

POWER LINE DATA COMMUNICATION AND GSM BASED HOME APPLIANCE CONTROL SYSTEM

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ABSTRACT

Today, technology plays a vital role all around the world. Each and every aspect of the human's life is impacted by the technology in numerous ways. With the enhancement of the technology, household and industrial applications are changed rapidly by using sophisticated methods. Nowadays, there are many technologies that have been developed for control appliance. Power line communication (PLC) is one of the technologies that have proved useful for control appliance. It is widely used in home automation systems, automotive and industrial applications. Power lines have been used for the transmission of electricity; but nowadays with the emergence of power line data communicate modem, data transmission is done over power lines has seen a really big growth. As well as power line data communication, Global system for mobile (GSM) based appliance control systems are also the emerging applications of home automation stream. By using GSM technology each appliance can be remotely accessed and controlled. The main attention on this project is introducing sophisticated appliance control systems to the modern home. This work will provide high reliability, high accuracy and flexibility of the existing systems. This research consists of ATmega16, TDA5051A, Metal oxide varistor (MOV), Opto- couplers, Crystal oscillators, 7805 Voltage regulator IC, GSM module, Arduino UNO board, Relay, Liquid crystal display(LCD), Keypad, Transistor, Resistor, Capacitors and Diodes, Light Emitting Diodes(LED) and design was done using Proteus software.

Keywords: TDA5051A, ATmega16, Power line data communication, GSM technology

1. INTRODUCTION

Automotive and industrial applications are widely used in home automation systems. Power line communication systems are also being changed day by day because it's a vast ranged area that can be used for home and industry applications. In PLC (Power line communication) system communication signals were sent and received on household and industrial power line. The emerging applications of the GSM technology are implemented by GSM based control systems. Using GSM networks, a control system has been proposed that will act as an embedded system which can monitor and control appliances and other devices locally using built-in input and output peripherals.

This project includes designing of a home automation system with power line data communication and a GSM based home appliance controlling system. This project basically concentrates for a modern home automation system. Power line carrier communication has recently become a popular technology. The reason is power line is a relatively cheaper and more robust communication channel which used throughout the world except wireless channel. It is used more commonly than any other communication channel.

The system allows the user to effectively monitor and control the house/office appliances and equipments via the mobile phone set by sending commands in the form of SMS messages and receiving the appliance status. The concept behind this part of the project is receiving the sent SMS and processing it further as required to perform several operations. The type of the operation to be performed depends on the nature of the SMS sent. The principle in which the project is based is fairly simple. First, the sent SMS is stored and polled from the receiver mobile station and then the required control signal is generated and sent to the intermediate hardware that we have designed according to the command received in the form of the sent message¹.

2. EXPERIMENTAL

In this study there are three important steps were used to execute this project, which are project planning, system design and system verification. Project plan consists of analytical studies and academic research on the existing technologies of the power line communication system and GSM technology. System design is the crucial part of this project and the designs have drawn using Proteus software. MikroC, Arduino program will be used in this project as the connector between the hardware and the software.

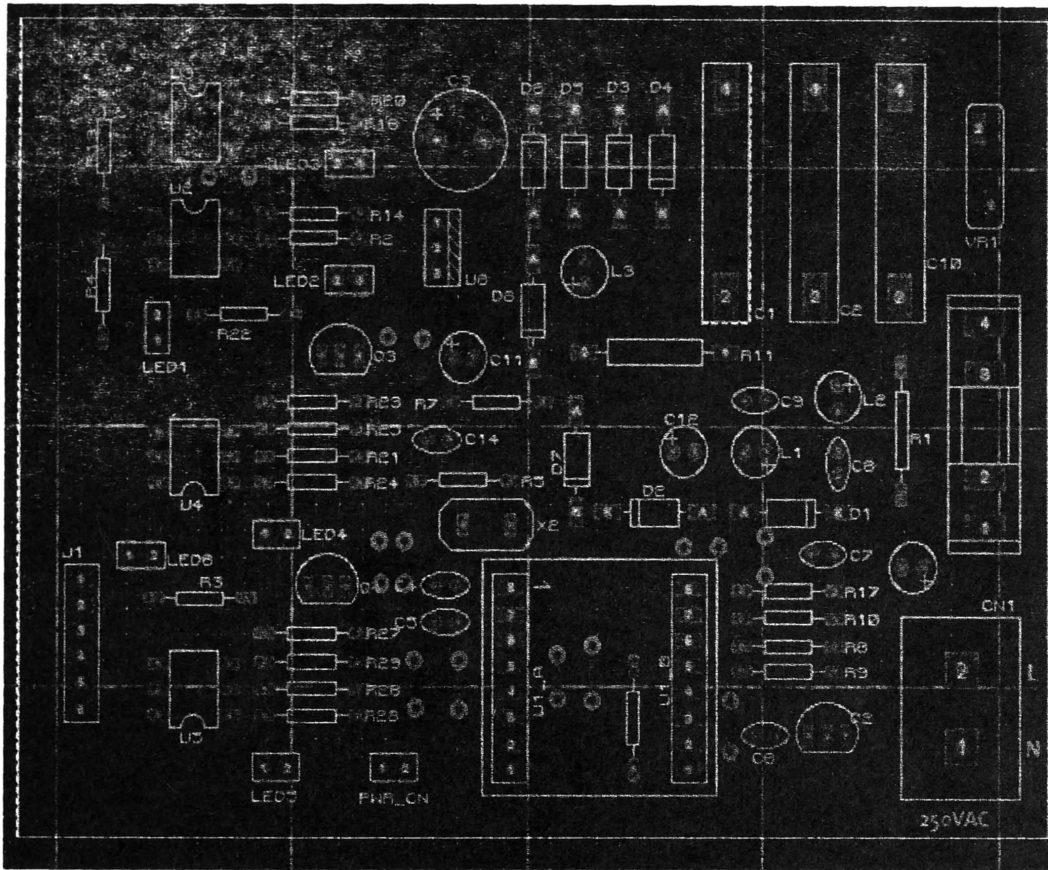


Figure 1: PCB design of power line data communication part

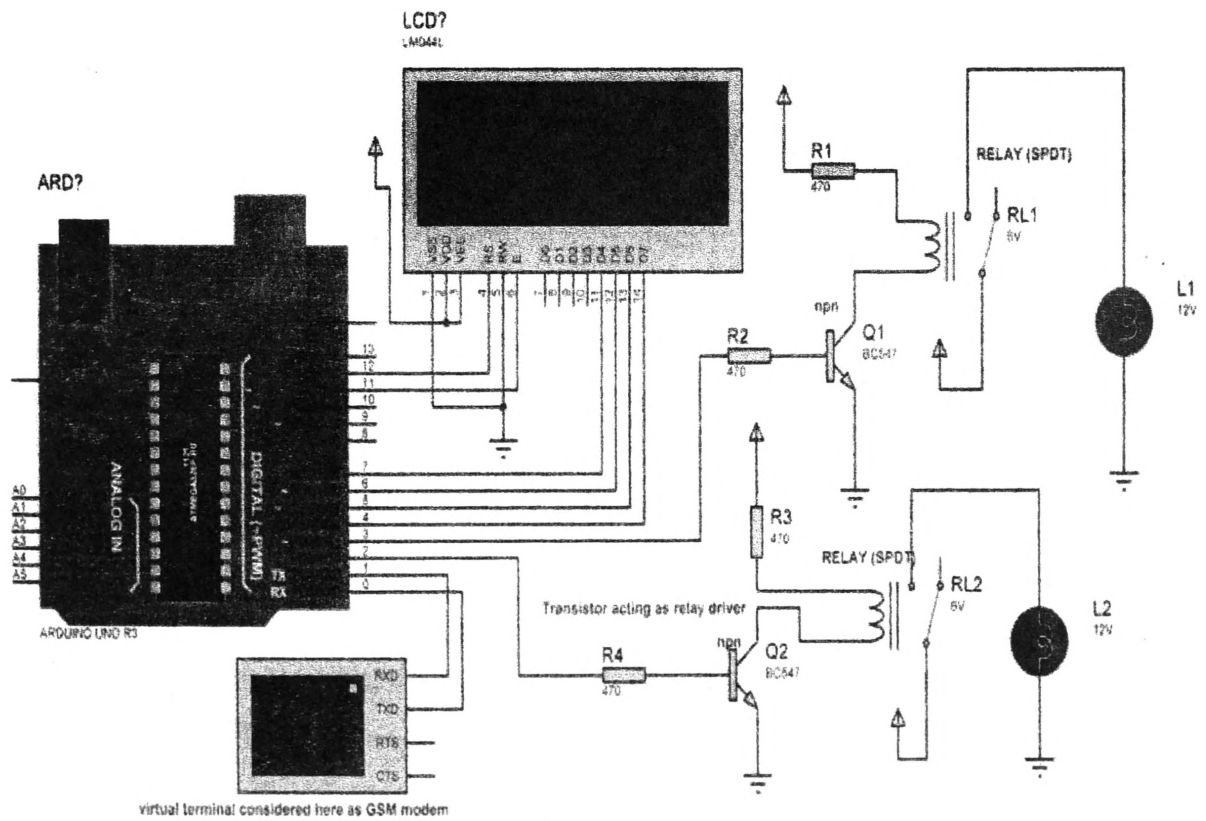


Figure 2: GSM module based home appliance control system

3. RESULTS AND DISCUSSION

4. 3.1 Results

In power line data communication device data sender can be entered data from slave1 unit (or slave 2 unit). Then entered data will be passed in to master1 unit from the slave1 unit. Master1 unit is passed entered data via power line to master 2 unit. Master 2 unit is passed received data to slave 2 unit and displayed it to the receiver. The same procedure can be done vice versa.

In GSM based home appliance control system user can be sent a special code message to the GSM module. Then after GSM module reads the received message and according to its control the appliance as mentioned in the program².

The final outcome of this project is a development of a power line data communication device and GSM based home appliance control system to automate the existing home appliance. In this project a simple experiment has been conducted in order to verify the accuracy of the power line data communication device .Through the power line send message from one room to another room by using power line data communication device. It successfully sent from room 1 to room 2. The task was completed by the device successfully.

GSM module based home appliance control system also checked by sending commands through message. Following test was done to check the system.

Table 1: Experiment results of the system

Command	Result
1. ON 1	LED1 turn on
2. OFF1	LED1 turn off
3. ON 2	LED2 turn on
4. OFF 2	LED2 turn off
5. ON 3	LED3 turn on
6. OFF 3	LED3 turn off

3.2 Discussion

The main purpose of this project is the power line data communication system. A GSM based home automation has been included in this system in order to improve the validity. It is a user friendly and flexible service. The main problem of this project is the lack of the Information in power line data communication. Actually, it was a hard part to find the literature study. When designing the circuit part of the power line

communication it was a critical situation because of the complexity of the circuit and testing should be done directly 230V main power. When designing the first circuit of the power line communication it didn't work because of the mismatch of the voltage and current that flows from circuit to power line modem. It was a huge task when designing the programming part of the GSM based automation system. To overcome these problems I studied online e-books and found the suitable voltage regulator IC and refer several articles through internet. This system is introduced several advantages such as it is most important for the home automation system and doesn't require an additional cable path to send data. It will send data through CEB power line.

Finally, this system is concentrated about home and industrial automation system and furthermore, suggests developing this system in more effectively and efficiently at low cost.

As a future enhancement to the proposed system, more smaller devices can be implemented. At the same time, including a touch system to slave unit of the power line data communication unit to enter data. This will make the system more advanced using touch technology. And also it is better to improve the feedback rate of the device³.

5. CONCLUSION

In this project, a basic understanding of the use of Power Line Modem ICs in Power Line Modem Devices has been achieved, a conceptual approach to detailed circuit construction using selected IC TDA5051A has been initiated, however, there are more to be learned about the communication scheme of the interface from MCU to PLC, and a detailed design of interface circuit is also another challenge. After all the hardware requirements have been achieved, the software development in PC to facilitate communication between two modem devices. All these requirements will be considered in the future plan for the project. The extensive capabilities of this GSM based home appliance control system are what make it so interesting. From the convenience of a simple cell phone, a user is able to control 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.

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