Power Proficient House Computerization Scheme Using Arduino

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Abstract: These days every system is computerized in order to mug fresh challenges in the current date circumstances. Computerized systems have less physical operations, so that the suppleness, dependability is high and precise. Therefore each area favour computerized manages schemes. Particularly in the area of electronics computerized schemes are having improved results. Most likely the main useful thing to identify about the global system for mobile communication is that it is an international standard. If you tour in parts of globe, GSM is lone kind of cellular facility existing. In place of analog services, GSM was billed as a digital scheme using TDMA technology. The objective of this paper is to build up a scheme, which uses Mobile technology that keeps control of the various units of the domestic device, which executes with respect to the signal sent by the mobile. For use of domestic devices the fresh idea has been considered to supervise them remotely by using GSM, which enables the user to remotely control switching of domestic devices. Just by dialling keypad of remote telephone, from where we are calling we can perform ON / OFF operation of the domestic device. The ranges of domestic devices that can be controlled through remote systems are many in number. A few of them are as follows and this depends upon the handling precedence of the domestic devices i.e. LED bulbs, Sound System or other electrical /electronic domestic devices.

Index Terms **- GSM, TDMA Technology, Analog Services, Mobile technology, Computerization.**

I. INTRODUCTION

The aim of the this paper is to develop a scheme, which uses Mobile technology that keeps control of the various units of the automobiles, Computer scheme, which executes with respect to the signal sent by the mobile.

GSM based House Computerization plays a very important role in domestic applications. The simple functioning of the kit and an incredibly reasonable cost add together as an extra benefit for its usage. Its connotation can be verified by taking into account the following qualities of kit designed by us. Dependability is one such issue that every electrical scheme should have in order to render its services without malfunctioning over a long period of time. The kit has been designed using ATmega128 Arduino which is it very reliable and also operate very efficiently under normal condition. The design is put into action at an incredibly reasonable cost. We have developed the GSM based House Computerization which are more economical rather than just interfacing those which are readily available in the market [1].

For utilization of domestic devices the new idea has been considered to handle them remotely by using GSM, which enables the user to remotely control switching of domestic devices. Simply by dialing keypad of remote telephone, you can achieve ON / OFF process of the domestic devices.

Large range of domestic devices can be controlled using this scheme. A few of them are as follows and this rely on the usage precedence of the domestic devices i.e. LED bulbs, Sound system or other electrical/electronic domestic devices. Several issues affecting house computerization schemes such as lack of robustness, compatibility issue and acceptability among the old and disabled people are discussed. The implementation of the paper makes the people reliable and satisfied. House computerization scheme has many advantages such as remote controlling of home domestic devices, availability and easy for users. The users get alerts anywhere through the GSM technology thus making the scheme independent. The scheme contains low components easily available which cuts down the overall scheme cost [5].

Moreover scheme allows secure access due to pre-configured number. The ease of development is due to wireless mode of communication. GSM technology provides the benefit that the scheme is accessible in remote areas as well. The scheme functionality is based on GSM technology so the technological constraints must be kept in mind. The scheme is vulnerable to power failure but this disruption can be avoided by attaching the voltage source thus allowing users to avail the great advantages of the scheme .A process unit that is the communication module that uses GSM mobile via serial port. It mainly focuses on the contents which are needed to designing the hardware and software. The hardware includes the components like ICs, Arduino board, GSM module, resistors etc [3].

II. EXISTING METHODS

House safety has been a main concern where offence is growing and each one needs to acquire appropriate measuring to stop it. In addition there was a need to computerize house so that user can take advantage of the technological advancement in such a way that a person getting off the office does not get melted with hot climate. Therefore this paper propose a scheme that allows users to be control home domestic devices ubiquitously and also provide security on detection of instruction via SMS using GSM technology [7]. Now using a developed software program the user sent SMS from any other mobile to destination GSM module which is connected to the hardware. Software will compile the SMS and according to that it will switch ON/OFF the device.

Also for safety, security and communication without any network interruption, GSM technology is safe enough to control. In many of existing schemes, Bluetooth devices and RF modules have been used to transmit the data wirelessly. Nut devices and modules have certain limitations and drawbacks. To overcome this problem of having short ranges, we have proposed a new scheme that has a capability to control the domestic devices at higher ranges [8].

In one of the paper Rajeev Piyare presents a low cost and flexible home control and monitoring scheme using an embedded micro-web server, with IP connectivity for accessing and controlling devices and domestic devices remotely using Android based Smart phone app. The proposed scheme does not require a dedicated server PC with respect to similar schemes and offers a novel communication protocol to monitor and control the home environment with more than just the switching functionality [12]. To illustrate the viability and usefulness of this scheme, devices such as light switches, power plug, temperature sensor and current sensor have been integrated with the proposed home control scheme. The keyword for this paper is Internet, smart home, home computerization, android smart phone, Arduino.

In another paper, Kim Baraka describes about House computerization techniques were use to design and implement a remotely controlled, energy-efficient, highly scalable and user-friendly Smart Home with basic features that safeguard the residents' comfort and security. The scheme consists of a house network, which includes both sensors and appliance actuators to respectively get information from and control the house environment. Arduino micro-controller was used a central controller that communicates through a Web Server with an Android application, the scheme's user interface. The scheme brings together in the house network both wireless Zigbee and wired X10 technologies, thus making it a cost-efficient hybrid scheme. On the software side, events can be program to trigger under specific conditions, and this can have a great role in reducing the total energy consumed by some domestic devices [2].

This paper from R. A. Ramiee, D.H.Z. Tang, M. M. Ismail describes the Smart Home Scheme for Disabled People via Bluetooth Wireless. Smart home scheme for disable people is the scheme called assistive domestics focuses on making it possible for the disabled to motivate them carry out the daily activity, safe and comfortable. However in our research work, we attempt to design the smart home scheme including the wireless controller via Bluetooth technology. This software application adapt in mobile phone, PDA, mobile computer (Samsung Galaxy Tab) using android's operating scheme (OS). This software application will control the electrical domestic devices switches wirelessly (Bluetooth). Results from this study found that the scheme was successfully produced where it is able to control any of the wireless switches at a distance of approximately 25-meter radius from the main controller. The scheme is seen potentially be used in hospitals, home care for the elderly and facilities for disabled users.

III. PERFORMANCE EVALUATION AND COMPARISON

In the mentioned scheme, for controlling whole process Arduino is used. For controlling domestic devices GSM wireless communication has been used. We send some commands like "#A. light on*", "#A. light off*" and so on for controlling domestic devices. Arduino receives the instruction via GSM and transmit the desired signal to relays to change the state of the domestic device with the help of relay drive.

Here we have used a prefix in command string that is "#A.". This prefix is used to identify that the main command is coming next to it and * at the end of string indicates that message has been ended.

When we send SMS to GSM module by Mobile, then GSM receives that SMS and sends it to Arduino. At this instant Arduino reads this SMS and dig out key command from the received sequence and save in a variable. After this, Arduino compare this string with predefined string. If match occurred then Arduino sends signal to relay via relay driver for turning ON and OFF the home domestic devices. And relative result also prints on 16x2 LCD by using appropriate commands. Here in this paper we have used 3 zero watt bulb for demonstration which indicates Fan, Light and TV.

In table 3.1 is the list of messages which we transmit via SMS, to turn on and off the Fan, Light and TV.

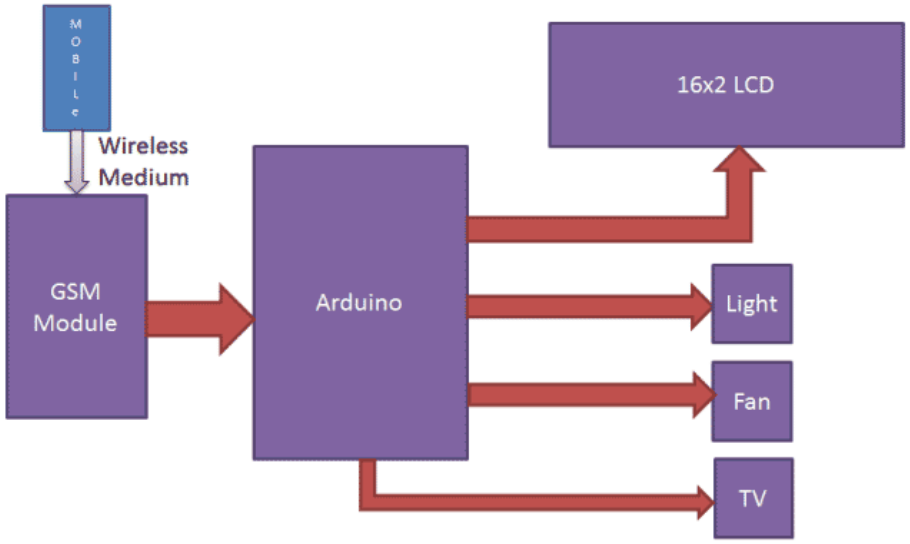

Fig. 3.1: Block Diagram of Computerization Scheme.

Circuit Description:

House computerization scheme use very sophisticated connection. LCD is commonly used for describing the status of domestic devices which directly connected with Arduino board. Data pins of LCD namely RS, EN, D4, D5, D6, D7 are connected to Arduino digital pin number 6, 7, 8, 9, 10, 11 and Rx and Tx pin of GSM module is directly connected at Tx and Rx pin of Arduino respectively. GSM module is powered by using a 12 volt adaptor. 5 volt SPDT and 3 relays are used for controlling LIGHT, FAN and TV.

Table 3.1: GSM instructions

Sr. No.	Message	Operation
1	#A.fan on*	Fan ON
2	#A.fan off*	Fan OFF
3	#A.light on*	Light ON
4	#A.light off*	Light OFF
5	#A.tv on*	TV ON
6	#A.tv off*	TV OFF
7	#A.all on*	ALL ON
8	#A.all off*	ALL OFF

Circuit Components:

- Arduino UNO
- GSM Module
- ULN2003
- Relay 5 volt
- Bulb with holder
- Connecting wires
- Bread board
- 16x2 LCD
- Power supply
- Cell phone

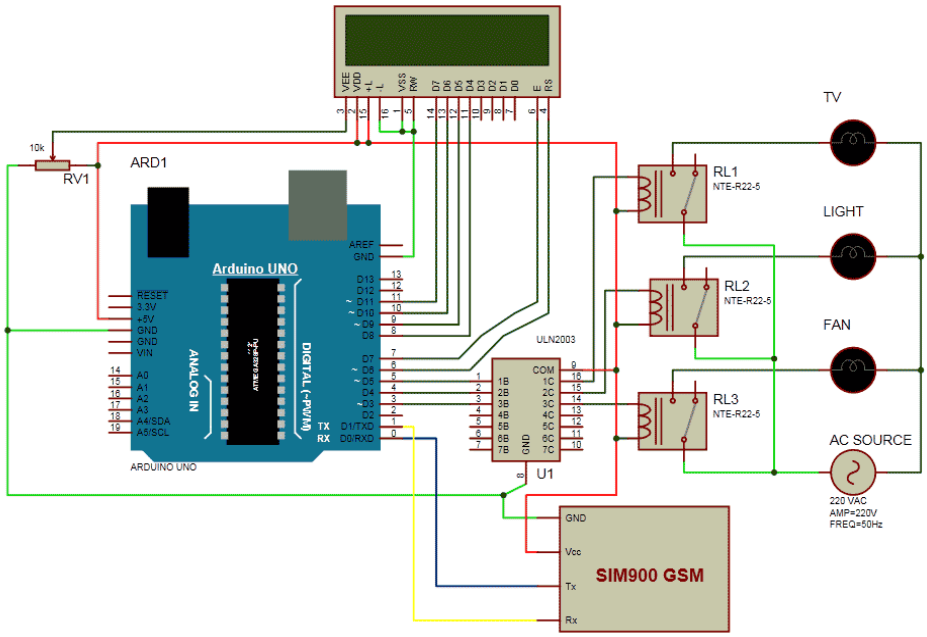

Fig. 3.2: Circuit Diagram of House Computerization Scheme

Arduino UNO

A microcontroller board which works on a concept of ATmega328 is nothing but Arduino UNO. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. To support the microcontroller Arduino UNO board contains whatever is required; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The GSM modem, phones provides a low cost, long range, wireless communication channel for embedded, microcontroller based applications that need connectivity rather than high data rates. Equipment such as industrial refrigerators, freezers, HVAC, supervising and retailing apparatus, transport service, caution system, safety system, remote control etc. could advantage from being connected to a GSM modem.

This tutorial describes how to use an AVR to control a GSM modem using AT commands. The interface between modem and host is a textual protocol called AT-Commands. Any GSM network user SIM card can be identified by GSM modem and its operation is like a cell phone. It can also work in GPRS mode to connect internet. AT command is used to communicate between PC and SIM 300 modem. The modem can either be connected to PC serial port directly by using RS-232 cable.12v power supply is applied to GSM modem to activate it.

Points to consider while choosing GSM module:

Quectel M10 is much dependable and a little bit expensive GSM modems compare to other GSM modem available in market which are SIM300, SIM900 and SIM900A. SIM300 is one of the oldest GSM which is not in use now days.

Power supply requirement:

The output voltage requirement for most of the GSM modem is 4.2V, but most of them are also works on 3.3V to 5V range. We have to identify the best GSM modem depending on our microcontroller requirement. The most of the current required for GSM modem is utilised in sending SMS, initializing call or registering on different network. Most of the communication devices based on GSM technology prefer GSM module. GSM module is a platform for interaction between GSM networks through computer. Only AT instructions are understood by GSM module and can react consequently. There are various AT instructions like ATA for answer a call, ATD to dial a call, AT+CMGR to read the message, AT+CMGS to send the SMS etc. AT instructions should be followed by Carriage return i.e. \r (0D in hex), like "AT+CMGS\r". We can use GSM module using these instructions:

ATE0	- For echo off
AT+CNMI=2, 2,0,0,0 <ENTER>	- Auto opened message Receiving.
ATD<Mobile Number>; <ENTER>	- making a call (ATD+919610126059; \r\n)
AT+CMGF=1 <ENTER>	- Selecting Text mode
AT+CMGS="Mobile Number" <ENTER>	- Assigning recipient's mobile number

>>Now we can write our message

>>After writing message

Ctrl+Z send message command (26 in decimal).

ENTER=0x0d in HEX

ULN2003

ULN2003 is used as an interface between power loads and low-level circuits. It is high voltage, high current device. ULN2003 uses Darlington pair transistors for getting higher current ratings. ULN2003 is preferred for interfacing with stepper motor which in turns requires very high current ratings.

Relays

A relay is electromechanical switch. It means that it has both electrical and mechanical operation in it. The relays work on the principle of electromagnet. Electromagnet pulls the contact to change the position of the switch. Fig. 3.3 explains the working relay's circuit diagram.

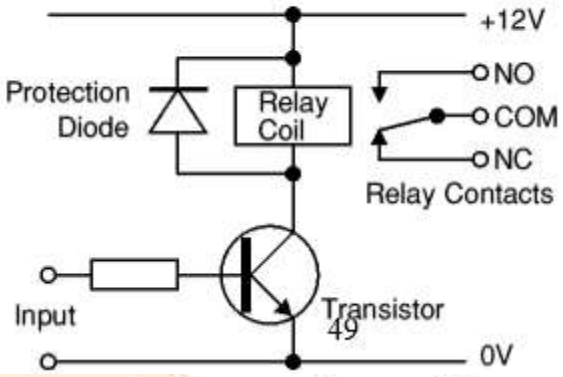

Fig. 3.3: Working Relay

The relay's switch connections are usually labelled COM, NC and NO:

- COM = Common, always connect to this; it is the moving part of the switch.
- NC = Normally Closed, COM is connected to this when the relay coil is off.
- NO = Normally Open, COM is connected to this when the relay coil is on.
- Connect to COM and NO if you want the switched circuit to be on when the relay coil is on.
- Connect to COM and NC if you want the switched circuit to be on when the relay coil is off.

16x2 LCD Display

LCD (Liquid Crystal Display) panel is an electronic show unit and find a wide variety of usage. A 16x2 LCD display is a basic element and is very regularly used in a variety of devices and circuits. These units are favoured more than seven segments and other multi segment LEDs. The motive being: LCDs are cost-effective; effortlessly programmable; have no drawback of displaying special & even custom characters , animations and so on. Displaying 16 characters/line and there are two such lines can be described by the 16x2 LCD. In this LCD every character is presented in 5x7 pixel matrix. This LCD has 2 registers, that is, Command and Data.

The command register stores the command instructions given to the LCD. An instruction given to LCD to do a predescribed assignment like starting the process, clearing the display, assigning the cursor position, managing the display etc is known as command. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

IV. RESULT, DISCUSSION AND CONCLUSION

The scheme "GSM based house computerization" has been successfully designed and tested. Integrating features of all the hardware components used have developed it. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly, using extremely advanced IC's and with the help of rising technology the scheme has been effectively put into practice. In Arduino we are emerging as a technology with high potential. The last decade observer the uprising of Microcontroller based schemes. With consideration to the needs congregate the physical work and the difficulty in including can be attained with the help of electronic devices.

A very simple program has been proposed for the interfacing of Arduino and the house domestic devices. We have demonstrated the working of this program on the real time domestic devices. In our house computerization scheme, we have considered a limited number of domestic devices for use. Thus the number of domestic devices can be increased by improving the program used for interfacing purpose. The advantage of using GSM is that we manage our domestic devices from even a large range by controlling it through a message. Also this scheme will help in energy conservation. Our paper has shown the possibility that controlling the home domestic devices through our gadgets is quite a feasible task and the particular set of domestic devices to be controlled can help us manage our domestic devices properly. In future, the use of computerized schemes will be more and at that time this home computerization scheme will be very useful. Some of the future scopes for this scheme are-

1. Voice announcement scheme can be added to indicate device conditions. We can add voice announcement scheme along with the buzzer so if there are harmful parameters identified then particular voice message will be pronounced.
2. We can add fingerprint sensor as an alternative of password based door operating. So entry will be allowed for the endorsed individual using their fingerprints.

3. We can monitor and control more constraint and devices. We can put into action other related modules like fire sensor, wind sensor.

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