



# **Data Acquisition and Control Using Android Platform**

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**ABSTRACT:**The design and implementation of a remote monitoring system for household electrical appliances in real time has been explained in this system. Objective of this system is to fulfill the growing energy demand by efficient utilization of existing energy Hence, this system enables the person to turn on/off the home devise remotely even if person forgot to do so. This facility may help to avoid the wastage of electricity to some extent.

**KEYWORDS:**Remote devices, GPRS Modem, Android

## **I.INTRODUCTION**

Growing Energy demand is becoming most important issue which to be considered on priority to prevent future inconvenience. Energy is most essential thing for our society to ensure our quality of life and to underpin all other elements of our economy. With the scarcity of power resources and increase in demand for power, the world is going through a power crisis. The world is now looking forward to develop technologies for power generation and efficient utilization at the same time. This system focuses on human-friendly technical solutions for easy monitoring and control of household appliances.

The ever changing Lifestyle is getting new dimensions everyday with more and more advancements in the field of information technology. The struggle of mankind for mere living got its apex from necessity, luxury to smart living. This struggle, these days is popular and obligatory for researchers and investors.

## **II. RELATED WORK**

The existing data acquisition systems [1][2][4][7][8][9] designed for remotely monitoring & controlling the various devices at home makes the use of various graphical user interfaces & several different types of wireless network connections such as WIFI, ZIGBEE, and Bluetooth. However, each type of connections has their own unique specifications and limitations. In the existing smart power monitoring and control system [1] which has been designed and developed toward the implementation of an intelligent Building, Zigbee wireless technology is used. The Use of Zigbee wireless network makes it less expensive & also consumes low power however it has limited network area coverage. S.IlangoSambasivan& Harish. I,[2] duo projected a system which is a web server application based intelligent Tele-monitoring giving more emphasis on gateway for the WSN and the server. The system [3] introduces smart plug using Arduino-Android platform for remote monitoring of energy consumption at the device level has been developed. This smart plug has cost benefit since it uses open source software's, provides ease of monitoring various devices but lacks in control. Ming Yan and Hao Shi proposed home automation system by using bluetooth which saves lot of power and time. It uses smart devices however use of bluetooth limits the range of coverage area.

The system [2][5] which are designed for residential buildings gives more emphasis on gateway for the WSN and theserver.

The existing system [7][8][8][9] which uses bluetooth module that is based on the Bluetooth V2.0 protocol and is having a limited range of accessibility i.e around 10 meters. Many present systems [1][2] are developed with the help of two most famous wireless technologies i.e. Bluetooth, ZigBee using short range radio frequency for the transmission of voice or data, or simple information. However, proposed system will enable us to remotely monitor & control various electrical appliances with no range limitations.

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Author[6] proposes the intelligent and versatile system for home safety environment to help elderly and individual with disability live independently in their own home however, Many countries have restricted the use of Wi-Fi in hospitals & schools since its prolong exposure may affect the human health, Hence it does not look well-suited for patients.

The proposed system enables the users to operate a device and monitor its power consumption even from a remote location using an android UI. The system focuses on human-friendly technical solutions for easy monitoring and control of household appliances.

## III.SYSTEM DESCRIPTION

In future, the mobile applications will play a major role in human to human and human to machine interaction. The smart devices capturing market as it has numerous attractive features that has been successfully implemented and being used.

The Implementation of designed system is to be carried out in two steps namely hardware and software. The application is hardware and software combined. The proposed system is composed of following Basic Hardware Parts given as follows:

- Power supply unit
- Wattmeter unit
- ARM7 Microcontroller board,
- SIM900 GPRS modem,
- Relay drivers for output devices.

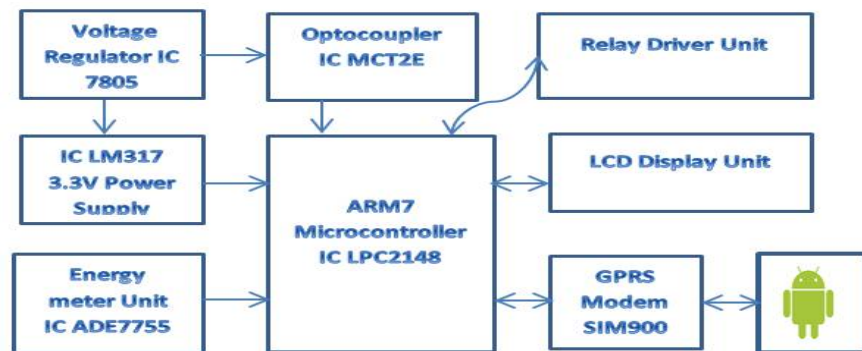


Fig. 1 Block Diagram

The system has five major areas in which the system is divided, which are shown in above block diagram. The proposed Data acquisition system is to be used with smart devices like android phone or tablet. With the promotion of Android as a Smart Phone Operating System by Google Inc, Smart Phones are becoming more and more popular around the world. In order to provide the remote monitoring & control of various home appliances, the proposed Data acquisition system is based on web server technology which uses GPRS Modem for the wireless data transmission between the android smart device and microcontroller based embedded device.

For this Data Acquiring & Monitoring System we are targeting Android platform since it has huge market and open source. Android is a software stack for mobile devices that includes an operating system, middleware and key applications. The Android Operating system is based on Linux. Android Applications are made in a Java-like language.

The proposed system is composed of various basic devices shown in the following block diagram. It comprises of wattmeter as the system needs to measure energy consumption that is the usage of particular home appliance. The energy utilization of various home equipments is being recorded by the wattmeter & will be displayed onto the smart device display. The system will be low powered as well as secured as it does not require continuous kind of monitoring. The system will provide updated information regarding energy consumption whenever requests come from authenticated user.



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- **Power supply :-**

The 5V regulated power supply is used with the help of 7805 IC which supplies 5V fixed voltage for Relays, LCD Display.

ARM7 needs 3.3V hence LM317 IC is used which supplies 3.3V.

- **Energymeter unit :-**

The energymeter is used to read the power consumption of the devices. The energymeter ADE7755 module is used in the system. ADE7755 is available in a 24-lead SSOP package. ADE7755 is High accuracy electrical energy measurement IC.

- **ARM7 Microcontroller board :-**

The LPC 2148 ARM7 Microcontroller module is used. The ARM processor controls the embedded device. The ARM7 is a load-and-store architecture, so in order to perform any data processing instructions the data has first to be moved from the memory store into a central set of registers, the data processing instruction has to be executed and then the data is stored back into memory. An ARM processor comprises a core (the execution engine that processes instructions and manipulates data) plus the surrounding components that interface it with a bus. Different versions of the ARM processor are available to suit the desired operating characteristics. A bus is used to communicate between different parts of the device. A bus has two architecture levels. The first is a physical level that covers the electrical characteristics and bus width (16, 32, or 64 bits). The second level deals with protocol—the logical rules that govern the communication between the processor and a peripheral.

- **Relay drivers for output devices.**

The devices which are to be monitored are connected to relays.

- **SIM900 GPRS modem :-**

The GPRS modem plays most important role of communicating device between the smart device & system. The use of GPRS modem communicating device will be helpful for betterment in the performance of the system. The Features of GPRS modem are given as follow:

1. SIM900 Quad Band GPRS Engine
2. It works on frequencies 850MHz, 900 MHz, 1800 MHz & 1900 MHz.
3. The Baud rate can be configurable from 9600-112500 through AT commands. Initially Modem will be Autobaud mode.

The Modem can be directly interface with 5V microcontrollers like PIC, AVR, 8051 Derivatives, Arduino and 3V3 Microcontrollers like ARM, ARM Cortex XX etc. Make ensure V\_INTERFACE pin is supplied with same voltage level as the microcontroller VCC. Connect RX pin of the modem to the TX pin of the microcontroller and TX pin of the modem to microcontroller's RX pin. The connected power supply (4.2v to 12v dc) should be capable of handling current up to 1A.

The modem automatically sets to the baud rate of the first command sent by the host system as it gets turned ON.

- **Software Tools:**

Android SDK for android application development.

Eclipse IDE: it is a free open source IDE.

Coding will be done in Embedded C using Kiel IDE to compile the program in ARM7.

Android [14] is a mobile operating system that is based on a modified version of Linux. It was originally developed by a startup of the same name, Android. The main advantage of adopting Android is that it offers a unified approach to application development. The Android OS is roughly divided into the main layers as below:

Linux kernel — This is the kernel on which Android is based. This layer contains all the low level device drivers for the various hardware components of an Android device.

Libraries — These contain all the code that provides the main features of an Android OS.

Android runtime — At the same layer as the libraries, the Android runtime provides a set of core libraries that enable developers to write Android apps using the Java programming language.

Application framework — Exposes the various capabilities of the Android OS to application developers so that they can make use of them in their applications.

Applications — At this top layer, you will find applications that ship with the Android device (such as Phone, Contacts, Browser, etc.), as well as applications that you download and install from the Android Market. Any applications that you write are located at this layer.



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## IV.RESULT

Total No. of Households in India as per 2011 census is approx.	248,408,494
Households in urban areas is approx.	78,900,000
if we assume if mare 1% of this urban household benefited at least once in a month (Means 1 household in 100 forgot to switch off appliances at least once in month) At least 4 small appliances are running at any time in house 2 Tube lights, 2 Fans ( 40 X 2 + 80 X 2) = 240 watts / hr	78,900
if they run for 8 hrs before turn off = 240 X 8	1920
Total savings in month	15,14,88,000

## V. CONCLUSION

This system helps to overcome the problem of unnecessary wastage of energy which is so essential for fast growth of our country. In this system, GPRS technology has served to eliminate the problem of limited accessibility of the devices. GPRS network covers comparatively vast area. Since the user can use his smart phone to monitor & control conveniently the home equipment, it becomes cost effective solution to serve this purpose.

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