Smart Home Automation Using LabVIEW Software

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***Abstract*—Smart home is a house that uses technology to monitor the environment with the help of various sensors, control the electrical appliances and communicate the outer world. Now-a-days the demand for home automation systems in homes and offices are invariably increasing. The home automation system is a key for energy conservation that can be equipped in normal buildings. The system is based on the LabVIEW software and can act as a security guard of the home. The system can monitor the temperature, light, fire & burglar alarm of the house and have infrared sensor to guarantees the family security. The monitored data is automatically stored into an excel file. The system can be connected to internet to monitor the security of home from anywhere in the world.**

Keywords: LabVIEW, Serial Port RS-232, Smart House, Sensors, Remote Control.

I. INTRODUCTION

A. Smart Homes

SMART homes can also refer as Intelligent Homes or Automated Homes. However, the term smart homes simply indicate the automation of daily chores with reference to the equipment in the house. Now a day, the demand for Home Automation system in homes and offices are increasing. With the recent expansion of communication networks, smart home applications can be further enhanced with new dimension of capabilities that were not available before. Smart house can also provide a remote interface to home appliances or the automation system itself, via telephone line, wireless transmission or the internet, to provide control and monitoring via a smart phone or web browser.

The smart house has two interfaces:

- Computer interfacing
- Remote control unit interfacing

Computer device that provided with LabVIEW software is the main controller unit for all systems in the house. It receives data from house sensors, process information and updates data for the difference systems, and transmit controlling signal to house systems and switching output devices. In addition, LabVIEW make the ability to monitor the important operations in the system to the users in order to be informed of the changes in the system. Users can also control the difference systems abilities, and chose the best system that required. In addition to LabVIEW interface for the smart house, remote control interfacing is available to control some applications in the house, and it is connected to LabVIEW software for other applications. Figure 1 shows the block diagram of the smart house. We present the design and implementation of a smart home which aims to define frame for remote monitoring and control of smart home devices via the internet. The design is based on wireless sensor network system of National Instruments. The programming is done using LabVIEW. For the sensing part, occupancy (PIR- passive infrared) sensor, infrared (IR) sensors, photo sensors and temperature sensors are used and for controlling part relays are used. We present the design of the system and implementation of it with all the aspects. Similar type of system can be used for various application related to building automation field.

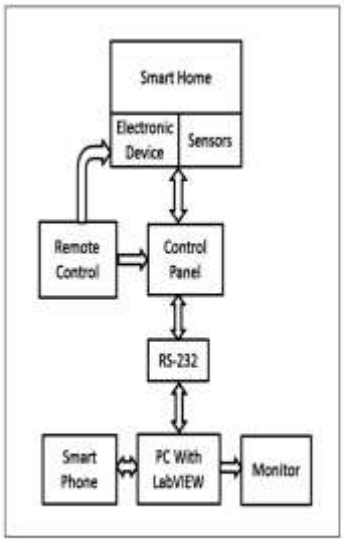

Fig 1. Block Diagram of Smart Home

B. LabVIEW:

LabVIEW stands for **Laboratory Virtual Instrumentation Engineering Workbench**. It started in 1983 by company National Instruments which famously stands for NI. NI

LabVIEW is a graphical development platform designed for engineers and scientist. Like C, JAVA, the LabVIEW software is known as "G" language. Lab view is mainly designed for complex problems. LabVIEW 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. LabVIEW 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. The advantage of LabVIEW in home automation not only makes it easier to design but also increases the accuracy and speed of the system**.**

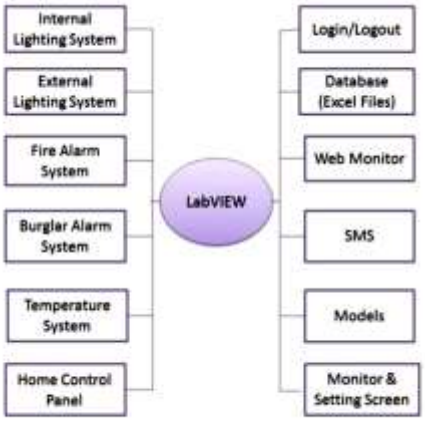

Fig2. LabVIEW Control of Smart House

1. **Design overview**

A. *LabVIEW Control*:

The Lab VIEW control the internal slighting, external lighting, fire alarm system, burglar alarm system, temperature system in the house.

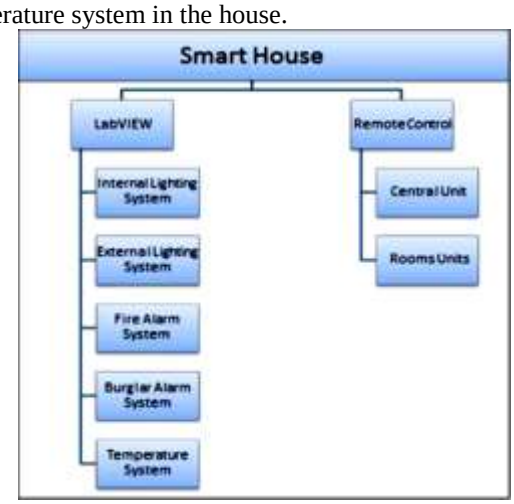

Fig 3. Smart House Control

a. Internal lighting System:

Smart home lighting system has many advantages:

- Lights in the house turn on automatically with one touch control.
- Turn off all the lights with a single touch.
- Free from shock hazards.
- Brightness can be controlled according to surrounding conditions.
- Power consumption will be less and leads to reduction of cost

The internal lighting system consists of a PIR motion sensor, dimmer and lamps which there are connected to Lab VIEW software program. If a person enters inside the house the system will make an automatic lighting in the house. Dimmer will give only a small percent of lamp lighting, and Lab VIEW will make 100% lamp lighting when it receives a movement signal from PIR motion sensor. When the PIR motion sensor detects a moving object, it will send a signal but it will be for a specific little time.

b. External lighting System:

External lighting system depends on the reading of sun cell. The DAQ will transform the analog signal got from the sun cell to digital signal and send it to Lab VIEW to analysts it. The Lab VIEW software program can select the time of morning and night time to control the status of external light lamps. The Lab VIEW software program will read and process the sun cell value and indicate to status of day _ morning or night _ in Lab VIEW front panel monitor screen.

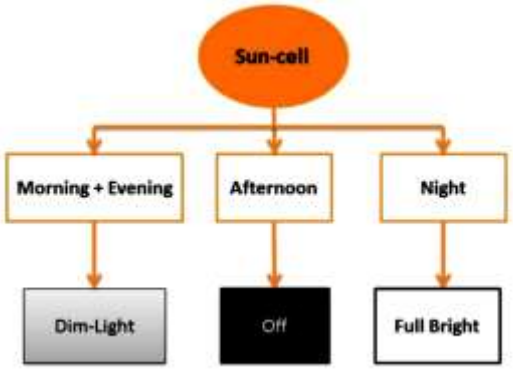

Fig4. External Lightning System

c. Fire Alarm System:

It is divided into three parts, the first part is the signal that reach from fire alarm system sensors as an indicator for announcing the outbreak of a fire in the house, the second part is the output signal that send after the processing of input signal, and finally the controlling system and data processing by LabVIEW. There are many types of sensors which used in fire alarm system. Smoke detector and heat detector are used in the smart house. For fire alarm warning and for control the spread of fire and smoke, three

applications are used to achieve the goal. We started with using alarm siren to generate a load wailing sound to express the presence of risk; moreover, we use gas solenoid valve to cut off the flow of gas to the house. In addition, the system will send a short message service (SMS) to house owner and to the firefighter's office to inform them of the existence of fire. LabVIEW will receive the signal from fire alarm sensor. After processing the input data, LabVIEW will send a set signal to alarm siren to make a load sound; also, this signal will set the gas solenoid valve to cut off the flow of gas to the house. Next to the implementation of those orders, LabVIEW will send a mobile message to inform the owner of the house about the risk of fire. After a specific time which can be adjusted as required, LabVIEW will send another SMS to the firefighting office to inform them for the need of help to fire suppression. To control the alarm siren set and gas solenoid valve reset by LabVIEW software program we ought to use driver between the DAQ and alarm siren and gas solenoid. So, two 5v relay are used to run the two devices . The first relay is N.O. relay and their contacts connect to 24 DC voltages to run the alarm siren. The second relay is N.C. relay and its contacts connected to 220 AC voltages to run the gas solenoid valve. The LabVIEW software program gives a flexibility to select the steps that the program should do. When a fire or Burglar exist, select if the system should run the alarm siren or not, and if it should send SMS or not.

d. Burglar Alarm System:

The design of Burglar alarm system is used in smart house system is similar to the design used for fire alarm system. It is divided into three parts; the first part is the signal that reaches from burglar alarm sensors when its trigger threshold has been reached after any a specific danger in the house. The second part is the output signal that send after the processing of input signal, and final part is the controlling system and data processing by LabVIEW.

e. Temperature System:

The basic element in temperature system is the reading of temperature value from temperature sensor. For that, LM35 temperature sensor is used. This sensor is connected directly with Rs-232. LabVIEW reads the signal from LM35 sensor as variable analog value. After processing the structure in the program, LabVIEW will send a cooling or heating signal to the system, depending on the value of the sensor and the critical value of temperature that required. In the mechanism of temperature system

II. Hardware Implementation

A. Communication using serial port:

LabVIEW can perform serial communication (either RS-232, RS-422, or RS-485 standards) using built-in or externally attached serial ports on computer. Serial communication uses a transmitter to send data one bit at a time over a single communication line to a receiver. Figure 5 shows a typical serial communication system. Serial communication is handy because most PCs have one or two RS-232 serial ports built in we can send and receive data without buying any special hardware.

Some newer computers do not have a built-in serial port, but it is easy to buy a USB to RS-232 serial adaptor for about the cost of a USB mouse. Although most computers also now have USB ports built-in, USB is a more complex protocol that is oriented at computer peripherals, rather than communication with scientific instruments. Serial communication is old compared to USB, but is still widely used for many industrial devices.RS-232 defines serial communication for one device to one computer communication port, with speeds up to 115 K baud (bits per second). Typically 7 or 8 bits (on/off signal) are transmitted to represent a character or digit. Serial communication has its uses and the LabVIEW Serial library contains ready-to-use functions for serial port operations.

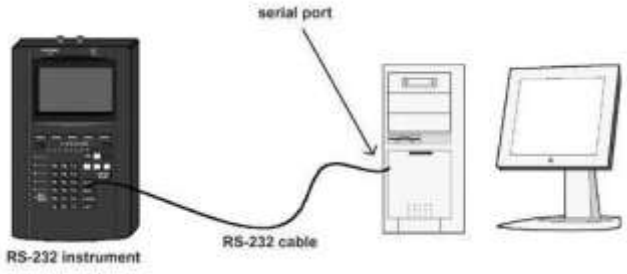

Fig5. System RS-232 instrument connected to computer via serial port

III. Data Acquisition System:

Data acquisition, or DAQ for short, is simply the process of measuring a real world signal, such as a voltage, and bringing that information into the computer for processing, analysis, storage, or other data manipulation. Physical phenomena represent the real-world signals you are trying to measure, such as speed, temperature, humidity, pressure, flow, pH, start-stop, radioactivity, light intensity, and so on. We use sensors (sometimes also called transducers) to evaluate the physical phenomena and produce electrical signals proportionately. For example, thermocouples, a type of sensor, convert temperature into a voltage that an A/D (analog to digital) converter can measure. Other examples of sensors include strain gauges, flow meters, and pressure transducers, which measure displacement in a material due to stress, rate of flow, and pressure, respectively. In each case, the electrical signal produced by the sensor is directly related to the phenomenon it monitors. LabVIEW can command DAQ devices to read analog input signals (A/D conversion), generate analog output signals (D/A conversion), read and write digital signals, and manipulate the on-board counters for frequency measurement, pulse generation, quadrature encoder measurements, and so on, to interface with the transducers. In the case of analog input, the voltage data from the sensor goes into the plug-in DAQ

devices in the computer, which sends the data into computer memory for storage, processing, or other manipulation.

IV. APPLICATIONS

- Useful in industries as well as in colleges.

V. FUTURE ENHANCEMENT

- In the future, the system can be improved by Internet of Things.

VI. REFERENCES

[1] 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.

[2] "Control4 Smart Home System using LabVIEW" Akshatha N Gowda(1), Girijamba D L(2), Rishika G N(3), Shruthi S D(4), Niveditha S(5), Department of Electronics & Communication Engineering, Bahubali College of Engineering, Shravanabelagola, Hassan Dist. IJESIT, Issue 3, May 2013.

[3] "Real Time System Development for Home Automation using LabVIEW" Dr. A.J. Patil1, Rajesh R. Karhe2, Mahesh S.Patil3 ,Principal, S.G.D. College of Engineering Jalgaon, (M.S.), India Assistant Professor, Department of Electronics & Telecommunication, S.G.D. College of Engineering, Jalgaon (M.S.) India**,** International JAREEIE, Vol. 2, Issue 4, April 2013.

[4] "Real Time Data Acquisition System for Smart Home using LabVIEW", 1Mr. Mahesh S. Patil ,2Mr.Sachin S. Nerkar,Govt. College of Engineering Jalgaon, International Journal of Science Spirituality, Business & Technology (IJSSBT), Vol. 2, No. 2, ISSN (Print) 2277—7261, May 2014

[5] "Energy efficient Smart home based on Wireless Sensor Network using LabVIEW" 1Jayashri Bangali, 2Arvind Shaligram ,1Kaveri College of Science and Commerce 2 Department of Electronic Science ,American Journal of Engineering Research (AJER) e-ISSN : 2320-0847 p-ISSN : 2320-0936 Volume-02, Issue-12, pp-409-413.