Enhancement of a GSM Based Control System

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Abstract:- This paper presents the development and implementation of a Global System for Mobile Communication (GSM) based on control system for electrical applications that enables the complete control of the interface on which it is based. GSM module was used for receiving short message service (SMS) from user's mobile phone that automatically enable the controller to take further action like switching ON and OFF electrical applications such as fan, air- conditioner, light etc. The system was integrated with microcontroller and GSM network interface using arduino.orduino software was utilized to accomplish the integration. The system is activated when user sends the SMS to the controller at home (regarded as Smart Home). Upon receiving the SMS command, the microcontroller unit then automatically controls the electrical applications by switching ON or OFF the device according to the user's order. In other word, it reads message from the mobile phone and respond to control the devices according to the received message.

Key words:- Implementation – GSM – Control – Switching – Arduino – Command – Message.

1.Introduction

The new research areas for the need of the man that controlled the electrical devices remotely, anything from the home such as an air conditioner, security system, set Top box, light, and so on. The case of remote control Capability and the possibility of achieving it at a reasonably Low cost have motivated the need to research into it not only for industrial application but also for domestic use or home use. Home wireless security systems are becoming increasingly popular and it is being a necessary nowadays. There are many benefits to using these compared to conventional systems[1]. There are many products of Wireless Home Security Systems in the market the price depends on how advance the system is.

Normally today home security system is in wireless form Rather than wired form. The reasons are wireless can Saves cost of wiring, Easy to install, occupy lesser space, easy for maintenance and more reliable. Besides that, the wireless also capability become as an appliances control in the home. The capability of controlling home appliances in a Wireless and remote fashion has provided a great Convenience to many people in life[2]. Through a wireless Remote controller, people can do remote operation without directly accessing the host of a home appliance. The home appliances like fan, lamp, television, washing machines and others.

The introduction of the Global System for Mobile Communication (GSM) and particularly the use of hand-held mobile phones brought the innovation of distance Communication at remote location[3]. Based on this, Research utilizes this facility for remote control of systems And appliances; take for instance, a man on a journey inside his car suddenly remembers that he left the Air Conditioner (AC), ON when it was supposed to be OFF. The normal condition is to drive back and switch OFF or for the home security we also monitor the home through the system but we are not include the option of the monitor in the system; in the system we consider only ON and OFF operation in. But with the GSM mobile phone in the hand, one looks on how the same could be used to effect control at any point and time[4].

Therefore in this project the GSM is the type of wireless that chooses. It is because it's the GSM

is better than others wireless. It is suitable to install the systems that need a wide range. It also can monitor the signal strength and more adaptable. So it is suitable to become a controller for home appliances and for security system. Nowadays, most couples leave for work early in the morning and get back only in the evening. Most people also have to travel to other cities for their work. When they are away, their house is empty and unguarded. Therefore case like theft and robbery is easy to occur because the home owners are not in the house.

The Multidimensional crisis like theft and robbery is one of the most serious problems that happen in this country. The based solution is to develop home security system using a wireless to keeps your house safe from intruders and enables you to work in peace. Based on the events above, the project can be developing to make our home secure and safe. We never anxious and worried anymore even we leave the house. So this system is to design and develop a home security system that can provide security against intrusion and other emergency situation by alarm via short message service (SMS). SMS stands for Short Message Service. It is a mobile technology that allows for sending and receiving text or even binary messages to and from a mobile phone .With an SMS based computer control system, monitoring and control can be achieved at all times. This is as a result of the ease of accessibility that comes with the use of a mobile phone.

To achieve an effective remote control and monitoring security system, today there are a many wireless home security alarm system available in the market. Some are designed for very high security level protection and some are basic type. Most of the alarm systems are very expensive and therefore not affordable by poor or middle class families. Some systems which cheaper in cost do not provide reliable features like status checking. To provide the public with a cost effective wireless security system, it is important to design a low cost system with advanced features which ease the benefits the people and also will decrease the crime. We are developing the system to control and monitor the home devices. It is important because the system can help the old persons, disabled persons and can help if there is no one at home.

The aim of the proposed system is to develop a cost effective solution that will provide controlling of home appliances remotely and enable home security against intrusion in the absence of homeowner. The system provides availability due to development of a low cost system. The home appliances control system with an affordable cost was thought to be built that should be mobile providing remote access to the appliances and allowing home security. Though devices connected as home and office appliances consume electrical power. These devices should be controlled as well as turn on /off if required. Most of the times it was done manually, but it is a necessity to control devices more effectively and efficiently at anytime from anywhere. In this system, we are going to develop a cellular phone based home/office appliance controller.

In this design, arduino software was used as it simple and easy, some people think of the entire Arduino board as a microcontroller, but this is inaccurate. The Arduino board actually is a specially designed circuit board for programming and prototyping with Atmel microcontrollers.

The nice thing about the Arduino board is that it is relatively cheap, plugs straight into a computer's USB port, and it is dead-simple to setup and use (compared to other development boards).

2 Problem definition

Controlling the hardware requires time and effort previously required presence near the device so as to turn it on or turn it off so it began to think about how to control remote appliances and rolled applications including Bluetooth and sensors, but it was working such applications on a close range So began prodding at how to control the devices from anywhere in the world so it was thinking about how to make the SMS from mobile controls in hardware and this is our topic.

3. Objective

The goal of this project is to design an embedded device which can control up to 8 devices by sending a specific SMS message from a cell-phone. This controller is extremely

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handy at places where we have to control the ON and OFF switching of the devices but no wired connection to that place is available. To implement this, a GSM modem is connected to a programmed microcontroller which
Would receive the SMS from a reference cell phone the control signal part of the received SMS is extracted and is changed to microcontroller-preferred format.
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 systems, 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 a given appliance or device back to the cellular phone.

3.Related work

3.1 Theory

The idea of using the short message service to establish routes in communication networks between receivers and transmitters for the purpose of safety and guaranty of service is not new, but the application, cost, design method and reliability of the system varies[6].

3.2 Discussion of the previous work

In (Conte and Scaradozzi, 2003) home automation systems as multiple agent Systems (MAS) were considered. In their work, home automation system was proposed that includes home appliances and devices that are controlled and maintained for home management Their major contribution to knowledge was to improve home automation but not minding the cost of the entire system[7]. In a related work, Alkar and Buhur (2005) in their paper also proposed an Internet Based Wireless Home Automation System for Multifunctional Devices. They proposed a low cost and flexible web-based solution but this system has some limitations such as the range and power failure. In (Delgado et al., 2006) problems with the implementation of home automation systems were considered. Furthermore the possible solutions were devised through various network technologies[8]. Several issues affecting home automation systems such as lack of robustness, compatibility issue and acceptability among the old and disabled people were also discussed. In (Ciubotaru-Petrescu et al., 2006), a design and implementation of SMS based control for monitoring systems was presented[9]. The paper has three modules involving sensing unit for monitoring the complex applications, a processing unit that is the microcontroller and a communication module that uses General Packet Radio Service (GPRS) modem or cell phone via serial port RS-232. The SMS is used for status reporting such as power failure. Murthy (2008) explores primary health-care management for the rural population. A solution proposes the use of the mobile web-technologies providing the Primary Health Care (PHC) services to the rural population. The system involves the use of SMS and cell phone technology for information management, transactional exchange and personal communication. In a related work, Jawarkar et al. (2008) proposed remote monitoring through mobile phone involving the use of spoken commands. The spoken commands are generated and sent in the form of text SMS to the control system and then the microcontroller on the basis of SMS takes a decision of a particular task. But the drawback of all the related work is the cost of the design, the reliability, and the use of foreign materials[10]. In this research, we utilize locally available materials for our design purpose, making it more reliable and portable with less cost. We employ microcontroller, relays, and a programmer for the microcontroller, mobile phones and a GSM modem.

4 Hardware of the proposed design

This section will discuss the design procedure of the SMS based Remote Controller and how it was implemented.

4.1 Gsm Introduction

Global system for mobile communication (GSM) is a globally accepted standard for digital

cellular communication. GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz it is estimated that many countries outside of Europe will join the GSM Partnership.

GSM was devised as a cellular system specific to the 900 MHz band, called "The Primary Band". The primary band includes two sub bands of 25 MHz each, 890 to 915 MHz and 935 MHz to 960 MHz GSM-PLMN has allocated 124 duplex carrier frequencies over the following bands of operation.

- Uplink frequency band: 890 to 915 MHz (MS transmits, BTS receives).
- Downlink frequency band: 935 to 960 MHz (BTS transmits, MS receives).
- Carrier spacing: 200 KHz.

4.2 GSM Network Structure

Figure 1 shows GSM structure in detail

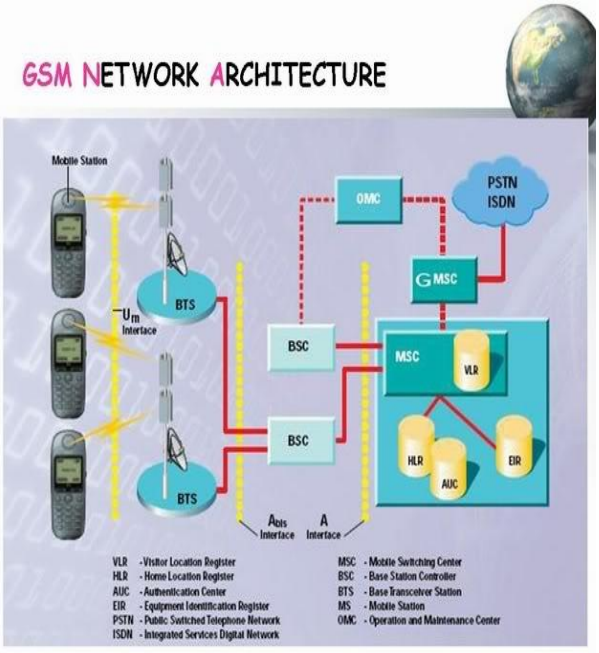

Fig.1: General architecture of a GSM network

A GSM public land mobile network (PLMN) is divided into three subsystem.

4.2.1 The Radio Subsystem (RSS)

The radio subsystem consists of

- THE MOBILE STATION (MS)
  - It is the interface between the user and the mobile system.
- BASE STATION CONTROLLER (BSC)
  - It controls call set-up and operation of base transceiver stationsBASE TRANSCEIVER STATION (BTS)
  - It handles the actual radio transmission to and from the Ms.
- TRANSCODING AND RATE ADABTATION UNIT(TRAU)
  - It handles the rate adaptation between the fixed and mobile parts.

4.2.2 THE SWITCHING SUBSYSTEM (SSS)

- MOBIE SERVICE SWITCHING CENTER(MSC)
  It switches the calls between MSs.
- GATEWAY MOBILE SERVICE SWITCHING CENTER (GMSC)
  It switches the calls between MSs and other network.
- HOME LOCATION REGISTER(HLR)
  It contains data of all mobile subscribers registered in its area.
- VISITOR LOCATION REGISTER (VLR)
  It contains data of all mobile subscribers visiting its MSC service area.
- AUTHENTICATION CENTER(AUC)
  It handles confidentially and security facilities with the system.
- EQUIPMENT IDENTITY REGISTER(EIR)
  It contains information on all MS equipments in the system.

4.2.3 The Operation Subsystem (OSS)

- THE OPEARTION AND Maintenance center for BSS.
- THE OPERATION AND MAINTENANCE CENTER FOR NSS.

4.3 THE MOBILE STATION (MS)

The MS consists of:

A. Mobile equipment (ME)

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It is the terminal used by the user.

B. Subscriber identity module (SIM) smart card
It is an electronic microchip for storing information about the subscription.

4.3.1 THE MOBILE EQUIPMENT (ME)

The ME encompasses the RF hardware to access the network. The ME unites take many functional elements in the transmission chain of the GSM system.With aid of the data stored in the SIM card, the speech is digitized, compressed, secured against loss of data through redundancy and interleaving , encrypted in prevent interception and modulated into the radio frequency (RF) created by the mobile station. Directly after, the signal is amplified and transmitted. In the opposite direction, the process runs inversely, beginning with the reception of RF. Figure 2 shows mobile equipment.

Fig. 2: Mobile equipment

4.3.2 THE SIM CARD

The SIM card should be inserted into ME with a valid IMEI for its operation, where IMEI is 15-digit number and verifies that the mobile station is type approved and not stolen.
It is a non volatile storage that is designed to be difficult to duplicate. It must be purchased from the GSM network operation. Figure 3 shows the sim smart card.
The SIM card carries the subscriber-related information and codes, so that a GSM subscriber with a SIM card can use different ME.
The main task of the SIM is the storage of data: permanent and temporary administrative data as well as data concerning security.
The SIM store 3 types of subscriber-related information.

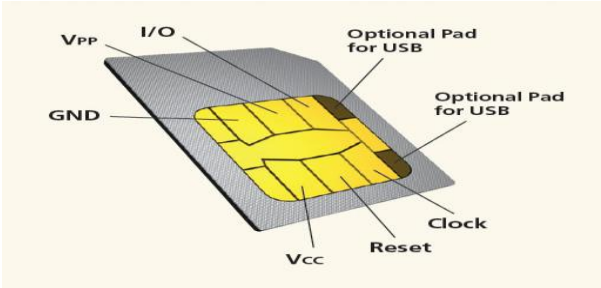


Fig. 3: SIM smart card

After explaining the GSM structure in which the proposed project based on it and two of many important components that we depend on them. There will be discussion in the coming section of the most important component that called SIM 900 module.

4.4. THE SIM 900 MODULE

One of the GSM modules that we can use for our project is SIM900 by SIMCom. This is a GSM/GPRS-compatible Quad-band cell phone, which works on a frequency of 850/900/1800/1900MHz and which can be used not only to access the Internet, but also for oral communication (provided that it is connected to a microphone and a small loud speaker) and for SMSs. Externally, it looks like a big package (0.94 inches x 0.94 inches x 0.12 inches) with L-shaped contacts on four sides so that they can be soldered both on the side and at the bottom. Internally, the module is managed by an

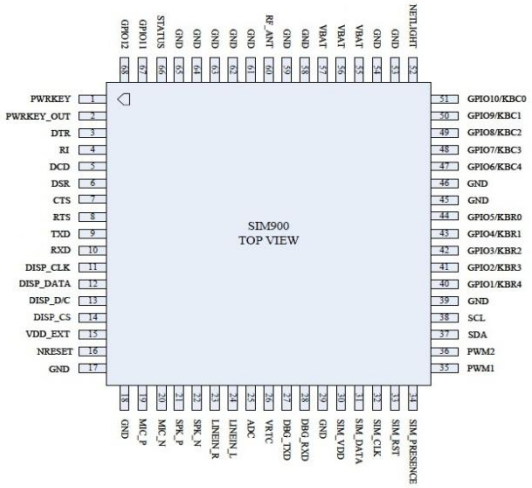
AMR926EJ-S processor, which controls phone communication, data communication (through an integrated TCP/IP stack), and (through an UART and a TTL serial interface) the communication with the circuit interfaced with the cell phone itself.

The processor is also in charge of a SIM card (3 or 1.8 V) which needs to be attached to the outer wall of the module.

In addition, the GSM900 device integrates an analog interface, an A/D converter, an RTC, an SPI bus, an I²C, and a PWM module. The radio section is GSM phase 2/2+ compatible and is either class 4 (2 W) at 850/ 900 MHz or class 1 (1 W) at 1800/1900 MHz.

The TTL serial interface is in charge not only of communicating all the data relative to the SMS already received and those that come in during TCP/IP sessions in GPRS (the data-rate is determined by GPRS class 10: max. 85.6 kbps), but also of receiving the circuit commands (in our case, coming from the PIC governing the remote control) that can be either AT standard or AT-enhanced SIMCom type.

The module is supplied with continuous energy (between 3.4 and 4.5 V) and absorbs a maximum of 0.8 A during transmission. Figure 4 shows SIM 900 configuration, figure 5 shows pinout SIM900 and figure 6 shows circuit of SIM900 GSM module.



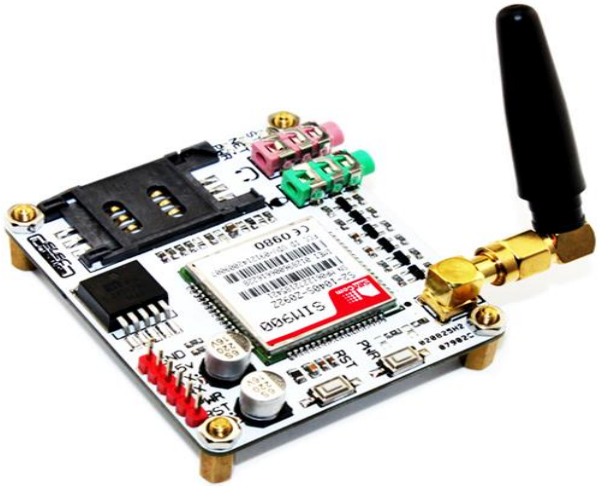


Fig. 5: pinout SIM900

Fig. 4: SIM 900 configuration

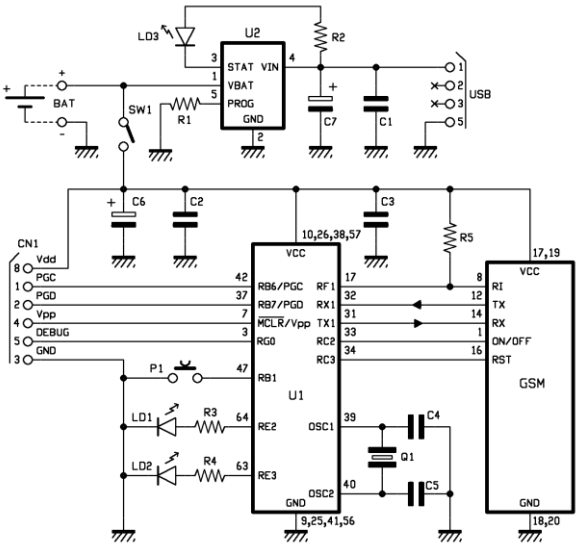


Fig. 6: circuit of SIM900 GSM module

In this section, how the SMS message sent and received to / from mobile (SMS scenario) will be explained.

The SMS (Short Message Service) message is sent over stand alone dedicated control channel (SDCCH). Note that this channel is allocated upon a service request. A SMS sender sends a SMS service request and gets an SDCCH channel. After all the authentication and security checks the sender finally forwards the message to the MSC. The MSC then forwards the message to the SMS service center to handle the rest. The mobile service switching center (MSC) also sends an acknowledgement to the mobile station (MS). For an incoming SMS the MSC page the MS. The MS then requests for the service in order to receive the SMS. The rest of the transactions are similar to the case of outgoing SMS.

An SMS can be sent of receive while taking (that is, a traffic channels (TCH) is assigned), In that case the SMS uses the fast associated control channel (FACCH), which is, indeed, the TCH channel but momentarily becomes a signaling channel to carry the signal (here it is an SMS message) before going back to be the traffic channel.

The cellular mobile system carries multimedia and other innovative services. Often these services require special feature for a mobile station. For example, an MS wants to send a picture to another MS but the receiver MS does not support this feature. To avoid this kind of problems the GSM system provides a feature to make a query to an MS if it has certain feature in order to communicate with the other end. The following diagram illustrates such a query.

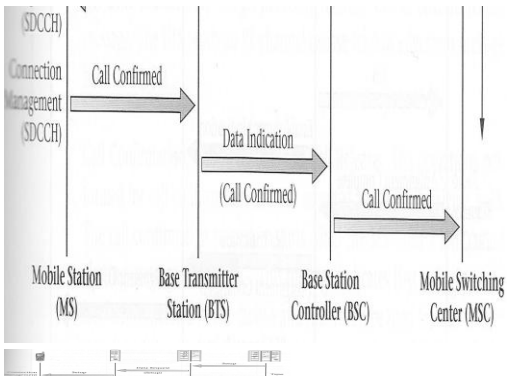


Fig. 7: SMS call flow diagram

5. General Discussions of Multiple Software

5.1 Micro Controller Items and Layout

A microcontroller (sometimes abbreviated µC, uC or MCU) is a small computer on a single integrated circuit containing a processor core, memory and programmable input/output peripherals. Program memory in the form of NOR flash or OTP ROM is also often included on chip, as well as a typically small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications.

Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes. Mixed signal microcontrollers are common, integrating analog components needed to control non-digital electronic systems.

Some microcontrollers may use four-bit words and operate at clock rate frequencies as low as 4 kHz, for low power consumption (single-digit mill watts or microwatts). They will generally have the ability to retain functionality while waiting for an event such as a button press or other interrupt; power consumption while sleeping (CPU clock and most peripherals off) may be just nanowatts, making many of them well suited for long lasting battery applications. Other microcontrollers may serve performance-critical roles, where they may need to act more like a digital signal processor (DSP), with higher clock speeds and power consumption. Figure 8 Shows pin pi 16f877a and figure 9 shows pin pic description

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Fig.8: pin pic 16f877a

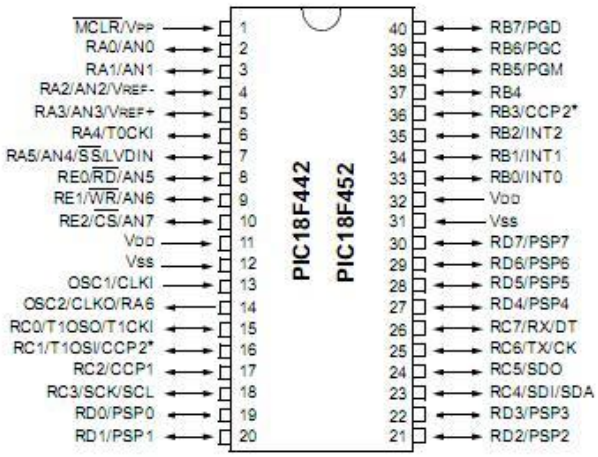

Fig. 9: pin pic18f442 description

Table 1: shows the description of the pin

Table 1: pin description

Pin Number	Description
1	MCLR/VPP
2	RA0/AN0
3	RA1/AN1
4	RA2/AN2/VREF-
5	RA3/AN3/VREF+
6	RA4/T0CKI
7	RA5/AN4/SS/LVDIN
8	RE0/RD/AN5
9	RE1/WR/AN6
10	RE2/CS/AN7
11	VDD
12	VSS
13	OSC1/CLKIN
14	OSC2/CLKO/RA6
15	RC0/T1OSO/T1CKI
16	RC1/T1OSI/CCP2
17	RC2/CCP1
18	RC3/SCK/SCL
19	RD0/PSP0
20	RD1/PSP1
21	RD2/PSP2
22	RD3/PSP3
23	RC4/SDI/SDA
24	RC5/SDO
25	RC6/TX/CK
26	RC7/RX/DT
27	RD4/PSP4
28	RD5/PSP5
29	RD6/PSP6
30	RD7/PSP7
31	VSS
32	VDD
33	RB0/INT0
34	RB1/INT1
35	RB2/INT2
36	RB3/CCP2
37	RB4
38	RB5/PGM
39	RB6/PGC
40	RB7/PGD

5.2 Arduino Items And Layout

Arduino is a single-board microcontroller, intended to make the application of interactive objects or environments more accessible. The hardware consists of an open-source hardware board designed around 8-bit Atmel AVR microcontroller, or a 32-bit Atmel ARM. Current models feature a USB interface, 6 analog input pins, as well as 14 digital I/O pins which allow the user to attach various extension boards.Figure 10 shows the arduino auno, figure 11 shows its hardware layout and figure 12 shows its pin mapping

Introduced in 2005, the Arduino platform was designed to provide an inexpensive and easy way for hobbyists, students and professionals to create devices that interact with their environment using sensors and actuators. Common examples for beginner hobbyists include simple robots, thermostats and motion detectors. It comes with a simple integrated development environment (IDE) that runs on regular personal computers and allows users to write programs for Arduino using C or C++.

Fig. 10: arduino uno

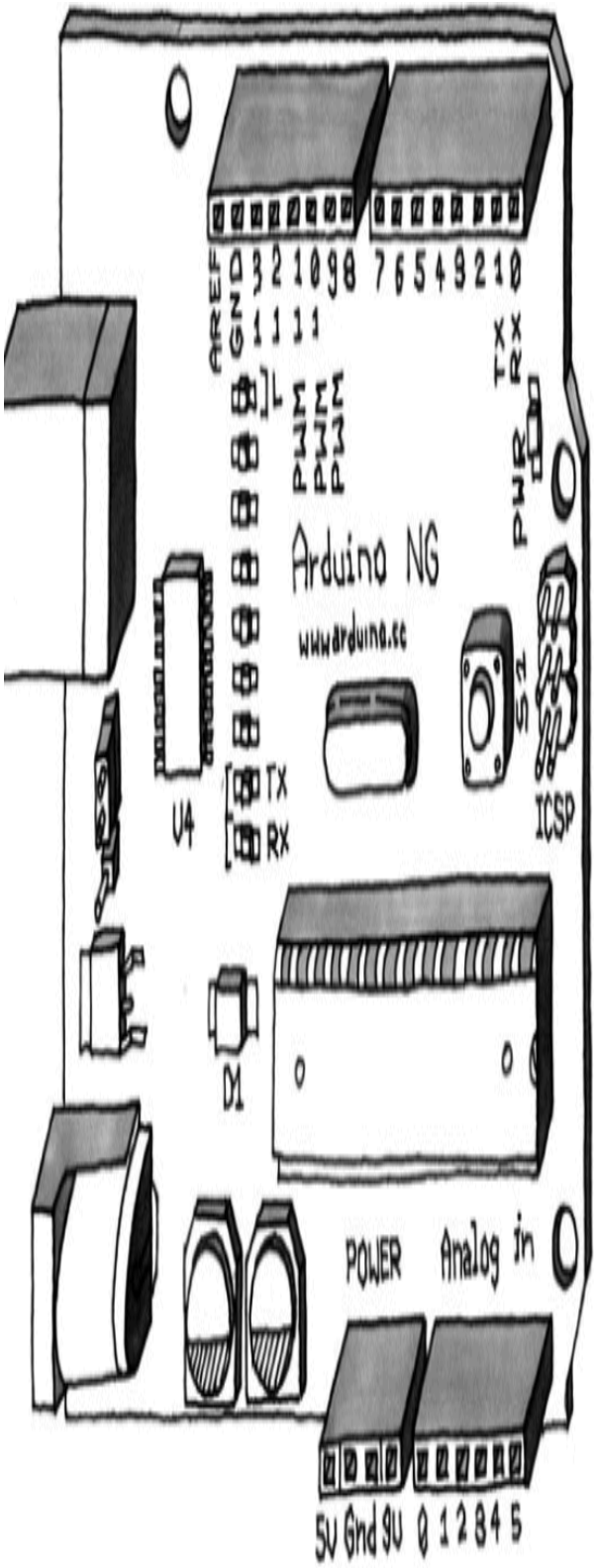

Fig. 11: Hardware layout of Arduino uno

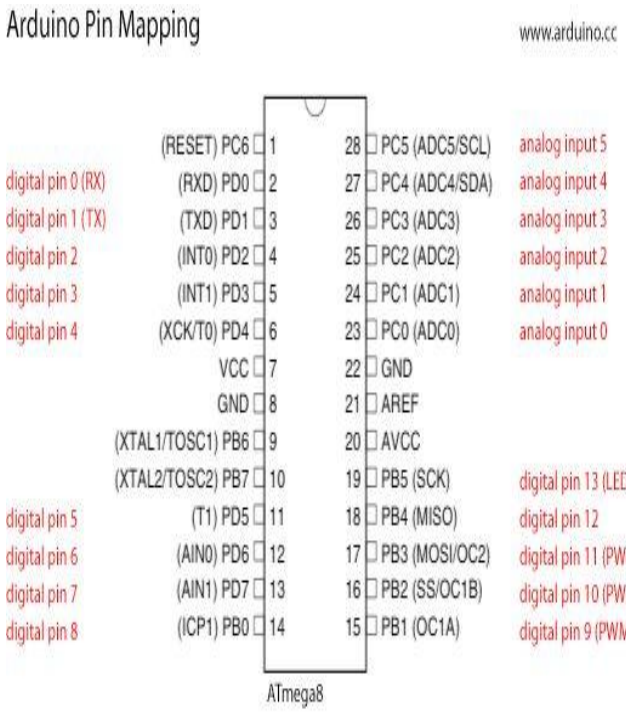

Fig. 12: Arduino pin mapping

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and VIN pin headers of the POWER connector.

The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

The power pins are as follow **:-**

A) VIN: The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.

B) 5V: This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board. We don't advise it.

C) 3V3: A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.

D) GND: Ground pins.

E) IOREF: This pin on the Arduino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs for working with the 5V or 3.3V.

6. Memory

The ATmega328 has 32 KB (with 0.5 KB used for the boot loader). It also has 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

7. Input and Output

Each of the 14 digital pins on the Uno can be used as an input or output, using pin Mode, Write, and digital Read functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50k ohms'. In addition, some pins have specialized functions:

A) Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.

B) External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.

C) PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analog Write function.

D) SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library.

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E) LED: 13. There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.
The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analog Reference function. Additionally, some pins have specialized functionality:
F) **TWI**: A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.
There are a couple of other pins on the board:

- **AREF**. Reference voltage for the analog inputs. Used with analog Reference.
- **Reset**. Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

See also the mapping between Arduino pins and ATmega328 ports. The mapping for the Atmega8, 168, and 328 is identical.

8. Communication

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '16U2 firmware

9.Advantage of arduino over microcontroller

Using an Arduino simplifies the amount of hardware and software development you need to do in order to get a system running. The Arduino hardware platform already has the power and reset circuitry setup as well as circuitry to program and communicate with the microcontroller over USB. In addition, the I/O pins of the microcontroller are typically already fed out to sockets/headers for easy access (This may vary a bit with the specificmodel). On the software side, Arduino provides a number of libraries to make programming the microcontroller easier. The simplest of these are functions to control and read the I/O pins rather than having to fiddle with the bus/bit masks normally used to interface with the Atmega I/O (This is a fairly minor inconvenience). More useful are things such as being able to set I/O pins to PWM at a certain duty cycle using a single command or doing Serial communication. Personally, I think the greatest advantage is having the hardware platform set up already, especially the fact that it allows programming and serial communication over USB. This saves me the trouble of having to do my own PCB (which can cost more than an Arduino) or bread boarding (which I'm not a big fan of). Either way takes time for me to do and verify that everything is working correctly.

10. System architecture

Figure 13 illustrates the block diagram of the remotely home appliance control system using SMS.

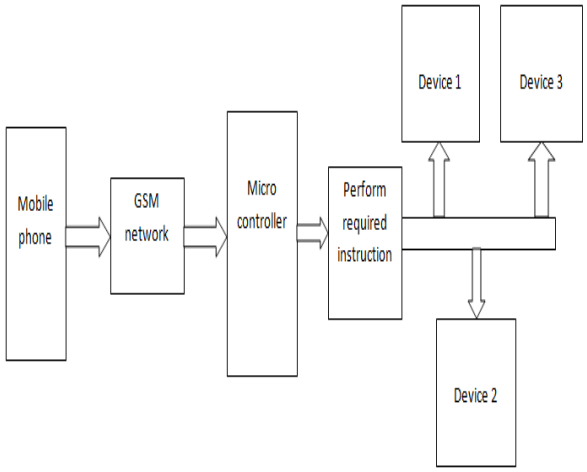

Fig. 13: Block Diagram of system

The Mobile Phone is integrated with Arduino which receives SMS message from user Mobile Phone and sends a command to controller to control whether to turn ON or OFF the output. The Mobile Phone also sends status reporting to the user regarding the electrical appliance. The

system utilizes a low cost Microcontroller that is currently available in the market. The development of this device involves with both hardware and software to provide a preferable results. The structure of the system is working with following steps:

A) The remote user sends text messages (SMS) including Authentication information and commands to the receiver.

B) GSM receiver receives messages sent from user cell phone or Mobile phone and send.

C) GSM receiver decodes the sent message and sends the commands to the microcontroller.

D) The microcontroller issues commands to the appliances.

E) Microcontroller issues commands to the appliances and the devices connected will switch ON/OFF.

F) The Microcontroller checks for completion status and apply operation on Electrical Devices.

G) GSM receiver informs the remote user of the outcome of their request by sending a completion status message back to remote user in the form of another SMS message.

System used the following technologies:

A)Cellular phone, Networks and Communication protocols:

The widely available networks are based on GSM. The network provides a wide area of coverage and can be utilized more cost-effectively for this system and communication protocols that are DTMF (Dual Tone Multi Frequencies), SMS etc., SMS is the most efficient medium for communication. Mobile phone or Cellular device is required for to create a SMS.

B) I/O Interfaces between Microcontroller and devices:

Serial or parallel I/O will be considered for to connect the GSM receiver and the Microcontroller. Using the microcontroller, a control circuit will be implemented to control the electrical appliances (air conditioner, security system, set top box, light, fan etc).

C) Microcontroller System

The micro-controller is a microprocessor with provisions for input and output embedded in it. It consists of timers, Analog to Digital Converters (ADCs), Universal Synchronous Asynchronous Receiver Transmitter (USART), etc. It is an 8-bit microcontroller with flash program memory and Electrically Erasable Programmable Read Only Memory (EEPROM). It contains 83-instructions which includes byte operations, bits operations and branching.

11. Software of the proposed design

This section describes the software development for the SMS Remote Controller. Arduino software was used as it is easier to understand, and it is quicker for writing working code.

The software was developed using a simple high level language tool in C. The software extracts the sent message from the SIM location at a regular interval and processes it to control the different appliances connected within the interface. Nokia F-Bus protocol was used to communicate with the mobile phone set. Most Nokia phones have F-Bus and M-Bus connections that can be used to connect a phone to a PC or in this case a microcontroller. The connection can be used for controlling just about all functions of the phone, as well as uploading new firmware. This bus allows SMS messages to be sent and received. All the peripherals used in the program were first initialized. In the coding, ASCII code was used in declaring the coding for received and read SMS message. A declare delete SMS coding is used to avoid the SMS interrupt with the previous message. It occurs when the microcontroller has carried out the instruction, the message is being deleted.

11.1 Algorithm

Step 1: Start
Step 2: Phone initialization
Step 3: Get Hardware Software
Step 4: Poll SMS from mobile phone
Step 5: If new SMS received go to step3 else, go to step1
Step 6: Receive SMS
Step 7: Check SMS pattern
Step 8: Control the device based on status
Step 9: Notify end user
Step 10: Go to step1

12 Results and Discussions

This section describes the output of the implemented system. Several testing were performed to ensure proper execution and production of the intended result. The system was designed to receive SMS from user mobile phone to the mobile phone connected to the Arduino circuit that acts as a GSM modem. This can be performed by dialing the mobile phone

number which has been set in the Arduino. The incoming message was deleted by the microcontroller upon completion of the requested process and the message is erased in the connected mobile phone which acts as GSM modem. Figure 14 illustrates the proposed design hardware.

The system then replies by sending a message to user mobile phone reporting the status of the devices (turned ON or turned OFF). The status message is to remind the user regarding the current state of the appliances.

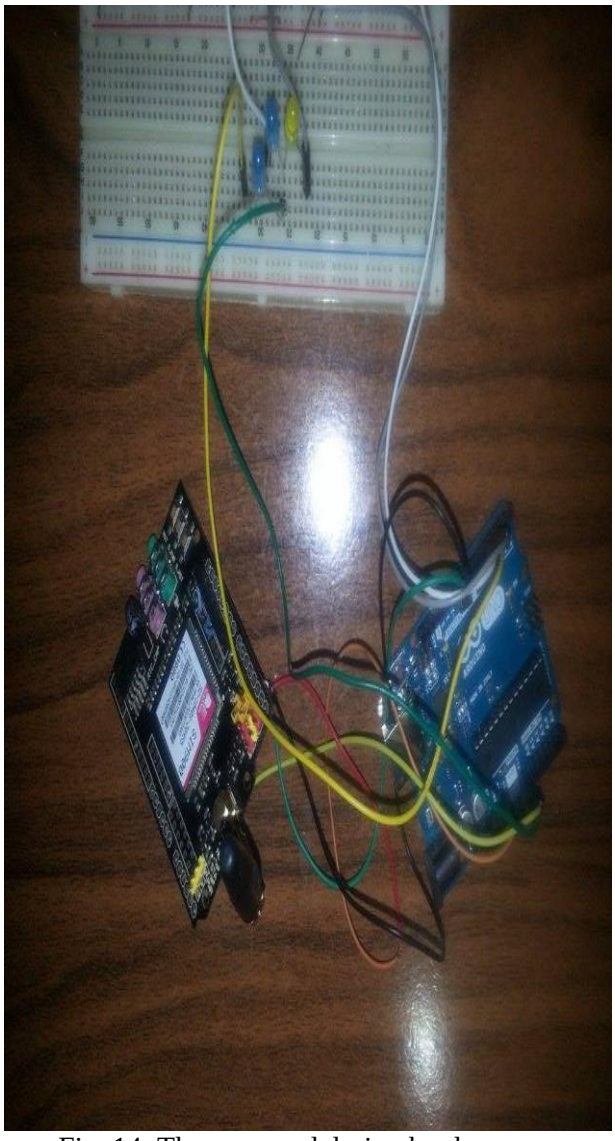

Fig. 14: The proposed design hardware

Table 2 shows the different cases of working

Table 2: cases of working

Commands from user mobile phone	Actions carried out by the microcontroller
A1open	Device 1 ON and device 2,3,4 OFF
B2yes	Device 2 ON and device 1,3,4 OFF
C3enter	Device 3 ON and device 1,2,4 OFF
D4walk	Device 4 ON and device 1,2,3 OFF
RUN12	Device 1, 2 ON and device 3,4 OFF
RUN34	Device 3,4 ON and device 1,2 OFF
OFFALL	Device 1,2,3,4 OFF

13. Conclusions

The proposed design which is developed of a GSM based control system for electrical appliances was designed considering some factors such as economic application, design economy, availability of components and research materials, efficiency, compatibility portability and durability. The performance of the project after test met design specifications. However, the general operation of the project and performance is dependent on the user who is prone to human error such as entering wrong timing.

Also the operation is dependent on how well the soldering is done, and the positioning of the components on the soldering-board. If poor soldering lead is used, the circuit might form dry joint early and in that case the project might fail. Furthermore, if logic elements are soldered near components that radiate heat, overheating might occur and affect the performance of the entire system. Other factors that might affect performance include transportation, packaging, ventilation, quality of components, handling and usage.

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SMS based remote control for home appliances is beneficial for the human generation, because mobile is most recently used technology nowadays. The SMS based remote control for home appliances is easy to implement the system that ON/OFF the electrical device through remotely via SMS or it handled more and more electrical devices which are use in home. In simple automation system where the internet facilities and even PC are not provided, one can use mobile phone based control system which is simple and cost-effective. Alternatively for such requirements landline phone with extension card could also be select for the system.

14. Future Works

We want to provide this circuit device tracking (GPS) in order to clearly define the place of the enhancement device is for example if we put it inside a car we can all easily locate them in case of theft and the practical application of the device can help to level the largest such as protecting electronic and can also provide circuit camera we can run through SMS and noted that the department heats so we will put the fan operates 12v effort Using heat-sensitive is connected with microcontroller .

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