



Telephonic Remote Control Device



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Abstract

The objective of this project is to enable users to remotely control their routers, server, switch and home appliances and systems using a cell phone-based interface. To access the control unit, the user should send an authentication code along with the required/ desired function/action to control the device via GSM. Upon being properly authenticated, the cell-phone based interface at desired location (control unit) would relay the commands to a microcontroller that would perform the required function/action, and return a function completion code that would be sent to the source of the original command (user's cell phone).



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Purpose

The purpose of the project final report is to provide a complete record of the project, its activities and its results. The format of the final report is specified so that all of the necessary material is present.

Audience

There are many audiences for the final report and they include the project client, the course coordinator, the project faculty advisor, the project team members, end users, follow-on maintenance and enhancement people and others who may have an interest in the project and its results.

Problem Statement

The objective of this project is to develop a device that allows for a user to remotely control and monitor multiple appliances (devices) using a cellular phone. This system will be a powerful and flexible tool that will offer this service at any time, and from anywhere with the constraints of the technologies being applied. Possible target appliances include climate control system, security systems, and lights anything with an electrical interface.

The proposed approach for designing this system is to implement a microcontroller-based control module that receives its instructions and commands from a cellular phone over the GSM network. The microcontroller then will carry out the issued commands and then communicate the status of the given appliances or device back to the cellular phone. For security purposes, a means of identification and user authentication will be implemented, and will combine caller identification with a password authorization.



CHAPTER 1 “INTRODUCTION”



1. Introduction

The Evolution of microelectronics and communication technologies brought many innovations in different automation areas, in particular in domestics, where the technology of industrial processes was adapted to routine domestic tasks.

New technological opportunities appearing that can contribute to simpler forms of implementation of wireless nets the detectors and sensors and mobile communication systems. The last aspect is important because part or all home users usually move to sometimes great distances, and eventually for long period.

Our project has its basis on the same grounds, that is, the manipulation of distant appliances. The key functionality incorporated into the system is to remotely control devices through mobile device. As a consequence, the user of the system acquires the potent capability to switch on or off any remote device through an SMS. The system has been designed using a combination of hardware, schematic capture, and software. Our proposed system is very user friendly and it has solved the main problems which are wastage of money and electricity.

The mobile phone is a natural choice, since it is a communication resource generally available by people, which makes them practically always contactable and capable to send commands to operate home systems, office systems etc.

SMS is a low cost, easy to use and a relatively safe media, with sufficient message dimension and rhythms of transaction for the normal functions in homes, offices, remote areas etc.

1.1. SMS

Short messaging service (SMS) is the transmission of short messages to and from a mobile phone, fax machine or from an IP address. Message must be no longer than 160 alphanumeric characters and contains no images and no graphics. SMS is a relatively simple messaging system provided by the mobile phone networks. SMS messages are supported by GSM, TDM and CDMA based mobile phone networks currently in use. Although services based on SMS have been feasible for many years, the recent mobile phone penetration and large scale adoption of the existing services by users have made the SMS based services even more attractive to service providers.

1.1.1 SMSC

SMS messages are transferred between mobile phones via a short message service centre. The SMSC is a software that resides in the operators networks and manages the processes including queuing the messages, billing the sender and returning receipts if necessary. Many operators now offer web based interfaces to their SMSC so we can send short messages to any mobile phones from the web some web sites now offer free SMS.

1.1.2 AT Command Set

Remote control operation of the GSM mobile telephone runs via a serial interface (data cable or infrared connection) where AT commands according to ETSI GSM 07.07 and GSM 07.05 SPECIFICATION as well as several manufacturer specific AT commands are available.

The standard for extended data modems is ITU-T recommendations. V.250 is also known v.25ter. The modern guideline v.25ter applies to the sequence of the interface commands. According to this guideline, commands should begin with the character string “AT” and end with “<CR>” {=0x0D}. the input of the command is acknowledged by the display of “OK” or “ERROR”. A command currently in process is interrupted by each additional character entered. This means you should not enter the next command until you have received the acknowledgement; otherwise the current command is interrupted.

1.2 HARDWARE

Our hardware comprises of mobile and microcontroller as main devices. Beside that we have a power supply section which will provide power to our system.

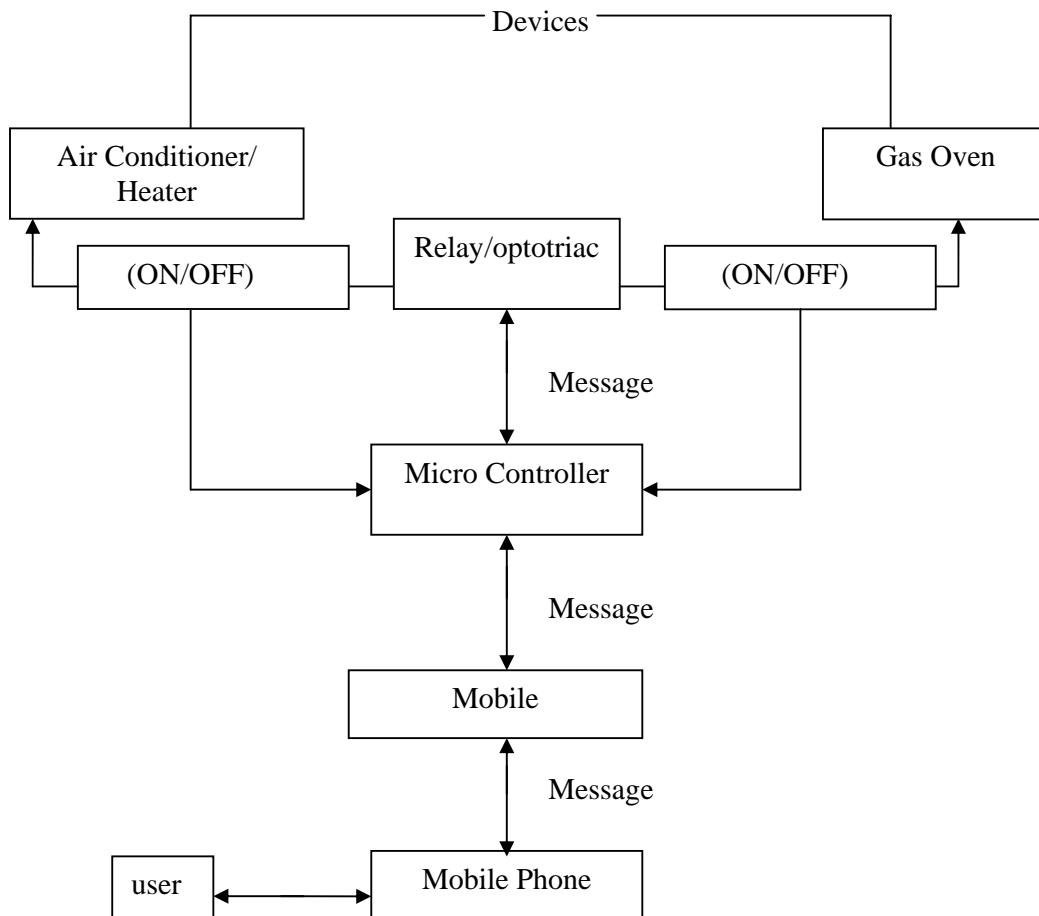


Figure 1 block diagram



1.3 Software

We have made software in Assembly. The Software converts data from Hex to ASCII and vice versa.



CHAPTER 2

“Requirements and specifications”



2. Operational Environment

The control system will include two separate units, the cellular phone and the control unit. There will therefore be two operating environments. The cellular phone will operate indoors and outdoors whereas the control unit will operate indoors within the temperature and humidity limits for proper operation of the hardware.

2.1 Intended Uses and Users

This product is aimed toward average consumers who wish to control devices remotely from their cell phones provided that the appliances are electrically controllable. Example of feasible appliances and applications under consideration include air conditioner, fans, gas oven and kitchen appliances.

2.2 Limitations

- The receiver must reside in a location where signal with a sufficient strength can be received from a cellular phone network.
- The only person who can communicate with the control module is the person who is successfully authenticated.
- Only devices with electrical controlling input ports will be possible targets for control.
- The controlled device will have I/O ports that will make communication with the receiver possible.
- The receiver must have power source attached at all times.
- Operation of the controlling unit is only possible through a cell phone with SMS messaging capabilities.
- The controlling unit must be able to receive and decode SMS messages

2.3 Expected End Product

The following is a list of expected end product and other deliverables.

- Receive instructions and commands from a messaging device on a communication network.
- Monitor a device status from an electronic interface.
- Control target devices through the electrical interface.
- A list of approved message input commands that the device is capable of executing.

2.4 Functional Requirements

The following is a list of functional requirement of the control unit/module.

- The control unit will have the ability to connect to the cellular network automatically.
- The control unit will be able to receive text messages and will be able to interpret text messages for instructions to be sent to the microcontroller



- The microcontroller within the control unit will issue its command to the electrical appliances through a simple control unit.
- The control unit will control the electrical appliances and detect the status of the appliances to be relay back to the microcontroller.
- The microcontroller within the control unit should be able to send status messages back to the cellular phone through the cellular network.
- The system should provide user authentication through call phone number identification.

2.5 Considerations

2.5.1 Constraints Considerations

- The controlled appliances will need an electrical control interface. This simple system is only capable of controlling electrical devices.
- The control module will need to be shielded against electrostatic discharges. This will increase reliability of the system.
- Battery backup for controlling unit will be implemented in case of power disruption. This is necessary to provide to provide user with status message such as power failure system unavailable. With this information user will know that communication with the system has been established. If there was not return message, the user has no knowledge of whether the message was received by the controlling unit.

2.6 Technical Approach

Assuming that the control unit is powered and operating properly, the process of controlling home devices will proceed through the following steps.

- The remote user sends text message and commands to the receiver.
- GSM receiver receives messages sent from user cell phone.
- GSM receiver parses the string for the commands.
- GSM receiver sends the commands to the microcontroller.
- Microcontroller issues commands to the appliances
- Microcontroller checks for completion status and sent it back to the GSM receiver.
- GSM receiver informs the remote user of the outcome of their request by sending it completion status message back to the remote user in the form of SMS message.

2.7 Technology Considerations

The consideration for this system will include a choice of networks, communication protocols and interfaces.

- **Cellular network**

The widely available networks are based on GSM. This network provides a wide area of coverage and can be utilized more cost effectively with this project.



- **Communication protocols**

The available protocols are DTMF and SMS. The SMS is the most efficient because this project requires a cellular communication and limited data to be sent.

- **I/O Interfaces between microcontroller and devices**

Serial or parallel I/O will be considered as options for connection between GSM receiver and the microcontroller. Using the microcontroller, a control circuit will be implemented to control the electrical appliances.



CHAPTER 3

“SMS”



Short Messaging Service (SMS) Technical Details

3. What is SMS?

SMS stands for short messaging service. It's a way to send text over wireless phone systems. The text appears on your handheld's screen, or in the case of a cellular phone, on the phone's display. SMS messages are text messages of up to 160 characters.

No phone call is required to send or receive a text message. In fact, it is possible to send and receive messages on Handspring phones while on a voice call. SMS has been around since 1991, has gained huge usage in Europe and Asia, but has come into widespread use in North America recently. SMS is a universal text messaging system but has come to be associated with its prime adopter, the GSM/GPRS wireless networks.

3.1 How SMS works

SMS works on a store-and-forward basis. Instead of being sent directly to the recipient, SMS messages travel through several important nodes before reaching the recipient. The SMS message is submitted to your wireless service provider's SMS Center. After the message is processed internally, the SMS Center sends a request to the Home Location Register (HLR) and receives the routing information for the recipient. The SMS Center sends the message to the Mobile Switching Center (MSC). The MSC collects the recipient's information from the Visitor Location Register (VLR) and, sometimes, proceeds with an authentication operation. The MSC forwards the message to a Mobile Server if the recipient has a Treo or Visor Phone; the SMS is placed on the SIM card until the handheld picks up the message and transfers it to the internal memory on the unit. This is how handheld devices can store hundreds of SMS messages, unlike ordinary GSM mobile phones that store only a few SMS messages. Treo 600 owners may encounter the error message "Your SIM contains at least one SMS message..." See the related SMS article in our knowledgebase for details. The MSC returns the outcome of the Forward Short operation to the SMS Center. The SMS Center reports delivery status of the short message back to the sender.

3.2 What are the components of an SMS message?

The actual text of the SMS message isn't the only thing that's being transmitted. Here are the elements of a complete SMS transaction:

Header: identifies the type of message.

Service Center Timestamp

Originator Address: the phone number of the sender

Protocol Identifier

Data Coding Scheme

User Data Length: tells how long the message is

User Data: the message itself (140 bytes: 160 7-bit characters, or 140 8-bit characters)

You won't see any of these components except the User Data (the message itself).

When you send an SMS to an email address, the message is still sent to the SMS Email center, but then it is relayed to the email server of the recipient. The recipient's email address is actually embedded in the User Data portion of the message, transparently on a Treo, or manually on a Visor Phone.