Controlling an Electrical Equipment by Mobile Phone

Sonali S. Ingle, Pratima M. Bhalekar, Ketaki S. Pathak
Ashoka Center for Business and Computer Studies, Nashik, Maharashtra, India.
sonali.ingle7512@gmail.com, pratimabhalekar@gmail.com, ketaki.s.pathak@gmail.com

Abstract: In modern days Human can control any electrical gadget from any part of the world through your Mobile phone, that too without spending a penny for the individual commands. We must use various high-tech equipments to get our jobs done and make the life easier. Whether your vehicle, your basement door or simply the air conditioner of your house, everything can now be switched by just a flick of your cell phone button. And it’s completely fool proof, meaning no false triggering is possible through any other cell phone signals, it works only through the owner’s cell phone commands.

This report is consists of designing and implementing a domestic electrical equipment controller using Mobile Phone. The technology is going to be advanced day by day. The explained circuit must be employed strictly for operating only the following specified equipment: All domestic electrical appliances like, lights, fans, motors, TV sets, refrigerators, Air conditioners, washing machine, porch lights, garage door, house gate, basement gate or entrance, car ignition, car doors, water heater etc.

I. INTRODUCTION

Basically the unit employs a very fundamental principle of converting the ringtone of a cell phone into a command output for operating a relay. This cell phone acts as a modem and is permanently attached with the internal control circuit of the unit. The modem cell phone is initially made ready by putting a SIM card inside it and by configuring the essential assigned numbers into its phone directory. These assigned numbers are the only numbers to which this modem responds. Therefore you would want to assign only those numbers through which you may like to make a call to the “system”.

For safety reasons more than one number is assigned to the modem so that in case one of your cell phones is out of order or has low battery, you always have the option of using the other cell phone for triggering the system.

The motivations behind the goal to remote control of home appliances are simple. It’s not always feasible to be physically near to the home sometimes it’s very important to control the appliances for many purposes. So the remote controlling takes the control of the home beyond the home and to the hands of the people. If a simple mobile phone takes the added responsibility to control the smart home then the control is reachable from almost everywhere people travels and lives on earth. This sort of high end technology is supposed to facilitate the different life easing utilities to a new age and bringing things out of the box to as near as one’s palm.

There exists a number of available media for remote communication. Internet is a good example of this type of remote communication. Internet places virtually no bounds on geographical placement and is thus considered “enough” remote by our definition. But the Internet is a place crowded with various types of traffics, often hostile to each other. Security vulnerability is the most striking alert point of the Internet. Whenever a web based application goes live, a lot of efforts have to take place before it can be said to be secured, if at all. When we say remote control, we want to make sure no malicious party ever gains control and abolishes everything. Also to use web, it requires resources like flawless internet connections and hosting servers, which may not always fit to the concept of remote controlling.

Another candidate solution to this remote communication problem is the use of mobile telephony. Mobile telephony offers a wide range of communication services like voice and data transfer through SMS and other enhanced data transfer protocols like GPRS, EDGE at a relatively low price and at a wide variety of places on the earth. On the other hand, the security is better achieved by the use of strict traffic control. We adhered to this method of remote controlling of home appliances because of its unparallel availability and modest security at the affordable price.

II. WISE (Web Inside, Smart Engine)

It is a product series developed by ICP DAS that functions as control units for use in remote logic control and monitoring in various industrial applications. WISE offers a user-friendly and intuitive web site interface that allows users to implement IF-THEN-ELSE control logic on controllers just a few clicks away; no programming is required. With its powerful and easy-to-use features, it will minimize the learning curve, shorten time to market and dramatically reduce the labor and cost spent on system development.

2.1 Features:

- Built-in Web Server for IF-THEN-ELSE rule setting
- Built-in IF-THEN-ELSE rule engine for logic operation
• Support IO, Counter, Timer, Schedule, Email, Recipe operations

• No more programming. Just click and get done!

• Data logger and data files send back function supported

• Modbus TCP/RTU Protocol for SCADA Software Seamless Integration

• Support XW-Board

• Support Modbus TCP Slave Devices (Up to 7)

• SNTP Time Synchronization Supported

• Support SMS (GSM: Quad-band 850/900/1800/1900 MHz)

2.2 Applications: Building Automation, Factory Automation, Machine Automation, Remote Maintenance, Remote Diagnosis, Testing Equipment, etc.

III. WISE-5801-MTCP

Both WISE-4000 and WISE-5801 are equipped with SMS alarm message notification function. It allows including SMS alarm sending action into logic rules to send a pre-set SMS message to related personnel when an event occurs. In addition, WISE-5801 allows receiving the SMS commands sending by specific phones numbers to perform tasks such as real-time channel monitoring, channel data modification and logic rules execution (triggered by SMS), etc.

3.1 Features of WISE-5801-MTCP: WISE-5801 supports an I/O expansion bus to implement various I/O functions such as D/I, D/O, A/D and D/A according to the XW-Board. In addition, it also support ICP DAS I-7000 remote I/O modules and Modbus RTU slave devices. Based on the variety I/O module of I-7000 and the connection ability with Modbus RTU slave devices, WISE-5801 can provide user more flexibility in application field.

WISE-5801 supports Modbus TCP/RTU protocol to make seamless integration with SCADA software available. It include all advantages which WISE series controllers can provide. In addition, WISE-5801 provide data logger function with microSD card, it can record I/O channel value by event trigger or regular time period.

The data files can be sent back by Email or FTP. All setting can be completed through browser.

In addition to merits inherited from the existing WISE series, WISE-5801 even provides more supports in I/O functions. It allows to connecting with a wide range of XW-Boards, I-7000 Remote I/O modules and Modbus RTU slave devices that enables users to freely choose the most suitable I/O modules.

Fig. 1. WISE 5801 MTCP

With the microSD card, it provides Data Logger function to real-time record the I/O data of the controller and sends the data files by FTP or Email at a sceduled time to the control center for further administration management or data analysis. WISE-5801 also features SMS sending function for alarm report and SMS command receiving function.

3.2 SMS Setting: WISE-5801 offers SMS alarm message sending and SMS command receiving functions. For SMS alarm message sending function; WISE-5801 offers up to 12 SMS alarm settings. It allows to send pre-set SMS alarm to specific phone numbers. For SMS command receiving function;

WISE-5801 allows to set up maximum 3 authorized phone numbers to receive SMS commands. WISE-5801 will execute the commands received from authorized phone numbers only. There are three types of SMS commands:

3.2.1 Retrieve real-time channel data: You can retrieve specific channel real-time data, one SMS command message can require up to 10 channel data values. To retrieve the channel data of WISE-5801, follow the following coding rules to send a SMS command to WISE-5801.

The Types of Codes used to retrieve real time data:

1. ai: Ai Channel Data
2. ao: Ao Channel Data
3. di: DI Channel Data
4. do: Do Channel Data
5. ci: DI Counter or RTU Discrete input data
6. co: RTU coil Output Data
7. ri: RTU Input Register Data
8. ro: TRU holding Register data
9. ir: Internal Register Data

3.2.2: Modify channel data: WISE-5801 allows to modify output channel and Internal Register data by SMS command. Each SMS command message allows to modify one output channel or Internal Register value. Specify the output channel or Internal Register by the coding rules as described above, add a “/” at the end of the string and then add the data value you would like to change to. (For DO: input 0 or 1, 0 indicates OFF and 1 indicates ON. For AO: input the value in floating point format.)

3.2.3 Modify SMS command variable data: WISE-5801 offers up to 12 SMS command variables. The status of the variables can be set as 0 or 1. The status of SMS command variable can be included in IF Condition as part of logic rules. You can send a SMS command message to modify the status of the variable, and then perform the execution of an Action that has been previously set.

3.3 Background Details:

3.3.1. X10 Active Home Controllers Pro: The X10 Active Home Computer Interface works in conjunction with free downloadable Active Home software to provide remote control over your whole home directly through your computer. The interface module serves as a transceiver, passing X10 signals between the PC and your X10 modules.

- Transmits and receives X10 commands
- Control your X10 system through a PC
- Schedule lighting and appliances to automatically turn on/off
- Replay usage pattern to make home look occupied when empty

An appliance specific module or generic module is plugged in between the controller and the appliances. The controller directly impacts the modules and not the appliances attached with the modules. So, the devices are completely unaware of the presence of the X10 home controlling and this is why X10 doesn’t limit its operations to some specific vendors. X10 controller uses the power line to send and receive commands to the modules.

This signal is passed using a bandwidth that doesn’t interfere with the existing power connections. To control a specific appliance of many so connected, X10 uses an addressing mechanism to detect the desired one. This addressing is set in the appliance modules prior to connecting it and can be changed at anytime.

Whenever X10 controller has to send some commands, it broadcasts the command to the power line. The command contains the address of the device that is intended to control. So, the module that has an address matching with the address in the command, responds immediately. This way, it handles a specific request issued by the controller to control an appliance.

3.3.2. Insteon: Insteon is a home automation networking technology that enables light switches, lights, thermostats, motion sensors, and other devices to interoperate through power lines, radio frequency (RF) communications, or both. It employs a dual-mesh networking, networking topology in which all devices are peers and each device autonomously transmits, receives, and repeats messages. Insteon was invented by and is a registered trademark of Smart labs etc. All Insteon devices are peers, meaning each device can transmit, receive, and repeat any message of the Insteon protocol, without requiring a master controller or complex routing software.

3.3.3. Z-Wave: Z-Wave puts the power of home control and monitoring with your smart phone, tablet or PC you can control and access your Z-Wave devices at home. This means you get

- Peace of mind knowing your home is secure - no matter where you are
- More money in your pocket by saving energy easily - with no sacrifice
- Convenience like you've never known - one button to "shut down" your home when you leave
- Security knowing you'll receive an alert if there is any trouble at home - water, fire, alarm, door/window sensors

Z-Wave is a wireless technology that makes regular household products, like lights, door locks and thermostats "smart".

Z-Wave products "talk" to each other wirelessly and securely and can be accessed and controlled on your phone, tablet or pc.
Z-Wave functionality can be added to almost any electronic devices. One can control Z-Wave household remotely from a PC and the Internet from anywhere in the world. Z-Wave unifies all home electronics into an integrated wireless network, with no complicated programming and no new cables to run. Any Z-Wave enabled device can be effortlessly added to this network, and many non-Z-Wave devices can be made compatible by simply plugging them into a Z-Wave accessory module. In seconds, device gets joined to the network and can communicate wirelessly with other Z-Wave modules and controllers. Because Z-Wave operates on its own unique frequency, it won't interfere with other wireless equipment in home, like cordless telephones and Wi-Fi routers. Z-Wave technology is extremely affordable, giving a powerful home control at a fraction of the cost of conventional smart home technologies.

3.4 ZigBee: Zigbee is a low power spin off of Wi-Fi. It is a specification for small, low power radios based on IEEE 802.15.4 – 2003 Wireless Personal Area Networks standard. The explosion in wireless technology has seen the emergence of many standards, especially in the industrial, scientific and medical (ISM) radio band. There have been a multitude of proprietary protocols for control applications, which bottlenecked interfacing.

Need for a widely accepted standard for communication between sensors in low data rate wireless networks was felt. It was this Zigbee Alliance that created Zigbee. Bluetooth and Wi-Fi should not be confused with Zigbee. Both Bluetooth and Wi-Fi have been developed for communication of large amount of data with complex structure like the media files, software etc. Zigbee on the other hand has been developed looking into the needs of communication of data with simple structure like the data from the sensors.

Now a day’s mobile is the part of the life. Controlling appliances remotely by a cell phone will one day become a reality. The extensive capabilities of this system are what make it so interesting. From the convenience of a simple cell phone, a user is able to control and monitor virtually any electrical devices. This makes it possible for users to rest assured that their belongings are secure and that the television and other electrical appliances was not left running when they left the house to just list a few of the many uses of this system. The end product will have a simplistic design making it easy for users to interact with. This will be essential because of the wide range of technical knowledge that homeowners have.

V. REFERENCES