

Android Based User Defined Device Monitoring and Controlling System using PLCC

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Abstract:

Rapid growth of various high-tech tools and equipments makes our jobs done comfortable and sophisticated. And the mobile phone is the inseparable part of human lives today. With the help of mobile phones human can do 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, Blue-tooth, RFID, and Wi-Fi wireless technologies. The works presents a design an highly developed electrical devices monitoring and controlling at home or offices remotely using android mobile. The controlling of electrical appliances is done wirelessly through Android smart phone using the Bluetooth feature present in it. Here in this project the Android smart phone is used as a remote control for operating the electrical appliances. The system also uses Power Line Carrier Communication (PLCC) from control section to the appliances section.

Keywords:

Android application, PLCC, Bluetooth module, Relays, TRIAC, PLCC module, ARM-7 microcontroller.

I.INTRODUCTION:

In Home automation systems there are collections of interconnected devices for controlling various functions within a house. Mobile devices are ideal in providing a user interface in a home automation system, due to their portability and their wide range of capabilities. Within the house, the user might not want to go to a central control panel, or not even to the laptop, but use the phone that is usually placed in closer proximity to the user. When far from the house, the user might want to check its current status or even schedule actions for his return.

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 PLCC module. Android is a vigorous 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 data transmission from transmitter to receiver section we use PLCC module for controlling devices. The important part of this technique is that the appliances can be controlled using power line carrier communication module network and produce required output. Here all the devices which are to be controlled are connected to the ARM-7 LPC2148 Microcontroller. The remaining part of this paper is prearranged as stated below. In Section II, we mentioned some related work. We present our methodology in section III, and then talk about the proposed hardware design in section IV. In section V discuss about the software development of android application. Finally we bring to a close this paper in section VI, VII.

II.RELATED WORK:

To fulfill the objectives of the project, we need to understand the basic elements of digital electronics. The project Assistive Housing [2] was developed focusing on the elderly comfort, allowing home automation by using the television set and its regular remote control as an interface. The design approach used to advance legibility and accessibility of the home automation interface on the

television screen was to use few and large graphical icons, with horizontal captions describing their function. Due to an environment of the building appliances control system, the device selection mainly considerate the economy and stability. First, the house intelligent switch control system should be adapted to several types of voltage, and the stability and safety should be guaranteed as well. Second, the system should have a tough anti-jamming capability and fast communication efficiency. There are two other relevant projects to monitor elderly using sensor networks and integrating home automation, but they do not explore user interface design [3],[4]. In Mainardi's work [11], the project is designed for people with manual dexterity and mobility impairments, but it could be widely used. The idea is to have a portable touchscreen device with the proposed interface.

The concept of using different levels of screens containing icons representing the rooms, the appliances to be controlled and the commands was utilized in our work, but as it is intended to be universal, additional requirements were needed. Other works present solution of image processing for interacting without traditional interaction. A gesture-based control system was developed to simplify the home automation interaction to people with mobility impairments in the Intelligent Sweet Home project [15]. Last, with long hours' work, Energy can be efficiently conserved if we can control the home electrical appliances like lights, fans, refrigerators, AC, TV's etc.

III. METHODOLOGY:

PLCC, Power Line Carrier Communication, is an approach to utilize the existing power lines for the transmission of information. In today's world every house and building has properly installed electricity lines. By using the existing AC power lines as a medium to transfer the information, it becomes easy to connect the houses with a high speed network access point without installing new wirings. This technology has been in wide use since 1950 and was mainly used by the grid stations to transmit information at high speed. Now a days this technology is finding wide use in building/home automation as it avoids the need of extra wiring. The data collected from different sensors is transmitted on these power lines thereby also reducing the maintenance cost of the additional wiring. In some countries this technology is also used to provide Internet connection. 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 using PLCC; there are many appliances in family and it needs more network capacity. manufacturers pay royalties or license fees to develop for the platform. The underlying operating system of Android is licensed under GNU General Public License. The Android framework is circulated 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.

IV. PROPOSED HARDWARE DESIGN:

We have presented a system that can be interconnected with the electrical devices and ARM-7 microcontroller using android application based on PLCC communicating network. The communication device used for the communication over the power lines is a MODEM, commonly known as Power Line MODEM (PLM). It works as both transmitter and receiver, i.e., it transmits and receives data over the power lines. A power line modem not only modulates the data to transmit it over the power lines and but also demodulates the data it receives from the power lines. By using modulation techniques, binary data stream is keyed on to a carrier signal and then coupled on to the power lines by PLM. At the receiver end another PLM detects the signal and extracts the corresponding bit stream. The PLCC transceiver module provides the communication mechanism between the user section from android mobile and the appliances section which are interfaced with ARM-7 LPC2148 microcontrollers.

1. Transmitter Section

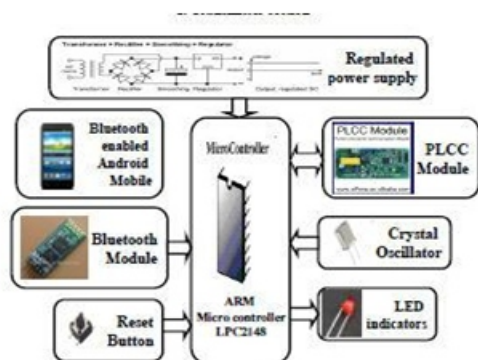


Fig.1 Block diagram of transmitter section

The presented application is a low cost solution for electrical appliances controlling using android application with PLCC communication network. The present system uses an onboard minicomputer 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 system provides solution which can be used in other types of application, where the information needed is requested rarely and at irregular period of time (when requested). The controlling device of the whole system is provided using ARM-7 LPC2148 Microcontrollers. The entire model consists of two sections one controlling section interfaced with Bluetooth module, PLCC module. The receiver or appliances section consists of PLCC module, TRIAC and Relays switches are interfaced to the ARM 7 Microcontroller. The data received by the Bluetooth module from Android smart phone is fed as input to the controller.

2. Receiver Section

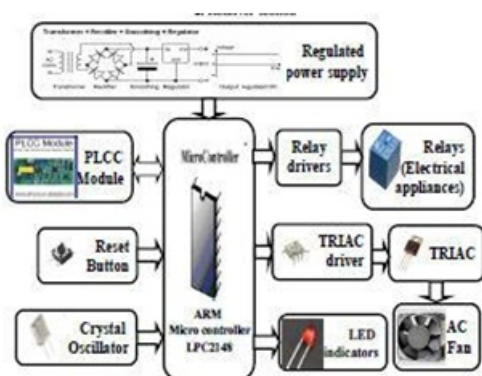


Fig.2- Block diagram of Receiver section

The controller acts accordingly on the Relays, TRIAC switches at the receiver section to control the connected electrical appliances like lights, fans etc. In achieving the task the controller is loaded with a program written using Embedded 'C' language. This system can be applicable in industrial environment, home automation and for any other commercial purposes.

AJ PLCC Module

PLC Transceiver is the key component of a PLCC system. It is the device which transmits & receives data to & from the power lines and acts as a hub between the power stations and our Computers/Network utilization devices. They are wired with the electrical voltage lines at home or business and work on two modes – transmit mode and receive mode. In transmit mode, they simply receive data from receiver end installed on the same network and further transmit them. In receive mode, they work the opposite way. A number of companies provide PLC transceivers and other networking devices for PLCC communication. Power-line communication (PLC) carries data on a conductor that is also used simultaneously for AC electric power transmission or electric power distribution to consumers. It is also known as power-line carrier, power-line digital subscriber line (PDSL), mains communication, power-line telecommunications, or power-line networking (PLN).. Power line carrier communication modem is an OEM module which carries data on a conductor used for electric power transmission – i.e the AC lines. PLCC offers a “no new wires” solution because the infrastructure is already established. This module can be integrated into and become part of the user’s system. The unit can be easily integrated into other systems to successfully transmit data over the power line



Fig3. Power line carrier communication module

B] Bluetooth Module:

Bluetooth is a wireless technology standard for exchanging data over short distances from fixed and mobile devices and building personal area network. The Bluetooth module allows us to wirelessly transmit and receive data. The module that we're using is based on the Bluetooth V2.0 protocol and is having a range of 10 meters operating at frequency of 2.4GHz with a maximum data exchange rate of 2.1Mbps.

C] ARM-7 Microcontroller:

The microcontroller (ARM-7 LPC2148) takes the input from Android application when the user selects the devices using android application and using wireless Bluetooth connectivity. At the receiver section PLCC modules receives data and controls electrical appliances like lights, fans using relay, TRIAC switches. a. ARM-7 LPC2148 Microcontroller: In the presented paper Home automation system we used ARM-7 microcontroller which is 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 a chip. It offers several architectural extensions which address specific market needs, encompassing fast multiply and innovative embedded ICE support. We have also implemented mechanism where the entire system can be halted by glowing of LED. Different home appliances are connected to the board. We have used bulbs and fan which is operated through DC motor to monitor and control the whole system.

V. Software Development

A] Android Application

Android is a software stack for mobile devices that include and operating system, middleware and key applications. The Android SDK provides the tools and APIs necessary to begin developing applications on the Android platform using the Java programming language. By providing an open development framework, Android offers developers the ability to build extremely rich and innovative applications. Developers have full access to the same framework APIs used by the core applications. Android includes a set of C/C++ libraries used by various components of the Android system.

They include System C library, Media library, Surface Manager, LibWebCore, SGL, SQLite, FreeType and 3D libraries. Android applications are written in Java programming language. The Android SDK compiles the code along with any data and resource files into an Android package, an archive file with an .apk file extension. All the code in a single .apk file is considered to be one application and is the file that Android powered devices use to install the application.

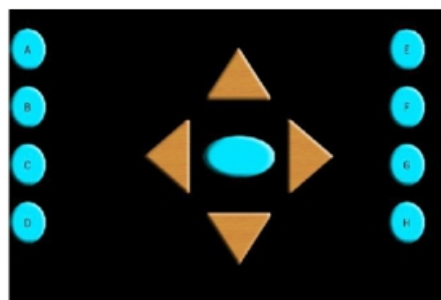


Fig.4 Android Main Control GUI

Above fig.4 indicates the android main control GUI which is developed for this project. A, B, C, D, etc are multiple rooms and the arrow shown in fig is for controlling and monitoring system. User can connect to main control board by bluetooth connection.

VI. RESULT

Final Setup

Fig 5 shows the prototype setup that was made by the authors: Despite working with a significantly varied group of users, with different needs, an interface suitable was achieved.



Fig.5 Prototype working design

VII. CONCLUSION:

In the paper low cost, secure, ubiquitously accessible, auto configurable, remotely controlled solution for an advanced

home automation system using android and PLCC communication which is controlled and monitor has been introduced. Statistical report for PLCC and Android usage its reviews on how the technologies are used for designing a portal device. In Particular it's helpful to identify the aspects of a product that people are happy. The paper provides highly advanced IC's like ARM-7 Microcontrollers, Relays and TRIAC switches, PLCC module communication technology with the help of growing technology. The idea of the advanced home automation can also be extended for future 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. It can also be extended using driver circuits for controlling intensities, speed levels for lights and fans devices. Usage of Wireless Wi-Fi network, through which the devices can also be controlled using voice application and also touch application from android mobile.

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