

Key words:

Android application, GSM modem, Relays, ARM-7 microcontroller.

I. INTRODUCTION:

In nowadays, we must make use of various high-tech tools and equipments to get our jobs done and make our life comfortable. And the mobile phone is the inseparable part of human lives today. With the help of mobile phones human can done many works related to their civil life. At today's repaired technology the mobile phone is also become smart one. With the help of this smart gadget we can make our home smart one.

Some products are commercially available in market which allows home appliances controlling through internet, GSM, Bluetooth, RFID, and Wi-Fi wireless technologies. But it lacks the true sense of real mobility, security and some limited range of connectivity.

We proposed a new technology so that the ordinary services of the mobile phones can be used to communicate with and control the home appliances. Here, the switch board of our regular use is replacing by Android mobile application which will communicate with ARM microcontroller and the android based smart phone.

The home appliances monitoring and controlling is done wirelessly through Android smart phone and also using GSM modem Android is a healthy array of connectivity options, including Wi-Fi, Bluetooth, GSM and wireless data over a cellular connection.

The advantage of controlling mechanism is the devices controlling and monitoring is available in two modes one from android application and from the application predefined SMS messages are sent to the microcontroller for controlling devices. The important part of this technique is that the appliances run on single processor and produce required output. Here all the devices which are to be controlled are connected to the ARM-7 LPC2148 Microcontroller.

II. RELATED WORK:

Intelligent information appliance is the main direction of development in the appliance control field. Intelligent appliance network has small amount and low speed of data transmission; there are many appliances in family and it needs more network capacity.

Figure- 1.Image of Android application for device controlling system

Android is an open source platform. Neither developers nor handset manufacturers pay royalties or license fees to develop for the platform. The underlying operating system of Android is licensed under GNU General Public License Version 2 (GPLv2), a strong "copy left" license where any third-party improvements must continue to fall under the open source licensing agreement terms. The Android framework is distributed under the Apache Software License (ASL/Apache2), which allows for the distribution of both open and closed source derivations of the source code. Commercial developers (handset manufacturers especially) can choose to enhance the platform without having to provide their improvements to the open source community. Instead, developers can profit from enhancements such as handset-specific improvements and redistribute their work under whatever licensing they want. Android application developers have the ability to distribute their applications under whatever licensing scheme they prefer. Developers can write open source freeware or traditional licensed applications for profit and everything in between.

Network Connectivity

It supports wireless communications using:

» GSM mobile-phone technology

» 3G

» Edge

» 802.11 Wi-Fi networks

II. PROPOSED METHODOLOGY:

In this paper we are presented a system that can be interconnected with the electrical devices and microcontroller using android application based SMS messages. The GSM modem provides the communication mechanism between the user and the ARM-7 LPC2148 microcontroller system by means of SMS messages.

The GSM modem provides the communication mechanism between the user and the microcontroller system by means of SMS messages. It is capable of receiving a set of command instructions in the form of Short message service and performs the necessary actions. We will be using a dedicated modem at the receiver module i.e. and send the commands using SMS service as per the required actions.

User can monitor the status and also control multiple electrical devices by sending suitable formatted SMS message to the ARM-7 LPC2148 microcontroller based control system. These SMS commands are interpreted by ARM-7 LPC2148 microcontroller system and are validated. If the SMS command received is valid that means then it takes the necessary action on the said devices and also it always monitors the home.

This system provides a modern era automation system where we can monitor and control the status of the appliances from anywhere in the world. Here the devices to be controlled are interfaced to ARM-7 LPC2148 microcontroller unit through switches Relay and controller which receives SMS through GSM modem interfaced to it, processes them and performs appropriate action on the devices. This project finds its applications in industrial environment, home automation and for any other commercial purposes.

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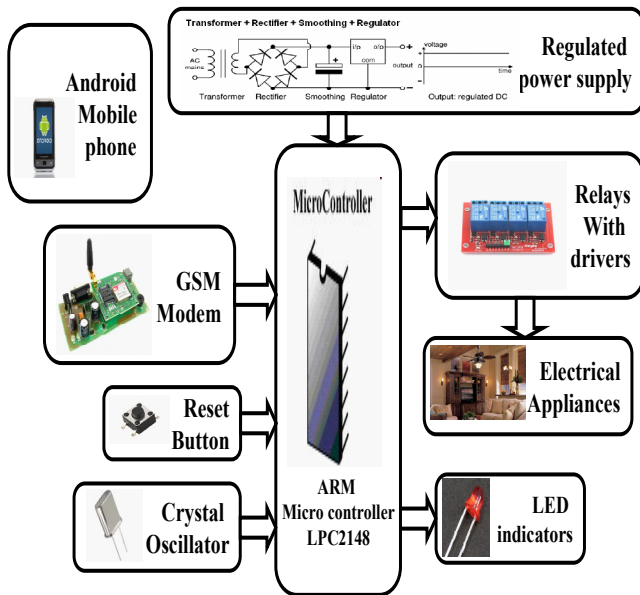
Figure- 2.Block diagram of Advanced Home Automation System using Android and GSM Technologies

The presented application is a low cost solution for electrical appliances controlling using android application with SMS feature. The present system uses an onboard mini computer named as ARM-7 LPC2148 microcontroller which consists of number of input and output ports. The input and output port of the micro controller are interfaced with different input and output modules depending on the requirements. The proposed solution can be used in other types of application, where the information needed is requested rarely and at irregular period of time (when requested).
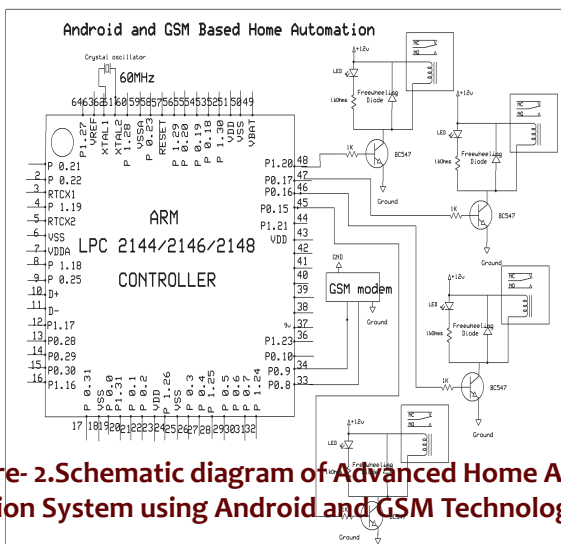

Figure- 2.Schematic diagram of Advanced Home Automation System using Android and GSM Technologies

III. HARDWARE DESIGN OF PORTABLE DEVICE

The portable Electrical devices controlling system using android mobile, relay switches for controlling devices, GSM modem an ARM-7 (LPC2148) micro-controller. The microcontroller (ARM-7 LPC2148) takes the input from GSM modem in the form SMS messages when the user selects the devices using android application

a. ARM-7 LPC2148 Microcontroller:

In the Proposed Home automation system we used the ARM-7 microcontroller is a is a RISC microprocessor architecture from Advanced RISC Machines Ltd. The ARM7 architecture is made up of a core CPU plus a range of system peripherals which can be added to a CPU core to give a complete system on achip. It offers several architectural extensions which address specific market needs, encompassing fast multiply and innovative embedded ICE support.
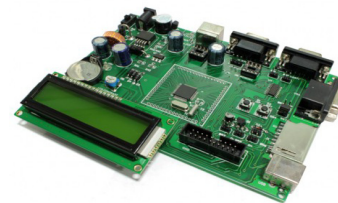
Fig.2 ARM-7 LPC2148Microcontroller

b. GSM modem:

The GSM modem provides the communication mechanism between the user and the microcontroller system by means of SMS messages. It is capable of receiving a set of command instructions in the form of Short message service and performs the necessary actions. We will be using a dedicated modem at the receiver module i.e. and send the commands using SMS service as per the required actions.


Fig4. GSM modem

c. Relay:

A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism, but other operating principles are also used. Relays find applications where it is necessary to control a circuit by a low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits, repeating the signal coming in from one circuit and re-transmitting it to another. Relays found extensive use in telephone exchanges and early computers to perform logical operations.

A type of relay that can handle the high power required to directly drive an electric motor is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device triggered by light to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protection relays".
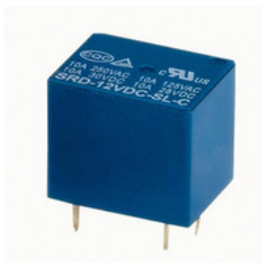
Fig.5. Relay

IV CONCLUSION:

The existing implementation of an advanced home automation system using android and GSM technologies is an Integrating feature of all the hardware. components been used and developed in it. The Presence of each and every module has been reasoned out and placed very carefully. Hence the contributing to the best working unit for a automation of electrical devices has been designed perfectly. Secondly, using highly advanced IC's like ARM-7 Microcontroller, Relay modules, GSM technology with the help of growing technology, the project has been successfully implemented with a unique idea. Thus the project has been successfully designed and tested.

The project "Design and Implementation of an Advanced Home Automation System using Android and GSM Technologies" was designed mainly intended to control electrical appliances using GSM and android technology. This project can be extended using GPRS module. GPRS module can be used to monitor and control the appliances of multiple devices like lights, fans, coolers etc using predefined weblink. The project can also be extended using driver circuits for controlling intensities, speed levels for lights and fans devices. The project can be extended using wireless Wi-Fi network using which the devices can also be controlled using voice application and also touch application from android mobile and also from PC.

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