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Design and Implementation of a short message service (SMS) Based Home Automation System

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ABSTRACT

This paper discusses the Design and Implementation of a short message service (SMS) Based Home Automation system. In this work, an Arduino Uno board featuring an Atmega 328P Microprocessor is used. Other hardware components used are: Global System for Mobile Communication (GSM) SIM900 module, a regulated 12V and 5Vpower supply unit, a relay board, a ULN2003 relay driver I.C, and a 16x2 LCD display unit. The software components involve the Arduino Software and the driver for the GSM SIM900 Module. The appropriate drivers were installed for the boards while the necessary libraries were included on to codes using the Arduino Integrated Development Environment (IDE). The 12V power supply from the power supply unit feeds the GSM Module and the relay board. The RXD pin of the SIM900 Module is connected to the TXD terminal of the Uno board. The TXD pin of the Sim900 is connected to the RXD terminal of the Uno board. The 5V power supply goes to the Arduino Uno. Thereafter, the Uno board is connected to the laptop for inclusion of appropriate libraries. Codes are uploaded and an ETISALAT Sim Card is inserted in to the GSM Module. The digital pins are configured to drive the relay board. The output terminals of the relays are set to drive the required loads in the home. The system was used to drive a 40 watts Energy saving bulb and a standing fan. It was very fast to switch on the lamp due to the strength of the Etisalat network in my office. The efficiency and reliability of the system is network dependent. Most interesting is that the lamp could be switched on or off from anywhere within the country.

1. INTRODUCTION

The determination for short message service (SMS) control of home appliances is the main focus of this design. Various technologies are evolving rapidly in various directions to solve problems and make life better. This work has become so necessary in order to reduce the inconveniences or stress of controlling home appliances irrespective of time and distance. From remote distance from our offices or location homes can be automated via global system for mobile communication. SMS control of appliances may include centralized control of fans, doors, lighting, and air conditioning. It also entails appliances and other security apparatus such as burglar alarms, motorized closed circuit television cameras in order to provide improved convenience [1]. Home automation can be realized through telephone line, short message service, or the internet to provide control and monitoring via smartphone or browser. The idea of smart house concept was first conceived in the early 80's as a project of the National Research Centre of the National Association of Home Builders [2].

1.1 RELATED WORK

1.1.1 GSM OR SMS Based Home Automation System

In [3][4][5], a GSM or SMS based home automation is presented. In this design, a remote-control system for electrical appliances and lighting is provided. A GSM shield is used for receiving short messages service from the user's cellphone which automatically enables an Arduino Microcontroller to activate necessary actions like switching ON and OFF of electrical appliances such as fans, air conditioners, lighting points etc.

1.1.2 BLUETOOTH Based Home Automation System

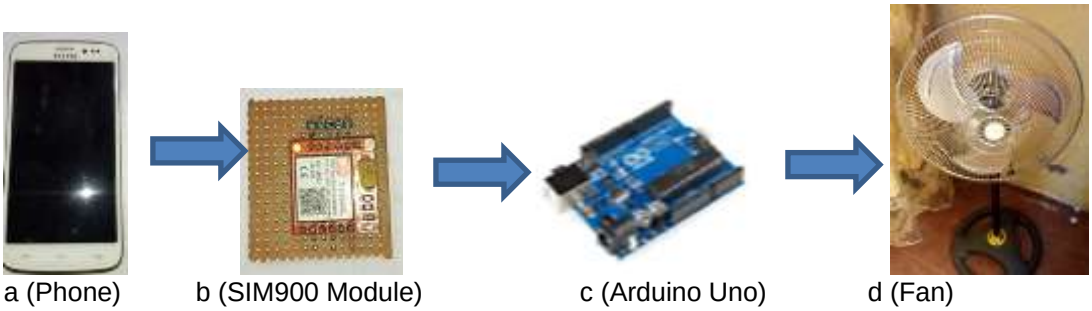
[6] Presents a Bluetooth based home automation system in which Bluetooth devices are used to connect to interfaces controlling connected home appliances and lighting. The design depends on a stand -alone Arduino Uno and Bluetooth board.

1.1.3 IOT Based Home Automation System

In [7], IOT based home automation system is presented. It uses a NODEMCU ESP866 Wi-Fi module which hosts a webserver. By connecting to the webserver through mobiles, tablets or PCs, the home appliance and lighting can be controlled through sets of relay drivers and switches.

2 MATERIALS and METHODS

The proposed system comprises two main parts, namely; hardware and software. The hardware segment consists of: An Arduino Uno board featuring an Atmega328P Microcontroller, a GSM 900 Module, a ULN2003 relay driver and a relay board comprising of four relays. A regulated 12V and 5V power supply unit and An Etisalat SIM Card, connecting leads and a cell phone. The appropriate drivers are installed for the boards while the necessary libraries are included on to codes written using the Arduino Integrated Development Environment (IDE). The 12V from the power supply unit is fed to the SIM900 Module. The RXT terminal of the Arduino board is connected to the TXD pin of the GSM module. The TXD pin of the Uno is connected to the RXD pin of the GSM Module. The Etisalat Sim Card is inserted in to the GSM module and tested for network presence. Codes are uploaded on to the flash memory of the Uno using the Arduino IDE. An android phone (Infinite Note 4) is used to send short messages to the Etisalat mobile number (+2348181375921).



a (Phone) b (SIM900 Module) c (Arduino Uno) d (Fan)

Figure 1. Proposed diagram of the SMS Home Automation System

In figure 1, an Android Phone sends message to Sim 900 Module which receives the message and passes it to the Atmega382P microcontroller. The data is processed by the microcontroller which executes the necessary decision to activate the relay board. All the connected appliances are driven by the relay board.

2.1 SIM 900 Module

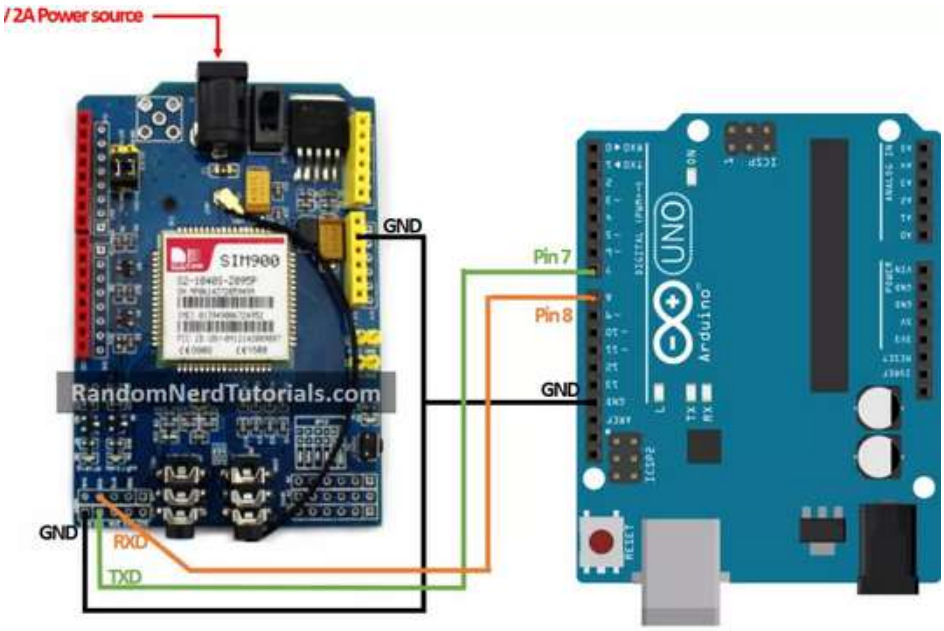


Figure 2. Interfacing GSM SIM 900 Module with Arduino [3].

The Rx pin of the GSM module is connected to the TX pin on the Arduino board as defined in the set-up file. The TX pin of the GSM module goes to the Rx on the Arduino board. The Vcc pin of the GSM Module should be connected to a constant 12V D.C. The power requirement is necessary otherwise the GSM module will not work.

2.2 Relay Board

Sending commands from software to turn ON/ OFF an appliance may not guarantee the correct operation of the appliance as the device may be defective. To solve this problem, a feedback circuit is provided to indicate the actual status of the device after it receives the command (ON/OFF) from the cell phone. Once a command is sent to turn ON a device, circuit senses the current and gives an output signal by turning ON a light emitting diode on the switching circuitry indicating the device is turn ON. If perchance the device is not turned ON when a command is sent, it indicates that the concerned relay is defective. Figure 3 and figure 4 shows the relay board and the switching circuitry of the relay board.

Figure 3: Relay Board

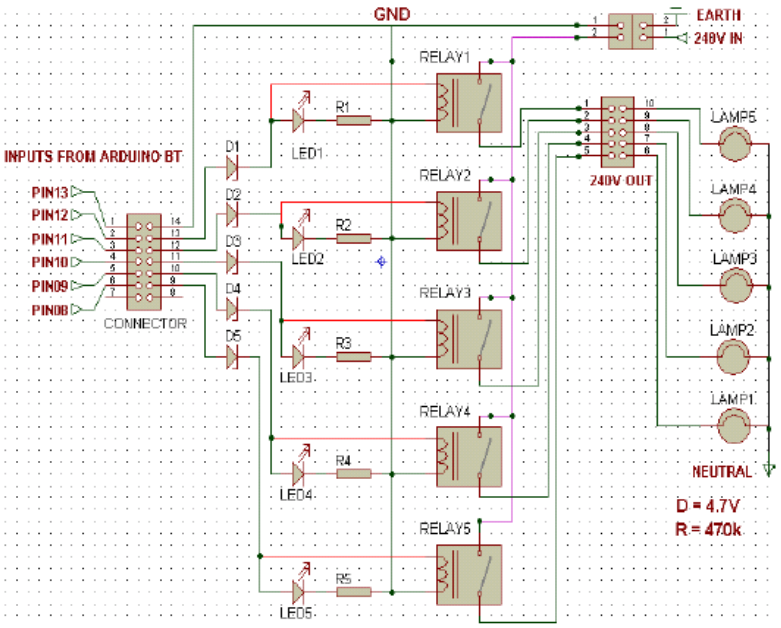


Figure 4. 5V -240 V switching circuit of the relay board [6]

2.3 Power Supply Unit

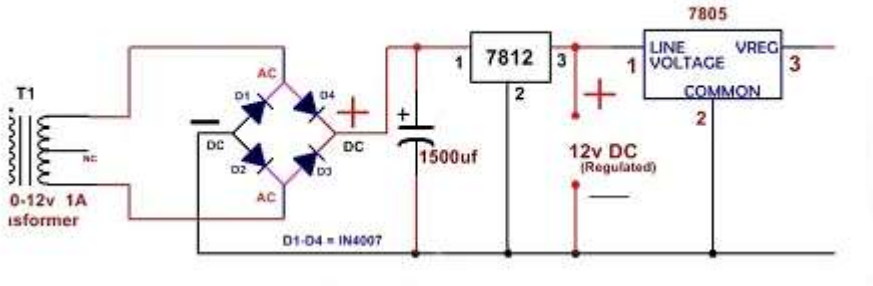


Figure 5. Circuit diagram of the Power supply unit.

The power supply unit is shown in figure 5. It is obtained by stepping down a 220V A.C supply to 12V. The 12 V, A.C is rectified and filtered through a 1500uf capacitor to a D.C voltage. The output voltage is regulated with an LM7812 voltage regulator and subsequently through an LM 7805 Voltage Regulator. The 12 V, from the lm7812 voltage regulator goes to the GSM Module and the relay board while the 5V from the lm7805 is connected to the Arduino board.

3 ARCHITECTURE OF THE SYSTEM

(a) Phone (b) SMS Control Board (c) Home Appliance

Figure 8. Complete system structure of the SMS - based Home Automation System.

In this design, a message is sent to the mobile number of the SIM Card inside the GSM Module. The GSM module receives the message and sends signal to the Microcontroller. The signal sent is processed and interpreted by microcontroller which sends control signals to the relay board to drive the necessary appliance or fan. A signal message can be sent to perform required switching action irrespective of distance or time. In this design, we can activate a maximum of three appliances or sockets.

5. RESULTS AND DISCUSSION

The complete system structure is shown in figure 8. The system works by sending configured messages through any Phone to the Sim Card number stored in the GSM Module. The GSM Module receives the SMS message and sends it to the Atmega 382P Microcontroller which decodes the message and initiate the right action by sending switching signal to the relay board driving the home appliances. In our design, the relay board is connected to sockets on to which each appliance is connected. By switching each socket, we can switch each of the load connected to the sockets. In order to indicate the switching action from the relay driver board, an LED is connected to indicate the presence of a switching signal. Several loads were connected to the sockets and different messages were sent to the GSM Module for appropriate response. By this, we switched an energy saving bulb of 100watts, a standing fan, a television set and an HP LaserJet P2035 Printer.

6. CONCLUSION

In this work, we have designed and implemented an SMS -based Home Automation system. The system is suitable for switching ON / OFF any home appliance connected to the socket driven by the relay board. Home appliances can be powered from any location and at any time by the use of Cell Phone and SMS Technologies. The system was used to drive a 40 watts Energy saving bulb and a standing fan. It was very fast to switch on the lamp due to the strength of the Etisalat network in my office. The efficiency and reliability of the system is network dependent. Most interesting is that the lamp could be switched on or off from anywhere within the country.

REFERENCES

[1] Bruhathirreddy, C., Kodandaramaiah, G.N., & Lakshmipathy, M. (2014). Design and Implementation of Home Automation System Using RASPBERRY PI, *International Journal of Science, Technology & Management*, *Vol.3, pp.94-98.*

[2] Mohamed, S.S., Ahmed, A., Alahmadi, A., Mash, A., & Mohamed, O.E. (2017). Design and Implementation of a Real- Time Smart Home Automation System Based on Arduino Microcontroller Kit and Labview Platform, International *Journal of Applied Engineering Research" Vol.12, no.18, pp.7259-7264.*

[3] Effah, E., Aryeh, F.L., & Kehinde, W.K. (2016). GSM Based Home Appliances Control System (HAC) For Domestic Power Users in Ghana, *4th Umat Biennial International Mining and Mineral Conference, pp. ce58-64.*

[4] Akanksha Singh, Arijit Pal and Bijay Rai, (2015). GSM Based Home Automation, Safety and Security System Using Android Mobile Phone", Vol.4, no.5, pp.490-494.

[5] Amruta Patil, Pooja Potnis and Karishma Katkar, (2017). SMS Based Home Automation System Using Arduino Atmega328 with GSM", International Journal of Engineering Research and Technology, Vol.4, pp.369-373.

[6] Piyare, R., Tazi, M. (2011). BLUETOOTH Based Home Automation System Using Cell Phone, IEEE 15th International Symposium on Consumer Electronics.

[7] Suraj Tonnage, Sandhya Yemul, Rajendra Jare and Veena Patki, (2015). IOT Based Home Automation System using Nodemcu Esp8266 Module", International Journal of Advance Research and Development, Vol.3, no.3, pp.234-238.

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