

Remotely Controlling Electrical and Electronic Appliances through Mobile Phone: A Pragmatic Approach.

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Abstract: Advent of mobile telecommunication has made things simpler and easier. People employ this technology in so many areas discipline. It is use in the bank for more transaction like online transfer of fund, purchase of credit or recharge card and so many others. It is very good also if this technology is also adopted in controlling electrical and electronic gadget or appliance. This paper focuses more on sustaining and managing electrical energy consumption through interactive remote electronics appliance controller. The main aim of the system is to provide sustainable power supply to the gadget to provide feedback and inform the user in case of change in the status of the gadget. The system allows the owner or user to control and also know the status of his house electrical/electronic appliances from remote places by sending SMS messages. There is rechargeable battery embedded in the power supply for constant supply of electrical energy. The control unit consist Atting 2313 microcontroller that is programmed to interface with the remaining unit of the system. The software is developed using C#. The system sends message to the preconfigured number if there is change in status of power supply or when the battery level is getting low. The user can also control home appliance by sending messages text messages to the system. The system can be used for high security in banks and other organizations. Using real time clock, the appliance needs response in real time can be controlled through the wireless link. The system can be expanded with the aid of some devices to accommodate more devices.

Keywords: Battery charging, Short Message Service (SMS), Global System for Mobile Communication (GSM), Microcontroller, Software.

I. Introduction

Sometimes occupant of a house may not be sure of the status of the electrical/electronic gadgets/appliances in the house when he has left the house. Therefore there is need for interactive way of verifying the status. This usually happens when there is usually power failure in the house prior to the time the occupant left the house. Since mobile handset is now common it is good to employ it in solving this problem. With this system the occupant will be able to change the status of the gadget/appliance either to put it on or off and is also conversant of the status. The system gives prompt message or information when there is change in the operation. This system also makes provision for back-up battery in the power supply unit. Some systems, gadgets or appliances like surveillances are supposed to be available all the time it is therefore necessary and important to know when they are out of operation. Some equipment used for monitoring events also needs constant supply of energy. If the back-up battery is getting low, it send message to the user so that the user is aware of the situation of the house and when the supply is restore it also send information to the user. This is done without a request from the user.

II. Review of Related Literature

(Potamitis, Georgila, Fakotakis, and Kokkinakis, G 2003) suggested the use of speech to interact remotely with the home appliances to perform a particular action on behalf of the user. The approach is inclined for people with disability to perform real-life operations at home by directing appliances through speech. Voice separation strategy is selected to take appropriate decision by speech recognition. (Murthy 2008) delved into primary health-care management for rural population and proposed the use of the mobile web-technologies providing the PHC services to the rural population. The system involves the use of SMS and cell phone technology for information management and personal communication. (Marriam Butt et al) proposed a system that uses voice Global System for Mobile Communication and wireless technology based on .Net framework and attention (AT) commands to implement controlling home appliances remotely through voice command. Microsoft speech reorganization engine, speech SDK 5.1 is used to understand the voice command of user. (Faisal Baig et al 2013) developed a mobile application using java for mobile technology and MPLAB to convert the user command into SMS. (Jawarkar P, Vasif A, Ladhake

A, Thakare R 2008) suggested the software system for communication between mobile and computer. UART 16550A chip employed using appropriate control format to support AT command. Mobile phone in the system receives and executes commands from preconfigured phone numbers and also sends information about the status of the input ports.

(Sikandar M, Khiyal H, Khan Aihab 2009) proposed a system for controlling home appliances remotely that is useful for the people who are not at home mostly to provide security and control the home appliances. The system is implemented by SMS technology that is used to transfer data from sender to receiver over GSM network. The 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.

(Krishna Y, Nagendram S 2012) recommends low power RF ZigBee based voice control system for home automation in which Zigbee receives the voice command as input and then send the data to ARM9 controller which converts the input data in required format. After the conversion ARM controller send data to microcontroller via ZIGBee where devices are attached. Voice command is simply converted into the digital data and sends serially as a packet of binary data. At receiver side digital data is again reconstructed into the voice and pass it to the computer through a sound card. Visual Basic programming is run which use Microsoft Speech API library for voice recognition. After voice recognition, system generates the control characters which then used to switch OFF/ON the appliances. Control characters are sent wirelessly to the specified appliance.

(Kumar Ch, RagbuB,Gamya, Vijay M) use 8051 microcontroller, max 232 and Triacs are used in place of relays.(Faisal Baig, Saira Beg, Muhammad 2013) facilitates the user to control appliances remotely via voice command and remote control. The user with android OS based Mobile speaks voice commands, the mobile application convert the voice command in to text and payload the command on GSM network via SMS. On the receiver side these commands are received and transfer to the controller using Bluetooth medium. For Control unit PIC16F877A microcontroller and Bluetooth Module BTM 222, ZigBeetransceiver MC13211 are used.

(ShilvaramanIlango 2014) propose a portable instrument with all the features inbuilt in a safety helmet that can be used in hazardous as well highly protected confidential environment that face the problem of security breach and lack of versatile communication during different situations.

Authentication is through NFID (near field communication) that is highly advanced and modified version of RFID technology. The monitoring and video tracking is through a small wireless embedded in the front part of the helmet for observing the movement of the person working inside a hazardous environment or security purpose in a protected area. The wireless camera can be interfaced with laptop and snapshots can be taken.

(Rahul Nangare, AnupsinghPardesir and Pratik 2014) in this system, microcontroller 89V51RD2 is used which control the keyboard and other peripherals interfaced. The SIM 300 GSM module is used to send the message to the mobile number stored. The LCD is used to pass the information to the visitor. The visitor enters his information with the aid of the keyboard provided.

III. Methodology

The heart of control unit isAtting 2313 controllerand max 232. SonyEricson mobile phone hand set is used although this can be replaced with GSM module properly connected with the microcontroller. The circuit can be interface with computer through RS 232. A relay based circuit is used to control the appliance. This relay may be substituted by triac depending on the nature of the load. Rs-232 serial port is used for connection to modem, printer or other peripheral devices. Up to seven appliances can be controlled with the system.

User from anywhere under the network coverage can send a text to the system to check the status of the appliances or control them. System first check the authenticity of the number and if it is from the preconfigured number then it follows the instruction otherwise it ignores the message. If the command is about changing the status of appliances it passes the signal to pin or port assigned to the relay. If the text is to check the status of appliances the system returns the message to preconfigured number telling the status of the appliances.

The software was developed using a high level language tool in C. the software extract the sent message from the SIM location at a regular interval and processes it to give status and control the different appliances connected within the system. The system uses of Sony Ericson F-Bus protocol to communicate with the mobile phone set.

Sony Ericson has F-Bus and M-Bus connections that can be used to connect a phone to a PC or microcontroller. The connection can be used for controlling about all functions of the phone. This bus will allow us to send and receive SMS messages. The phone has a port which enables user to connect the data cable.



Figure 1: Sony Ericsson Connection Port

Table 1: Sony Ericsson Port Connection and Assignment

PIN	NAME	DESCRIPTION
1	ATMS	Audio to mobile
2	AFMS/RTS	Audio from mobile/RTS
3	CTS/ONREQ	CTS/Mobile Station On Request
4	DATA IN	Data to mobile (Rx)
5	DATA OUT	Data from mobile (Tx)
6	ACC IN	Accessory control to mobile. Used as Rx in some models for flashing.
7	ACC OUT	Accessory control from mobile/hands free sense. Used as Tx in some models for flashing
8	AGND	Audio signal ground +0V reference
9	FLASH	Flash memory voltage + service (shorted to pin 11 in service cable)
10	DGND	Digital ground
11	VCC	DC = for battery charging + external accessory powering



Figure 2: Max 232 transceiver is used to interface RS232 Tx and Rx pins.

3.1 Pseudo Code for Proposed System

```

Begin
If hardware test fails
Send message
End
Else if hardware test succeed then
Successful Communication
If system get a call
Check the authenticity
If text not from the preconfigured number
Ignore
Else
Receive the call and listen to the command
If the command is about controlling the appliances
Send the command to remote unit through control unit
If the system is through parallel port
Send the signal to parallel port and control them
Send the respective text message
If the command is about knowing the status of appliances
Check the status of the appliances and sends the status to that number
If the system sense change in the status of the electrical supply
    
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Send message to preconfigure number
If battery level is getting low
Return text message to preconfigure number
End.
    
```

Pseudo code for proposed system

3.2 Flowchart

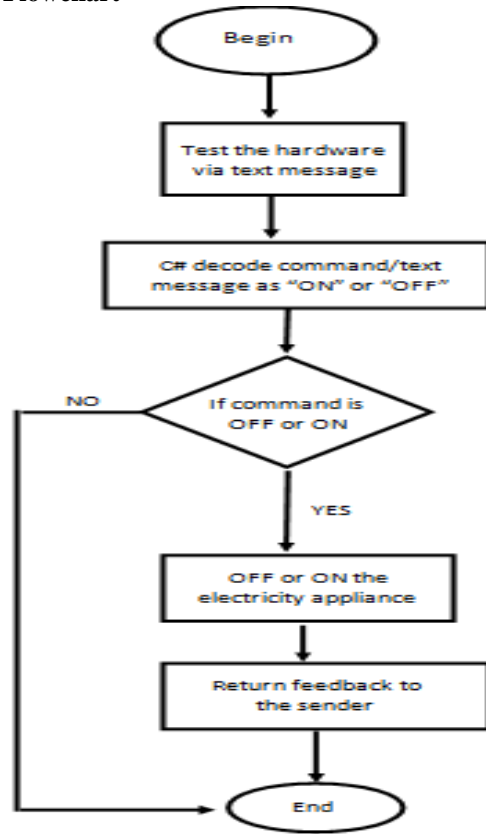


Figure 2: Flowchart for proposed system

Flowchart

Figure 2, shows the flowchart of the proposed system. The Global System for Mobile Communication based appliance control system will go “off” or “on” once the text message is sent to it. If the command is “OFF” or “ON” the appliance will be switch on or switch off as the case may be. Then the microcontroller will send feedback to the sender.

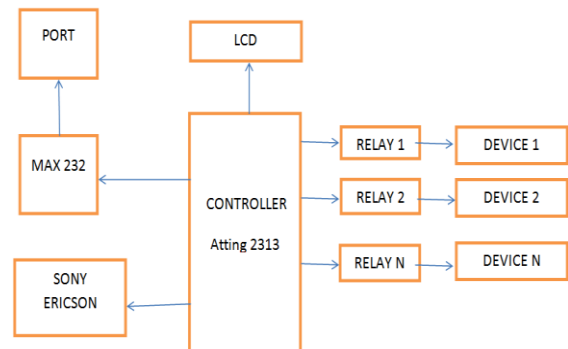


Figure 3: Block diagram of proposed system

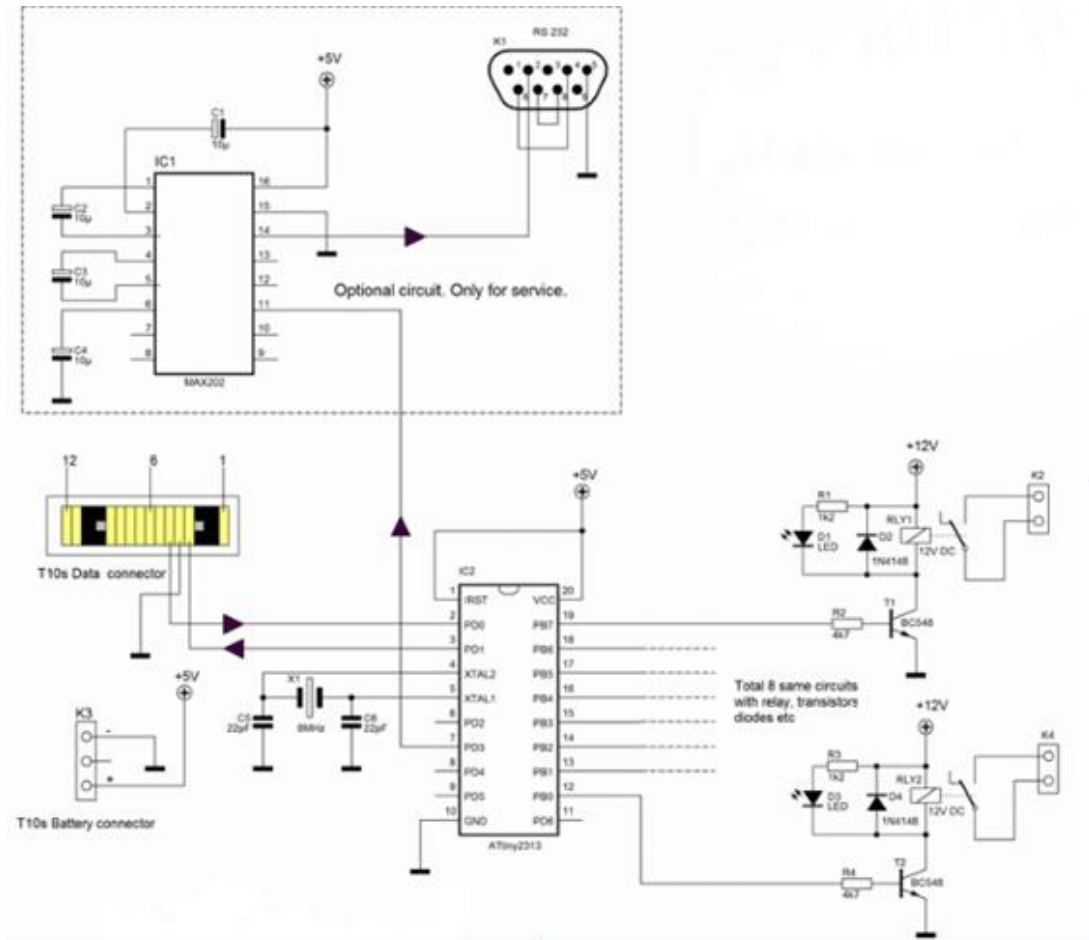


Figure 4: Circuit Design

The function of the microcontroller is to verify the authenticity of the caller. It then read the information from the user on what to do and where to send signal. It act either to switch ON or OFF any outlets device (through relay or triac) by sending high or low voltage. It then send signal back to the user and then delete the message.

Relays are used because the current required by the load (device) is more than what the microcontroller can accommodate.

rectifiers which consist of the four diodes B1. Fuse F1 is a protective device. Capacitor C1 is to filter the ripples. LED D2 is to indicate presence of power in the power circuit. Battery B1 is a backup battery which keeps the memory of the controller so as to know the device that is ON and OFF in the case there is power failure. It also enables the microcontroller to send signal to the user that there is no power source in the house and also helps the microcontroller to continue its operation. Regulator IC1 provides the required 5V for the micro controller.

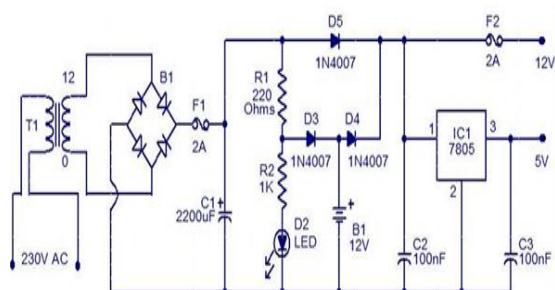


Figure 5: Proposed sustainable power supply

The diagram in figure 5 is power supply unit that controls the circuit. From the A.C mains, the voltage is stepped down to 12V by the Transformer T1. This is rectified by the bridge



Figure 6: Snapshot of the construction

IV. Conclusion and Recommendation

Using wireless technology to control home appliance has revolutionized our way of living. However it is very important to monitor the status of supply to the building in order to conserve energy. The system can be used where there is GSM network coverage. It is easy and cheap since almost every individual now have mobile phone. The project may be extended to other areas like car demobilizer using GSM and microcontroller.

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