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A SMART SYSTEM FOR CONNECT AND DISCONNECT ELECTRICAL DEVICES AT HOME BY USING GPRS

NIDIGONDA ANURADHA[1]

anu123.chanti@gmail.com[1]

D.BHANDUCHANDAR[2]

dornalachandu@gmail.com[2]

[1]PG Scholar, Dept of ECE, Vathsalya Institute of Science & Technology, Anantharam Post, Bhongir (m), Nalgonda, Telangana, India.

[2] Guide, Associate Professor, Dept of ECE, Vathsalya Institute Of Science & Technology, Anantharam Post, Bhongir (m), Nalgonda,, Telangana, India.

***Abstract*—** The goal of this work is to develop an energy-saving smart switch and disconnect system in the field of home appliances. Intrinsically in home and office appliances like light and fan are controlled manually, which leads to power wastage. By making a smart automated controlling system for appliances we can save the power by some amount. In this paper we are providing a solution for preventing the wastage of power in an adequate and cost effective way. This paper put forwards the design of home automation system using ARM7 LPC2148 board. The design is based on a standalone embedded system board ARM7 LPC2148 at home. Home appliances are connected to the ARM7 and communication is established between the ARM7 and mobile by using GPRS Technology. The home appliances are connected to the input / output ports of the embedded system board and their status is passed to the ARM7. We would develop an authentication to the system for authorized person to access home appliances. The device with low cost and scalable to less modification to the core is much important. It presents the design and implementation of automation system that can monitor and control home appliances.

Key Words: *Microcontroller, GPRS, home appliances.*

I. Introduction

With the continuous growth of mobile devices in its popularity and functionality the demand for advanced mobile applications in people's daily lives is continuously increasing. Utilizing web services is the most open and interoperable way of providing remote service access or enabling applications to communicate with each other. An attractive market for home automation and networking is represented by busy families and individuals with physical limitations. Smart home is a very promising area, which has various benefits such as providing increased comfort, greater safety and security, a more rational use of energy and other resources thus contributing to a significant savings. This research application domain is very important and will increase in future as it also offers powerful means for helping and supporting special needs of the elderly and people with disabilities. 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 internet connectivity to ARM Processor based embedded systems. This system uses ARM Processor to store the main application source code, web pages and TCP/IP stack which is a vital element of the system software. An GPRS module is used to handle the communications and it is interfaced with the ARM Processor using UART protocol. Configurations like IP address and other details are set using RS232 interface. The site can be viewed on any system with Internet/LAN connection by configuring the specific IP address and by giving User Login ID, password. There are several I/O pins available at the ARM Processor which are 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.

II. Literature Review

Many Wireless Technologies like RF, Wi-Fi, Bluetooth and Zigbee have been developed and remote monitoring systems using these technologies are popular due to flexibility, low operating charges, etc. Today Wireless Sensor Network are used into an increasing number of commercial solutions, aimed at implementing distributed monitoring and control system in a great number of different application areas.

(Wijetunge et al., 2008) designed a general purpose controlling module designed with the capability of controlling and sensing up to five devices simultaneously. The communication between the controlling module and the remote server is done using Bluetooth technology. The server can communicate with many such modules simultaneously. The controller is based on ATMega64 microcontroller and Bluetooth communication TDK Blu2i (Class 1) module which provides a serial interface for data communication. The designed controller was deployed in a home automation application for a selected set of electrical appliances.

(Kumari and Malleswaran, 2010) developed real time based equipment condition monitoring and controlling system using embedded web based technology which directly connects the equipment to network as a node. The embedded system consists of ARM7 based LPC 2148 microcontroller board, A/D, signal conditioning, sensors, and communications interface. The function of web based system is to collect the real time data information of the on-site equipment and remotely send the data in the form of user defined data transmission style. The remote Computer collects the data and running status through the network and provides the comparison on the historical data. If the parameter value is different from the original set value, the corrected signal is sent to the control unit. The embedded remote monitoring system completes the data Collection in the embedded platform and provides the data to remote host through the TCP/IP protocol from Web server. It creates condition to realize unattended management through providing Web-based graphical management interface for the Internet or LAN users

(Kanma et al., 2003) proposed a home appliance control system over Bluetooth with a cellular phone, which enables remote-control, fault-diagnosis and software-update for home appliances through Java applications on a cellular phone. The system consists of home appliances, a cellular phone and Bluetooth communication adapters for the appliances. The communication adapter hardware consists of a 20MHz 16bit CPU, SRAM and a Bluetooth module. The communication adapter board is connected to the home appliance and to the cellular phone through serial ports. The appliances can communicate with the cellular phone control terminal via Bluetooth SPP.

(Flammini et al., 2007) suggested a novel architecture for environmental tele-monitoring that relies on GSM for sampling point delocalization, while on-field nodes implement local subnets based on the DECT technology. Local subnets contain two major blocks; Acquisition Station (AS) where sensors and actuators are located and Transmitting Module (TM), i.e., the module that handles several measurement stations and sends data to the control center (CC). Each AS acts as a data logger, storing in its internal memory device field data; communications between AS and TM are cyclic (round robin), with a cycle time of about 1–10 min. On the contrary, communications between TM and CC occur once a day for data-logging purposes, while alarms or threshold crossings are communicated asynchronously by means of Short Message Service (SMS). Prototypes have been realized to interface with temperature (T, AD590 from analog devices), humidity (RH, HumirelHM1500), and carbon monoxide (CO, Figaro TGS2442) sensors. DECT Siemens module MD32 and GSM module MC35 were used. AS was based on Microchip's PIC18F452 microcontroller and TM was designed using 32-bit ARM-based microcontroller from Samsung (S3F441FX).

III. Design of Proposed Hardware System

In this proposed system consists of two parts one is

hardware part and second part is software. In this hardware part divided into two parts one is home section and another one is monitoring and controlling section.

In the first section having devices, Microcontroller and GPRS module. Whenever we are receiving the data from monitoring section GPRS module activate and inform to the microcontroller here controller control the devices according to the data received.

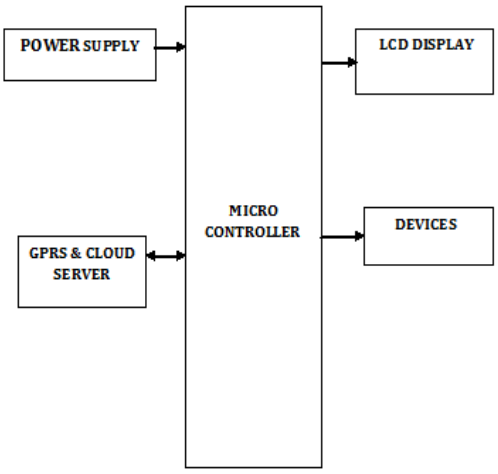


Fig.1. Home Section Block diagram

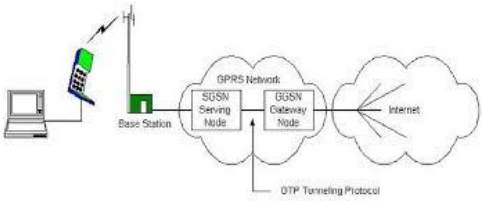
Fig.2. Monitoring and controlling Section

IV. Board Hardware Resources Features

GPRS: GPRS is expected to profoundly change the mobile data services that GSM, CDMA and TDMA (ANSI-I36) network operators can offer. GPRS will increase opportunities for higher revenues and enable new, differentiated services and tariff dimensions to be offered (such as a charge for the number of kilobytes of data transferred). GPRS combines mobile access with Internet protocol (IP)-based services, using packet data transmission that makes highly efficient use of radio spectrum and enables high data speeds. It gives users increased bandwidth, making it possible and cost-effective to remain constantly connected, as well as to send and receive data as text, graphics and video.

The key drivers for operators to evolve to GPRS networks are to:

- increase revenues by moving into the mobile data market, especially since the voice market has had profit margins squeezed with the commoditization of voice services
- gain new subscribers who require mobile data services or do not want to invest in aPC to gain Internet access
- retain current subscribers by offering new services
- reduce costs due to the efficient use of network resources
- Ease of adapting applications for mobile users because high data speeds mean that middleware is no longer required to convert fixed applications for mobile use.



GPRS network

The SIM900 is a complete Quad-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM900 delivers GSM/GPRS 850/900/1800/1900MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mm x 24mm x 3 mm, SIM900 can fit almost all the space requirements in your M2M application, especially for slim and compact demand of design.

- SIM900 is designed with a very powerful single-chip processor integrating AMR926EJ-S core

- Quad - band GSM/GPRS module with a size of 24mmx24mmx3mm
- SMT type suit for customer application
- An embedded Powerful TCP/IP protocol stack
- Based upon mature and field-proven platform, backed up by our support Service, from definition to design and production.

RELAY:

Relay is an **electrically operated switch**. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are **double throw** (**changeover**) switches.

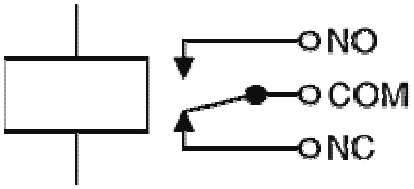


Fig.3. Relay circuit

Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits; the link is magnetic and mechanical.

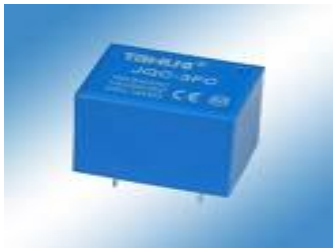


Fig.4. Relay coil

The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for the popular 555 timer IC is 200mA so these devices can supply relay coils directly without amplification.

V. CONCLUSION

An automated home can be a very simple grouping of controls, or it can be heavily automated where any appliance that is plugged into electrical power is remotely controlled. Costs mainly include equipment, components, furniture, and custom installation. Ongoing costs include electricity to run the control systems, maintenance costs for the control and networking systems, including troubleshooting, and eventual cost of upgrading as standards change. Increased complexity may also increase. Maintenance costs for networked devices. Learning to use a complex system effectively may take significant time and training. Control system security may be difficult and costly to maintain. By using ARM LPC-2148 Microcontroller and cell phone can make possible Smart home automation with high speed and very small amount of time by sending and receiving SMS through user cell phone to cell phone which is at on door of user home.

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