IMPLEMENTING HOME AUTOMATION SYSTEM USING LABVIEW AND GSM

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Abstract— Home automation is a house that has able control over the activities monitor regularly in daily routine life to achieve more familiar,security and safety life. A home automation is a home that is ready with special controlled wiring to enable defend to wireless control of automated home electronic devices by using GSM module using text messages.Home automation achievement depends on the LabVIEW programming. This progam contains numerous frameworks, for example GSM module, arduino uno , AC and DC control gadgets. Each of us needs solace and daily in our life. Numerous genuine frameworks utilized as a part of building don't have the give and the capacity to give clients all reassure and wellbeing that they require. Making a total framework is a major test in view of the need to make many controlling framework which can keep running in a similar time. The point of this venture is to delineate procedures output ideal use of home mechanization innovation, to guarantee whatever number users as could be expected under the technology having entry to the innovation most important for their requirements.

Index Terms— Arduino uno, GSM module, home automation, Lab VIEW.

I. INTRODUCTION

Home automation technology is a combined term for in order- and to control over system as we used in houses where the various appliances are communicating via remote control. The expertise can be used to monitor, warn and carry out functions according to selected criteria. Home automation expertise also makes the regular message with the locale possible via the Internet, commonplace fixed telephones or mobile phones. This system used the modern GSM communication via text message. smart home utilizes superior innovation, organize correspondence modernism and programmed control innovation, which consolidates the subsystem into a control subsystem including lighting control, temperature monitor, AC and DC working appliance example air cooler, lighting system, door sensor and main house power supply switching system. In figure1 (a) model structure of the home automation system. As LabVIEW has a good interface and programming environment,this system is designed based on LabVIEW.
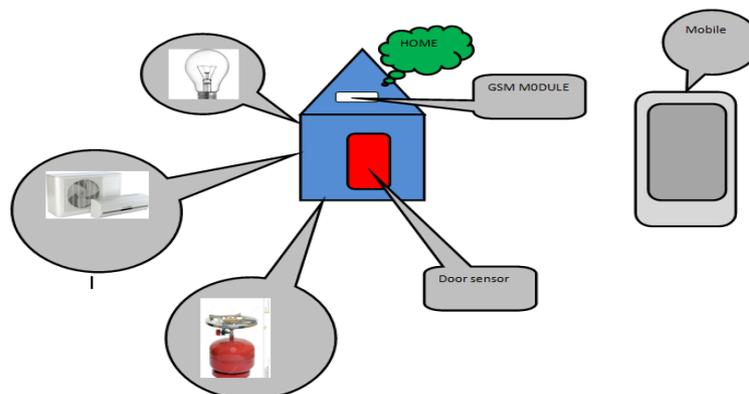

figure 1(a) model structure of home automation system

II. LITERATURE REVIEW

[1] "Visual Programming of an Interactive Smart Home Application using LabVIEW".In this paper they are implemented home application using the visual programming paradigm. From this we can implement by hardware so that user can manipulate power consumption and utilization.

[2] "Smart Home for Elderly Care, based on Wireless Sensor Network" In this paper ZigBee convention is a perfect determination for the temperature checking application. Media to convey they utilized.

[3] "Automation and Energy management of Smart home using LabVIEW "in this paper they implemented they developed a flexible modular smart home application using the visual programming paradigm and the LabVIEW environment. The main we power can be controlled via hardware through GSM.

III. OBJECTIVE AND MOTIVATION

Testing and monitoring arduino interface with LabVIEW by using NI makerhub and LINX tool. Understanding the network communication on NIVISA tool. Build the home appliances by using peripherals and control by LabVIEW.Control and monitoring Home appliances by using GSM module.
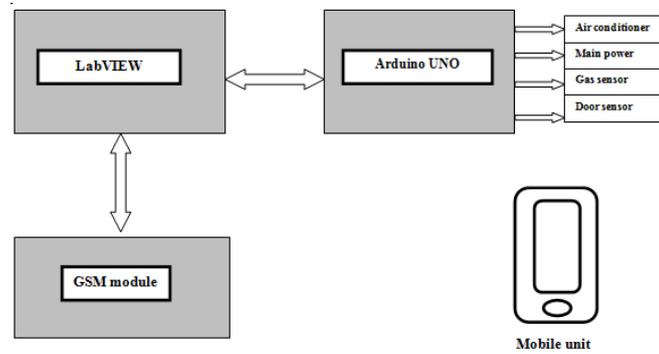
figure1(b) controlling home appliances control using labVIEW

Figure1(b) shows controlling home appliances control using labVIEW. In home automation the controlling of devices using GSM module. the home appliances like fan, air-conditioner(AC),lighting system. if gas get leakage so that authentication person will get a message. The LabVIEW programming used to control the appliances. The authentication person send a message to the GSM module so that appliances can be control.

IV. HARDWARE COMPONENTS
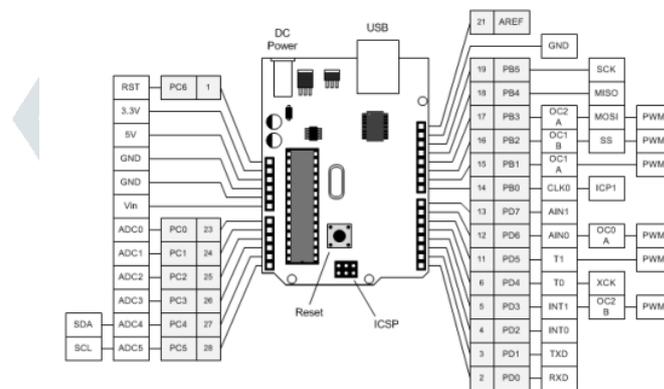### A. ARDUINO UNO

figure4(a) Arduino Uno Board

Arduino is an open-source physical platform based on microcontroller board having the ATmega328 series controllers and Integrated Development Environment for writing and uploading codes to the microcontroller. The figure4(a) shows the arduino uno It has input and output pins for interaction with the outside world such as with sensors, switches, motors and so on. To be precise it has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller .It can take supply through USB or we can power it with an AC-to-DC adapter or a battery Arduino acts as the processing module of the. system. It takes input from the gas sensor, process the data and gives the output to LEDS directly or through a relay and a transistor mechanism. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.
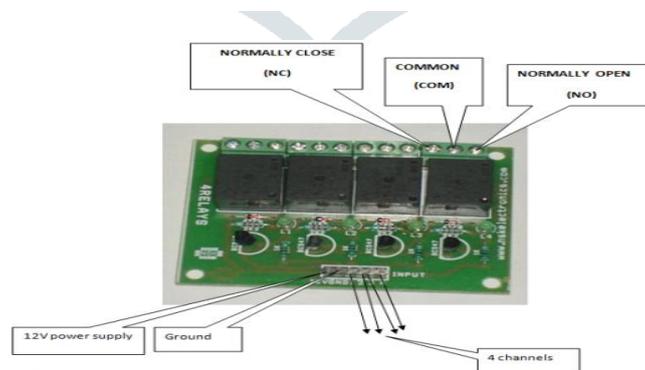
B. RELAY

figure4(b) relay board

We know that most of the high end industrial application devices have relays for their effective working. Relays are simple switches which are operated both electrically and mechanically. Relays consist of an electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. There are also other operating principles for its working. But they differ according to their applications. Most of the devices have the application of relays.

Figure 4(b) shows the small and easy to use 4 channel relay board. Use it to control four 240V power appliances directly from microcontrollers or low voltage circuits. Perfect for switching 240V appliances - lights, fans, etc, and even high power motors. Each relay has all three connections - Common, Normally Open, Normally Closed brought out in 3 pin screw terminals which makes it easy to make and remove connections. Board can accept both AC and DC voltages and comes with reverse polarity protection Onboard 4 mounting holes

for easy mounting In this project whenever high voltage supply has to be used then relay is used to provide isolation between low voltage circuitry and high voltage circuitry. Arduino is also used to provide control signal to relay whenever sense the signal from the arduino board and GSM module.

C. GSM MODULE

figure4(c) GSM module

GSM which stands for Global System for Mobile communications, reigns as the world's most widely used cell phone technology. Cell phones use a cell phone service carrier's GSM network by searching for cell phone towers in the nearby area. Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. The GSM SIM900 as shown in the figure4(c).GSM is the mobile cellular radio system operating at 900 MHz.. A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a microcontroller or computer, this allows the microcontroller or computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS as well as for control applications using GSM.

The GSM shield by Arduino is used to send/ receive messages and make/receive calls just like a mobile phone by using a SIM card by a network provider. We can do this by plugging the GSM shield into the Arduino board and then plugging in a SIM card from an operator that offers GPRS coverage. The shield employs the use of a radio modem by SIMComm. We can communicate easily with the shield using the AT commands. The GSM library contains many methods of communication with the shield. This GSM Modem can work with any GSM network operator SIM card just like a mobile phone with its own unique phone number. Advantage of using this modem will be that its RS232 port can be used to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily using this. The modem can either be connected to PC serial port directly or to any microcontroller through MAX232. It can be used to send/receive SMS and make/receive voice calls. It can also be used in GPRS mode to connect to internet and run many applications for data logging and control. In GPRS mode you can also connect to any remote FTP server and upload files for data logging This GSM modem is a highly flexible plug and play quad band SIM900A GSM modem for direct and easy integration to RS232 applications. It Supports features like Voice, SMS, Data/Fax, GPRS and integrated TCP/IP stack.

D. SERIAL COMMUNICATION–RS232

figure4(d) serial communication RS232

A popular way to transfer commands and data between a personal computer and a microcontroller is the use of standard interface, like the one described by protocols RS232 (older) or USB (newer).the figure 4(d) shows the serial communication through RS232, This chapter is devoted to communication conforming to RS232 protocol, the hardware for such interface is provided onboard. An example will be presented showing the processing of commands received through RS232 interface, and sending of a string of numbers using the same interface.

GETTING STARTED

1. Insert SIM card: Open the SIM cardholder by sliding it as per the arrow mark and lift up. Insert the SIM card, so as to align the chamfered corner suits in card holder .After inserting the SIM card, lock the holder by sliding it to the opposite direction of arrow mark.
2. Connect The Antenna: Fix the Supplied RF antenna to the SMA Antennae connector and tighten it by Rotating the Nut (Never rotate the antennae for tightening).
3. Power the Modem: Power the modem from suitable power supply, which is having enough current capacity (>1A).
4. Check the Status of the LEDs: PWR LED - Red LED will lit immediately STS LED - Green LED will lit after 1-2 seconds NET LED -Blue LED will starts to blink in fast for few seconds (Searching for Network) and becomes slow blinking once the Modem registers with the Network.
5. Network LED The Network LED indicates the various status of GSM module e.g. Power on, Network registration & GPRS connectivity. When the modem is powered up, the status LED will blink every second. After the Modem registers in the network (takes between 10-60 seconds), LED will blink in step of 3 seconds. At this stage you can start using Modem for your application

V. SOFTWARE
LabVIEW

Lab VIEW stands for Laboratory Virtual Instrumentation Engineering Workbench. It started in 1983 by a company National Instruments which famously stands for NI. NI Lab VIEW is a graphical development platform designed for engineers and scientist. Like C, JAVA, the Lab VIEW software is known as G language. Lab view is mainly designed for complex problems [3]. Lab VIEW is a graphical programming language used to create programs called VI which are in a pictorial form called a block diagram, which eliminates a lot of the syntactical details of other programming languages like C and MATLAB that use a text based programming approach. Lab VIEW is available for all the major platforms and is easily portable across platforms. It is simple and flexible, since it is a graphical approach no need of writing programs of 100 lines like other program languages. Each VI has two windows-Front Panel and Block Diagram windows. Front Panel is user interface which has controls and indicators. Block Diagram is program code which shows data travels on wires from controls through functions to indicators. The major drawback for Lab VIEW not into application is its cost. Thus presently Lab VIEW application are restricted to only high scale applications in industrial levels and yet to shift on the home level. The advantage of Lab VIEW in home automation not only makes it easier to design but also increases the accuracy and speed of the system.

LINX

It is an open source project by Diligent and is designed to make it easy to develop embedded applications using LabVIEW. LINX includes VIs for over 30 of the most common embedded sensors as well as hardware agnostic APIs for accessing peripherals like digitalis I/O,analog,I/O,PWM,I2C,SPI,andUART.

Whether you're remotely controlling a chip KIT or Arduino over USB/Serial, Ethernet or Wi-Fi, or deploying VIs to run on BeagleBone Black or Raspberry Pi 2/3, LINX and LabVIEW make it easy visualize the data you're working with, debug your code, and create advanced embedded applications faster than ever before.

NI-VISA Overview

National Instruments' implementation of the Virtual Instrument Software Architecture API, commonly referred to as NI-VISA. You can use NI-VISA to communicate with most instrumentation buses including GPIB, USB, Serial, and Ethernet. It provides a consistent and easy to use command set to communicate with a variety of instruments. One of VISA's advantages is that it uses many of the same operations to communicate with instruments regardless of the interface type. For example, the VISA command to write an ASCII string to a message-based instrument is the same whether the instrument is Serial, GPIB, or USB. Thus, VISA provides interface independence. This can make it easy to switch interfaces and also gives the users who must program instruments for different interfaces a single language they can learn.

VISA is also designed so that programs written using VISA function calls are easily portable from one platform to another. VISA does this by defining its own data types. This prevents problems like, for example, possible problems caused by moving from one platform to another where the size of an integer may be different. In other words, a LabVIEW application written with VISA calls can be easily ported to another platform that supports LabVIEW. Several operating systems are supported, including Windows XP/64, Windows 2000/ME/98, MAC OS X/9/8, some Linux distributions, as well as some.Solarisdistributions.

VISA's greatest advantage is that it is an extremely easy language to learn. VISA provides a very simple-to-use API that has bus independent functions for most of its I/O functionality. VISA provides the most commonly used functionality for instrumentation in a very compact command set, eliminating the need to learn low level communication protocols for multiple bus types.

**A Typical VISA Application**
- Open a Session to a given Resource.
- Do any configuration on the given resource (setting baud rates, termination   character, etc...).
- Perform writes and reads to the device.
- Close the Session to the Resource.
- Handle any errors that may have occurred

GENERALLY WANTS TO SEND SMS USING GSM MODULE FOLLOWING COMMANDS TO FOLLOW
1)AT+CMGF=1 command sets the GSM modem in SMS Text Mode or SMS PDU Mode
2)AT+CSCA="MOBILE NUMBER"reading the service centre address.
3)AT+CMGS="Send SMS Command in Text Mode.

To send SMS ad receive following resource are used
VISA Configure Serial Port
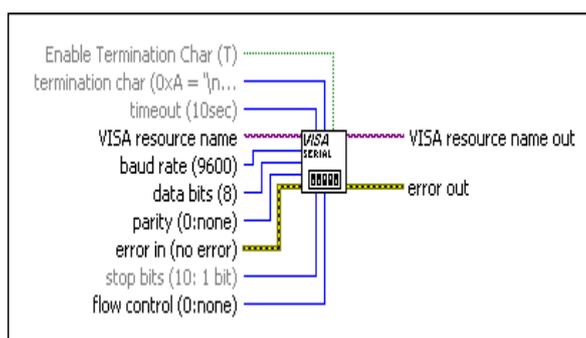
Enable Termination Char prepares the serial device to recognize **termination char**. If TRUE (default), the VI_ATTR_ASRL_END_IN attribute is set to recognize the termination character. If FALSE, the VI_ATTR_ASRL_END_IN attribute is set to 0 (None) and the serial device does not recognize the **termination char**.

termination char calls for termination of the read operation. The read operation terminates when the **termination char** is read from the serial device. 0xA is the hex equivalent of a linefeed character (\n). Change the **termination char** to 0xD for message strings that

terminate with a carriage return (\r).

`[U32]` **timeout** specifies the time, in milliseconds, for the write and read operations. The default is 10000.

`[I/O]` **VISA resource name** indicates the asset to be opened. The VISA asset name control likewise indicates the session and class.

`[U32]` **baud rate** The **baud rate** is the **rate** at which in a row is transferred in a contact channel. In the serial port situation, "9600 **baud**" means that the serialized port is capable of transfer a maximum of 9600 bits per subsequent.

`[U16]` **data bits** is the number of bits in the incoming data. The value of **data bits** is between five and eight. The default value is 8.

**`[◄►]`** **parity** specify the equality used for every structure to be transmit or occupied.

`[≡≡]` **error in** describes error conditions that occur before this node runs. This input provides standard error in functionality.

`[U16]` **stop bits** specifies the number of stop bits used to indicate the end of a frame. This input accepts the following values.

10	1 stop bit
15	1.5 stop bits
20	2 stop bits

`[I/O]` **VISA resource name out** is a copy of the VISA resource name that VISA functions return.

`[≡≡]` **error out** contains error information. This output provides standard error out functionality.
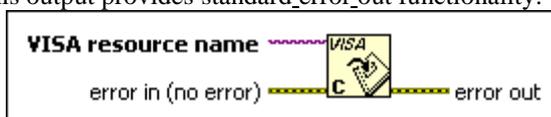
`[I/O]` **VISA resource name** specifies the resource to be opened. The VISA_resource_name control also specifies the session and class.

`[≡≡]` **error in** describes error conditions that occur before this node runs. With the following exception, this input provides standard error in functionality. This node runs normally even if an error occurred before this node runs.

`[≡≡]` **error out** contains error information. This output provides standard error out functionality.

LINX IN

Send SMS
Serial Port
Specifies the COM port of the remote LINX device.
Baudrate override When specified, allows the user to override the dfault baud rate used for serial communication. By default LINX establishes communication using a baud rate of 9600 and then negotiates for the remote LINX device's maximum supported baud rate and re-establishes communication at that maximum rate. If a Baud Rate Override input is provided it will be maximum baud rate used. This is useful when using UART abstractions that are not able to change baud rates on the fly (Xbee for example).
ErrorIn
Describes error conditions that occur before this node runs. This input provides standard error in functionality.
 Outputs
LINX Resource :Contains LINX connection resources.
Device Name :The name of the remote LINX device.
Error Out :Contains error information. This output provides standard error out functionality.
Digital write channel

Inputs
- **LINX Resource**
- Contains LINX connection resources.
  DO Channel Specifies the digital output channel to write to.
- **Output Value** Specifies the digital value to write.
- **Error In Describes blunder conditions that happen before this hub runs. This info gives standard mistake in usefulness**
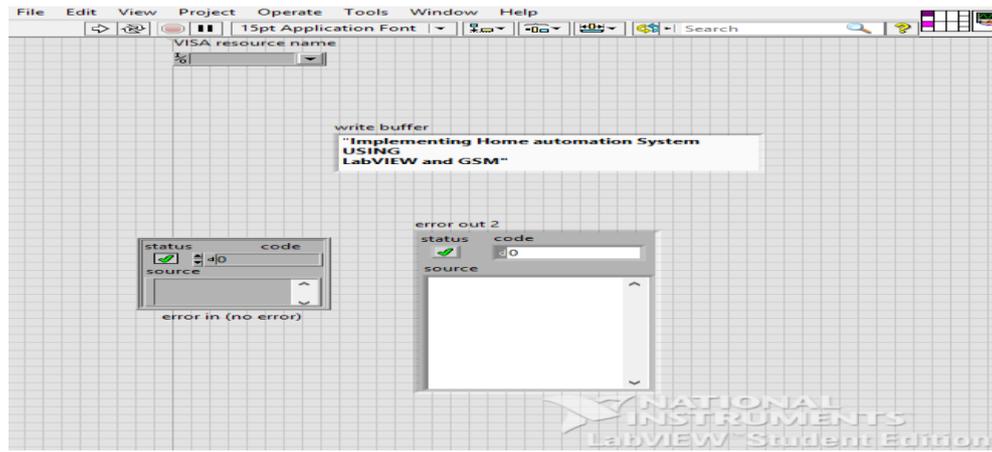
To send SMS
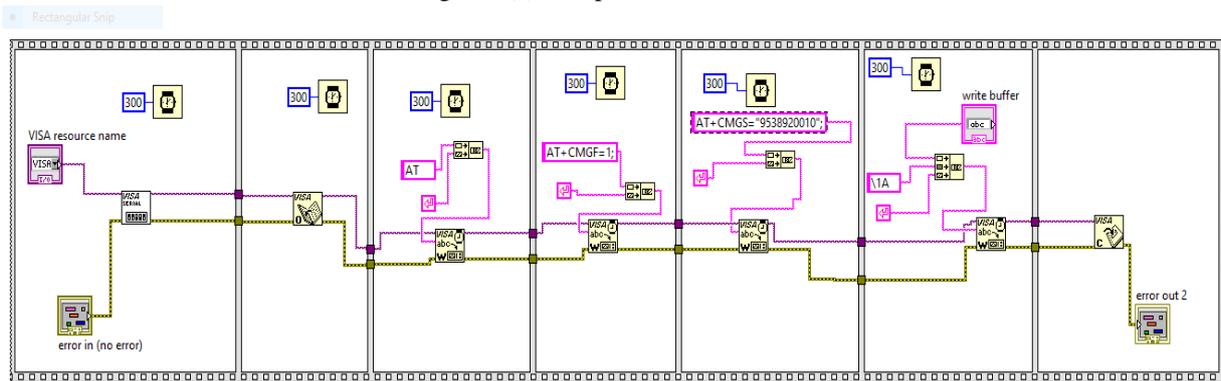

figure 5(a)front panel to send SMS

figure 5(b) block diagram to send SMS

Receive SMS

In the figure 5(a) and (b) shows the send SMS using GSM module and LabVIEW software. Using AT commands. In figure 5(c) and (D) shows the receive SMS using GSM and LabVIEW software
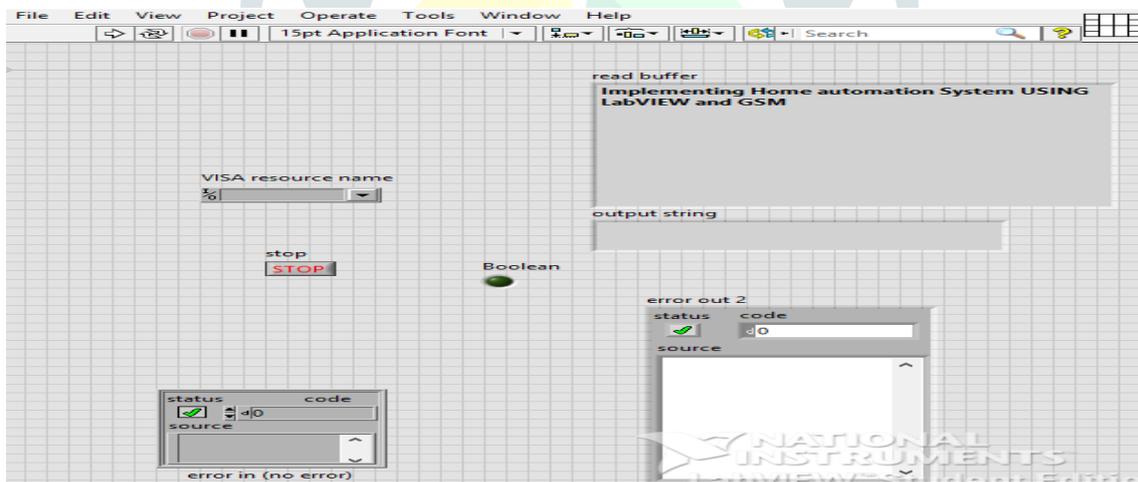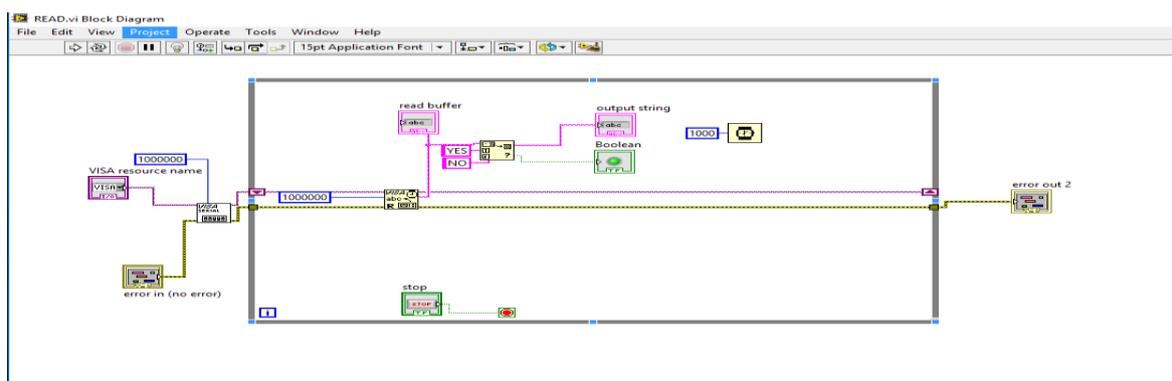

figure 5(c)front panel receive SMS

Figure5(d)block diagram of to send SMS
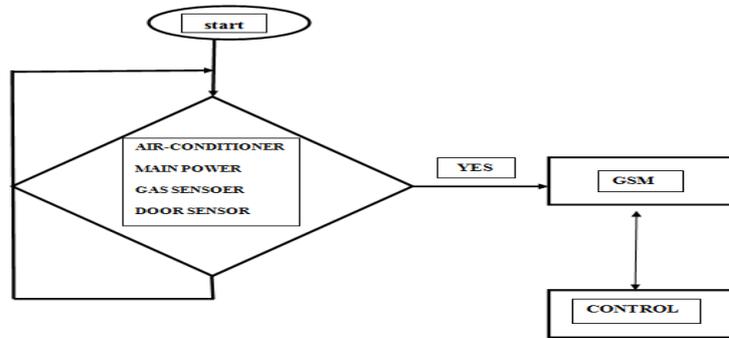
Design and flowchart

figure 5(e)design flow chart

From the basic sending and receiving SMS we can built our home automation system.LabVIEW takes different contributions from associated sensors and procedures it as indicated by characterized program and afterward it gives consistent output to entire house's energy framework. Its extra components is that it is having power assurance framework likewise, so when any blame happens inside home the insurance framework instantly traps the primary power source .the design flow follow the flow chart.as shown in the above.

VI. RESULT
To turn ON AC

Figure 6(a) shows the when SMS send through mobile phone example to turn ON Air-condition send as "ac on" similarly in figure 6(b) to turn OFF Air-condition send as ac OFF" the ac will be OFF by text message.
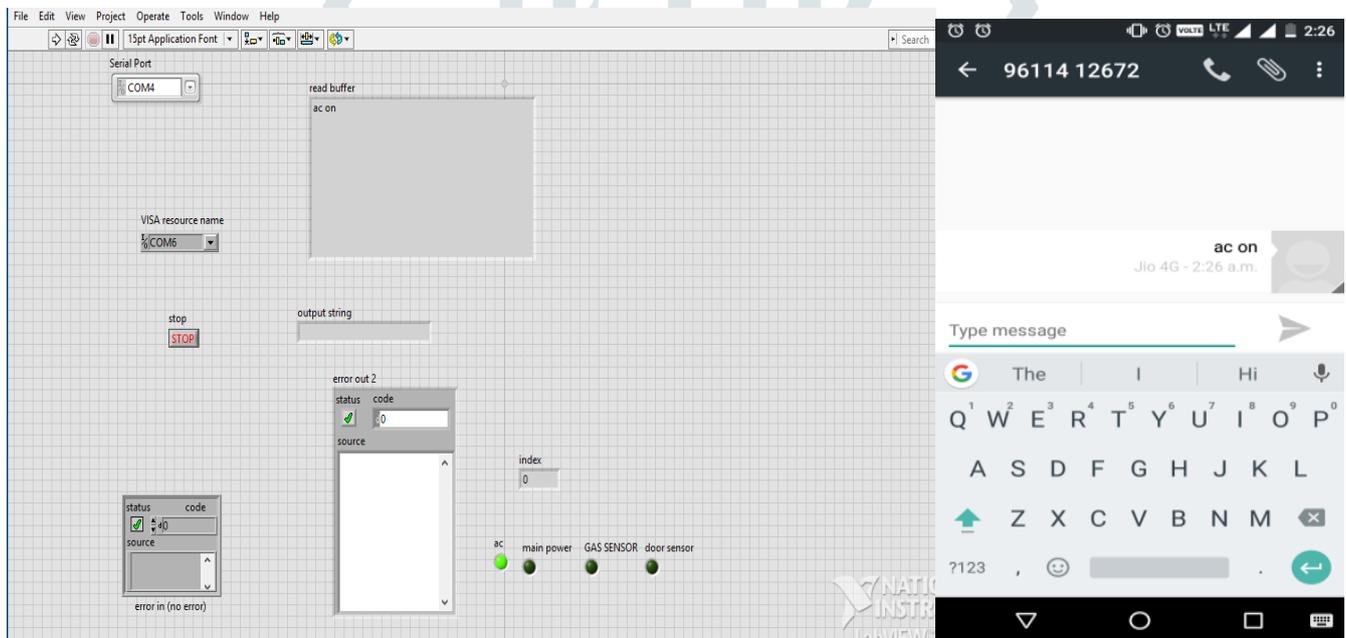

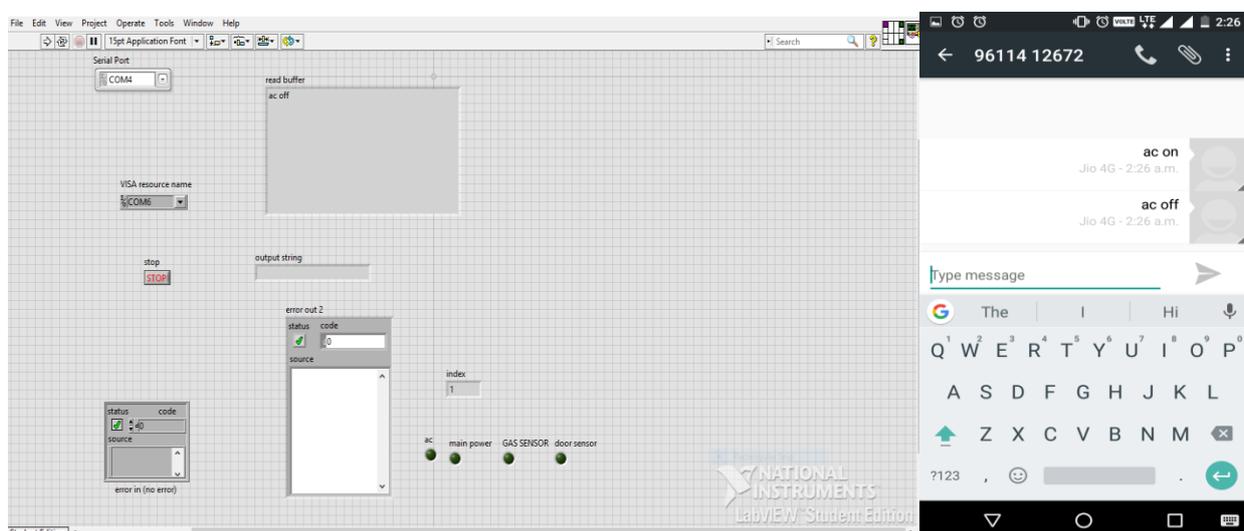figure 6(a)front panel To turn ON AC sending SMS

Turn off AC

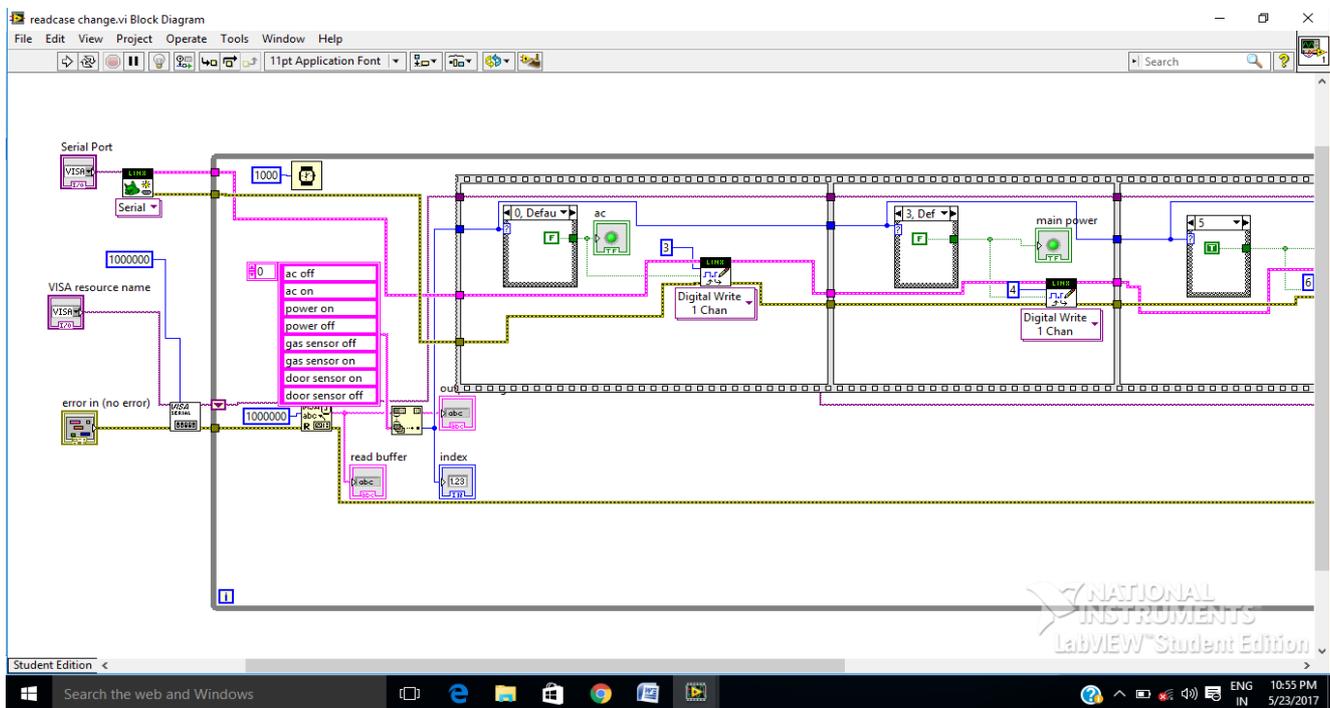figure 6(b))front panel To turn OFF AC sending SMS

figure 6(c) Block diagram To turn ON/OFF AC sending SMS

V. CONCLUSION

This review utilized LabVIEW as the improvement and usage home robotization system utilized to straightforwardly build up an easy to use interface amid the programming stage.In the control mechanism , the indicate point correspondence with remote system comprising of GSM module. In the proposed system, the system and GSM are utilized to present remote control capacities. Subsequently, the straightforward neighborhood end checking system can have the wireless control work. Other than working remotely, the system can be associated through PC or insightful cell phones. GSM module can likewise be utilized to messages for framework observing, hence upgrading the system adaptability.

REFERENCE

[1] Dimitrios Giannakis and Apostolos Meliones,Visual Programming of an Interactive Smart Home Application using LabVIEW, Department of Digital Systems, University of Piraeus

[2] RasikaS, Ransing, Manita Rajput Smart Home for Elderly Care, based on Wireless Sensor Network.

[3] T.Sivachandrabanu, J.Ashley Jenifer,A.Darwin Jose Raju Automation and Energy management of Smart home using LabVIEW , St.Xavier's Catholic College of   St.Xavier's Catholic College of St.Xavier's Catholic College of Engineering Engineering Nagercoil, India 629003

[4] Dr. Basil Hamed, "*The Design and Implementation of Smart House Control Using Lab VIEW*", International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Vol. 1, Issue-6, January 2012.

[5] Abhishek Anand ,Kunal Kumar, Anand Sharma, Aditya Kumar, , , Ajit Singh Pawar & Ajay Kumar, "Vision of Smart Sustainable Home & Home Application Made Real, Using Lab VIEW" , Undergraduate Academic Research Journal (UARJ), ISSN : 2278 – 1129, Vol.1, Issue-2, 2012.

[6] B V Sumangala & K Bhargava Ram, "Advantages of Lab VIEW over Embedded System in Home Automations", International Conference on Advancement in Engineering Studies & Technology, ISBN : 978-93-81693-72-8, 15th JULY, 2012.

[7] Guneet Kour, Jaswanti, " Lab VIEW Based Alarm Systems In Home", ISSN 2250-0987 Jaswanti et al, UNIASCIT, Vol 2, Issue-3, pp. 305-307, 2012.

[8] Janani Prasad, Indumathi.S, " Energy Conservation in smart home using Lab VIEW ", International Conference on Computing and Control Engineering (ICCCE 2012), 12 & 13 April, 2012 ISBN 978.

[9] Tai-Hoon Kim and Rosslin John Robles "A Review on Security in Smart Home Development", International Journal of Advanced Science and Technology Vol. 15, February, 2010.

[10] Jingzhi,Xu "Smart Home." And Business Aspects of the Internet of Things, 13, 2009.

[11] http://www.ni.com/labview/