

Appliance Control using Short Message Service (SMS)

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Abstract: This paper describes the design and implementation of a GSM-based password-protected control system for electrical home appliances that allows for remote control. The GSM module is used to receive short message service (SMS) messages from the user's mobile phone, which automatically allows the controller to take further action such as turning on or off home appliances such as lights, air conditioners, fans, water pumps, door locks, TVs, and so on. The system's hardware was created using an Arduino Uno board, GSM modules, switching relays, and other readily available electronic components. The Arduino IDE was used to create the driving software. When only the user sends the SMS to the controller at home with the exact password, the system is activated. When the microcontroller unit receives an SMS command, it automatically decodes it and controls the electrical home appliances by turning them ON or OFF based on the user's instructions.

Keywords: Short Message Service (SMS), Global System for Mobile communication (GSM), Radio Frequency (RF), AT Commands, ubiquitous access and Automation.

I. INTRODUCTION

The use of various computer technologies and mobile devices such as cellular phones is undeniably important in various aspects of society. Rapid technological innovation paves the way for various automation research and design topics. One popular topic in automation is the use of computing to secure, monitor, and remotely control home appliances. Home automation researchers are involved in this field.

SMS Remote Controller is an electronic device that allows the user to control appliances remotely from anywhere in the world using a mobile phone. The microcontroller reads the SMS from the phone, decodes it, recognises the phone number, and then turns on the relays connected to its port to control the appliances. After a successful operation, the controller sends an acknowledgement via SMS to the user's mobile phone. The SMS Remote Controller has numerous applications. It can be used to create an extended range control that can be operated from anywhere in the world. In industry, it can be used to monitor a running machine or to alert when a certain threshold is reached.

This section will go over the SMS-based Remote Controller's design process and how it was implemented. The section is divided into two fundamental sections: hardware and software. These are divided further into sub-sections.

Hardware Section:

This section discusses the physical component used in SMS Remote Controller. The GSM modem module, the LCD module, the appliance module, the control module, and the power supply module are the five sub-sections of this section.

GSM Modem Module:

As a modem, the Siemens Sim340Z GSM modem is employed. The Sim340Z has a communication port (built-in GSM modem) that can be programmed with the AT

Command Set. The GSM modem communication port has the following signal names: audio input and output pins (for connecting external hands-free audio devices), mute control pin, flash programming signal pins, external power pins, and receiver and transmitter pins.



Figure 1: Sim340Z GSM Modem

The SMS Remote Controller will only highlight the receiver (RX) and transmitter (TX) pins, also known as the serial port. The serial port is TTL (Transistor-Transistor Logic) compactable and interfaces directly to the ATmega8515 microcontroller without the need for a driver. The modem's serial port operates at 115200 baud, 8bit data, 1start bit, 1stop bit, and no parity bit. [1]

Cell Phone:

The GSM Modem communicates with the mobile device via radio waves. The communication mode is wireless, and the mechanism is based on GSM technology. A SIM card and a GSM subscription are required for a cell phone. The system has this cell phone number saved. The user sends instructions via SMS, and the system acts on those instructions.

Short Message Service:

SMS is a text-messaging service that sends text messages between cell phones or from a PC or handheld to a cell phone. The "short" part refers to the maximum text message length: 160 characters (letters, numbers or symbols in the Latin alphabet). The maximum SMS size for other alphabets, such as Chinese, is 70 characters [2].

SMS is now provided by default by GSM network providers. The exchange can take place between phones or between computers and phones. A GSM modem is required for SMS exchange between a computer and a phone.

Objectives:

The purpose of this paper is to discuss the design and development of a home automation system that allows end-users to remotely monitor and control the power supply of home appliances, thereby promoting proper energy usage and conservation. The study was specifically designed to remotely turn on and off electric flow to various appliances using specific SMS commands and monitor an electric appliance's electric consumption by sending an inquiry to the system.

II. RESEARCH METHODOLOGY

This study employs Prototyping as a step in the System Development Life Cycle (SDLC) implementation and employs the Descriptive method to analyse and present the research findings. This study, as developmental research, includes the creation of a Remote Household Appliance Monitoring and Control System using Short Messaging Service (SMS). The Prototyping process model was used by the researchers to determine the necessary processes in the development of the home automation device.

III. REVIEW OF LITERATURE

Dr. Malik S.H.Khiyal, Aihab Khan, and Erum Shehzadi from Fatima Jinnah Women University published a paper in Informing Science and Information Technology in 2009 that clearly states the effective use of SMS for automating appliances and security. However, their main concern is security, as the extensive controls have been compromised in exchange for the promise of future work release with the hardware. [3]

Home Appliance Control System (released: October 12th, 2006) by Duk-Jin Kim, Jeff Dix, Jyotsna Kotur, Warren Pena, Yajing Zhao, and Yasaman Haghpanah provides an in-depth look at appliance controls. The controls were so detailed that it was possible to set the microwave oven's cooking time through the controls [4].

Ciubotaru-Petrescu, Chiciudean, Cioarga, and Stanescu (2006) present an SMS-based control design and implementation for monitoring systems. The paper is divided into three modules, each of which includes a sensing unit for monitoring complex applications. A microcontroller-based processing unit and a communication module that connects to a GPRS modem or

cell phone via serial port RS-232. The SMS is used to report statuses such as power outages. [5]

Potamitis, Georgila, Fakotakis, and G. Kokkinakis (2003) propose using speech to interact remotely with home appliances to perform a specific action on the user's behalf. The approach encourages people with disabilities to perform real-life tasks at home by directing appliances with their voices. Speech recognition uses a voice separation strategy to make an appropriate decision. [6]

Descriptive research is a status study that uses observation, analysis, and description to solve problems and improve practises. Developmental research, observational research, and correlational studies are all examples of descriptive research [7]. The Correlational Studies determine and analyse the relationship between the development system's readings and a standard power controller device. The researchers established all of the device's functional requirements as well as the materials required during the development stage.

The microcontroller is a high-performance microcomputer that provides a highly flexible solution for embedded systems. It has a dedicated PEROM (Programmable and Erasable Read-Only Memory) with an industry-standard instruction set and pin out. The microcontroller receives SMS module requests and responds appropriately, either by turning on or off the power line or by returning the electrical consumption of an attached appliance.

IV. RESULT AND DISCUSSION

Using SMS to Turn On/Off Appliances:

The program's password is set to 123. When the SMS with the content "123 AC on" was simulated, the AC was turned on. The command used on the "User's phone screen," where SMS is simulated, is password>Appliance>status>. Following the tying of "123 AC on"



Figure 2: Using SMS to turn on/off appliance

The output as shown in Figure 2 was turned on. The circled area indicates which part of the programme is active. [8]

The results of the HACs system: -

The system validates battery support, signal strength, and GSM modem SMS sending and receiving capability. If these tests are successful, the system returns 'OK,' otherwise 'ERROR' is returned.

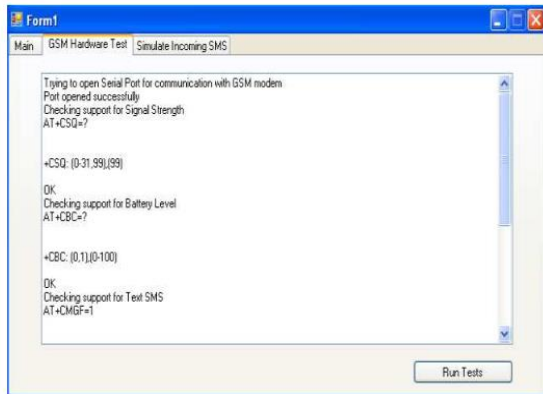


Figure 3: GSM Hardware Test

Figure 3 depicts the various GSM hardware tests that will be performed to ensure hardware support. The serial port is then opened for communication with the GSM modem by the system. If the port is successfully opened, the system communicates with the GSM Modem; otherwise, the system does not communicate. [9]

The battery level, charging status, and signal strength are all constantly monitored by the system. Figure 4 depicts the communication between the system and the GSM hardware device via COM port 7.

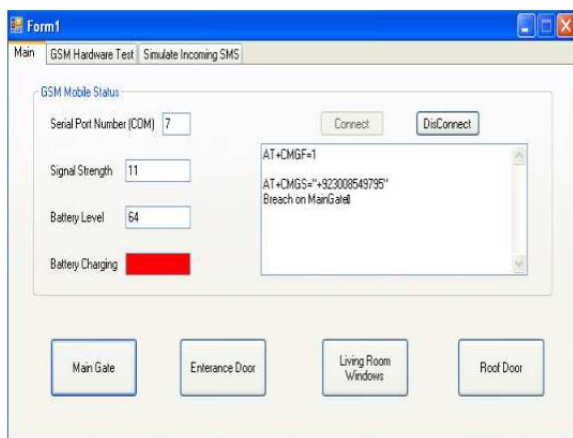


Figure 4: SMS alert on Intrusion Detection

Figure 4 depicts the outcome when the intrusion event was triggered, and the system automatically generated SMS to notify the user of the security risk.

V. CONCLUSION

The SMS-based appliance control system can control the appliances from any location where GSM service is available. This paper describes the design and implementation of a user-friendly smart control system for electrical appliances based on a microcontroller and GSM. The system is intelligent enough to control the water pump as well as any other home electrical units. The system was designed with economic application, availability of components and research materials, compatibility,

portability, and durability in mind. The system ensures reliable operation at a low cost and reduces system complexity. The system can be improved by detecting the water level in the reserve tank and switching the pump on and off as needed. Although some common home appliances have been controlled in this project, it can be used for any other appliances from any location.

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