Design & Virtual Implementation of Savvy Home Control framework Using Lab VIEW

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Abstract

Savvy home is a house that utilizes information technology to monitor the environment, control the electric appliance and communicates with the outer world. A savvy home mechanization framework has been produced to naturally accomplish a few exercises performed often in day by day life to get more agreeable and less demanding life condition. An example, house condition screen and control framework of the Smart home is addressed in this paper. The framework depends on the Lab VIEW programming and can go about as a security monitor of the home. The framework can screen the temperature, lighting, fire and theft alert to ensures the family security. This paper presents the hardware implementation of a multiplatform control system for house automation using Lab VIEW. Such a framework has a place with an area for the most part named brilliant house frameworks. The approach combines hardware and software technologies. Lab VIEW results of the system have shown that it can be easily used for the smart home automation applications.

Keywords: Savvy home, Lab VIEW, fire caution framework, theft alert framework, inside light framework, outer light framework.

I. INTRODUCTION

Each of us needs solace and wellbeing in our life. Numerous genuine frameworks utilized as a part of building don't have the adaptability and the capacity to give clients all solace and wellbeing that they require. Making a finished framework is a major test as a result of the need to make many controlling framework which can keep running in a similar time. This work incorporates numerous frameworks which controlled by Lab VIEW, for example, fire caution framework, theft alert framework, inside light framework and outer light framework.

Savvy house; give clients an adaptability and productivity to control all frameworks. By Lab VIEW programming, clients can put an uncommon setup on setting screen with a specific end goal to enact any framework and to plan the run time for these frameworks. Lab VIEW has a screen which can demonstrate any adjustment in the house frameworks. Lab VIEW is interfacing with remote control which gives us the capacity to put numerous modes for our controlling framework.

II. LITERATURE REVIEW

Lab VIEW (Laboratory Virtual Instrument Engineering Workbench) is a system-design platform and development environment for a visual programming language from National

Instruments. Lab VIEW is commonly used for data acquisition, instrument control and industrial automation on a variety of operating systems (OSs), including Microsoft Windows, various versions of Unix, Linux, and macOS. The latest versions of Lab VIEW are Lab VIEW 2017 and Lab VIEW NXG 1.0, released in May 2017. LabVIEW integrates the creation of user interfaces (termed front panels) into the development cycle.

LabVIEW programs-subroutines are termed virtual instruments (VIs). Each VI has three components: a block diagram, a front panel, and a connector panel. The last is used to represent the VI in the block diagrams of other, calling VIs. The front panel is built using controls and indicators. Controls are inputs: they allow a user to supply information to the VI. Indicators are outputs: they indicate, or display, the results based on the inputs given to the VI. The back panel, which is a block diagram, contains the graphical source code. All of the objects placed on the front panel will appear on the back panel as terminals. The back panel also contains structures and functions which perform operations on controls and supply data to indicators. The structures and functions are found on the Functions palette and can be placed on the back panel. Collectively controls, indicators, structures, and functions will be referred to as nodes. Nodes are connected to one another using wires, e.g., two controls and an indicator can be wired to the addition function so that the indicator displays the sum of the two controls. Thus a virtual instrument can be run as either a program, with the front panel serving as a user interface, or, when dropped as a node onto the block diagram, the front panel defines the inputs and outputs for the node through the connector pane. This implies each VI can be easily tested before being embedded as a subroutine into a larger program.

Many researchers [1-5] named home environment monitoring systems as “smart home” and developed various systems to monitor home environment from any place. Shang- Liang Chen et al. [1] have developed multi sensor embedded intelligent home environment monitoring system based on digital signal processor and Wi-Fi. The major problem faced by researcher is interfacing of hardware and software. Lab View is systems engineering software for applications that require test, measurement and control with rapid access to hardware and data insights.

III. SAVVY HOME FRAMEWORK

This paper presents savvy house controlled by Lab VIEW that controls main system. The main system consists of five parts; these five parts are connected to Lab VIEW software as the main controller for these systems. The first subsystem in smart house project is security systems that include fire alarm system used in announcing the outbreak of a fire and work to extinguish the fire, and theft alarm system that signals the occurrence of a burglary. The second subsystem is lighting system that include the internal lighting of the house, and the ceil lighting outside the house. The third subsystem is remote control system for house controlling. The fourth subsystem is temperature system for air conditioner controlling. The fifth subsystem is Main house power switching system to switch the power supply for all rooms in the house.

The smart house has computer interface. Computer device that provided with Lab VIEW 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, Lab VIEW 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 Lab VIEW interface for the smart house, remote control interfacing is available to control some applications in the house, and it is connected to Lab VIEW software for other applications. Figure 1 shows the block diagram of the savvy home controlled using Lab VIEW.

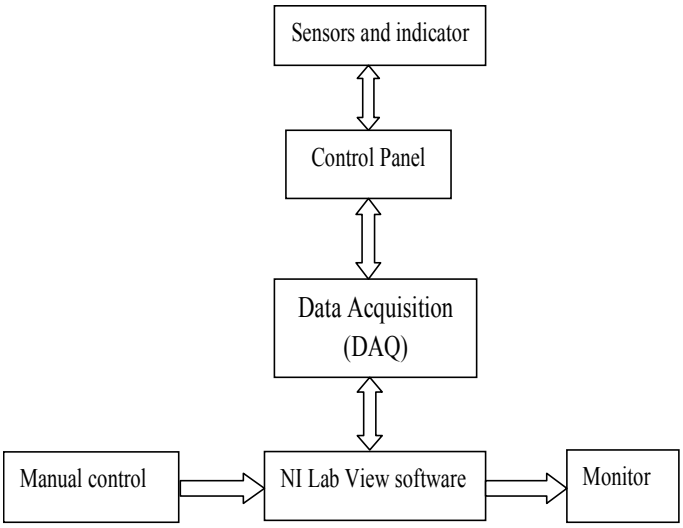

Figure 1. Block diagram of the Lab VIEW controlled savvy home.

IV. DESIGN

With technological advances, the controls in savvy house frameworks develop and incorporate new and refined techniques in view of various control projects and frameworks. In this paper Lab VIEW program is used to control different systems in savvy house. Figure 2 shows the various frameworks controlled by Lab VIEW software. The frameworks are namely fire caution framework, theft alert (Burglar) framework, inside light framework (Home light) and outer light (Garden light) framework and temperature systems in the house.

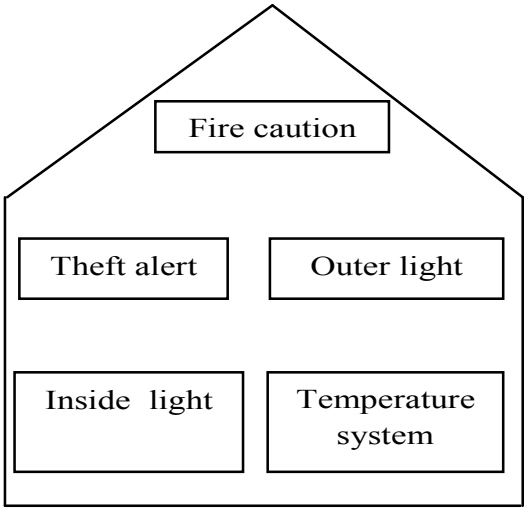

Figure.2. Savvy home control

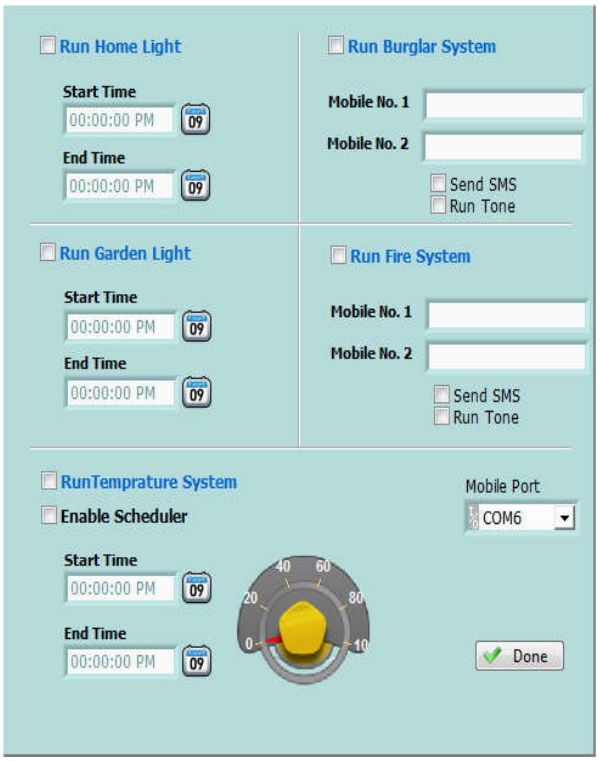

Figure3. Front panel of the Lab VIEW controlled savvy home.

Figure 3 shows front panel of the Lab VIEW controlled savvy home. The design of Lab VIEW control of these systems is presented as follows;

1. **Fire caution framework:** This framework 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 various types of sensors which can be 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. Initially started with using alarm siren to generate a load wailing sound to express the presence of risk; here gas solenoid valve is used 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. Lab VIEW will receive the signal from fire alarm sensor. After processing the input data, Lab VIEW 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, Lab VIEW 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, Lab VIEW 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 Lab VIEW software program, relay is used as a driver between the DAQ and alarm siren and gas solenoid. 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. Figure 4 shows fire caution alarm and gas solenoid valve relay implementation.

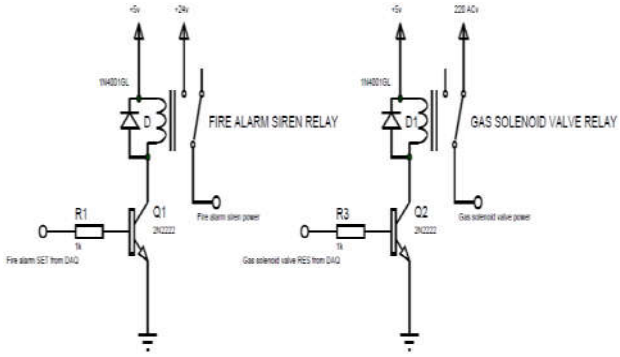

Fig.4. Fire caution alarm and Gas solenoid valve relay implementation

2. Theft alert framework: The design of Burglar alarm system 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 sends after the processing of input signal and final part is the controlling system and data processing by Lab VIEW. Figure 5 shows fire caution alarm implementation using Lab VIEW.

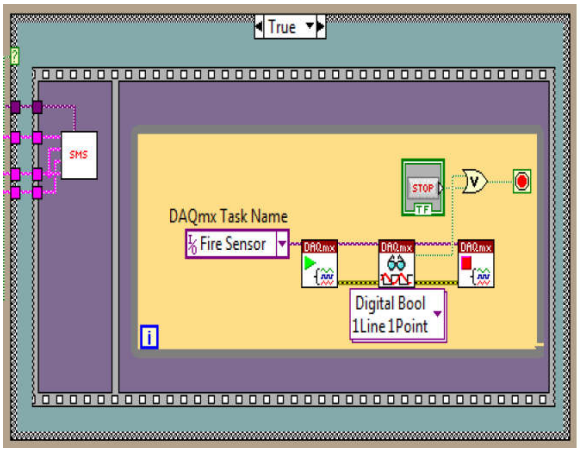

Figure 5 Lab VIEW circuit diagram fire caution alarm.

3. **Inside light framework:**The internal lighting system consists of a PIR motion sensor, dimmer and lamps which there are in contact with LabVIEW software program. This

system will make an automatically lighting in the house when there is any movement inside it. Dimmer can use to make a small lamp lighting percentage, and LabVIEW will make 100% lighting for the lamp when it receives a movement signal from PIR motion sensor and the user can scheduler the time of running the system. When the PIR motion sensor detects a moving object, it will send a signal but it will be for a specific little time. For this reason, 555 timer circuit is used to generate accurate time delays that will be more suitable for lamp lighting inside the house. User can monitor the system by the LabVIEW front panel monitor screen as shown in Figure 3. The LabVIEW block diagram of internal lighting system is shown in Figure 6.

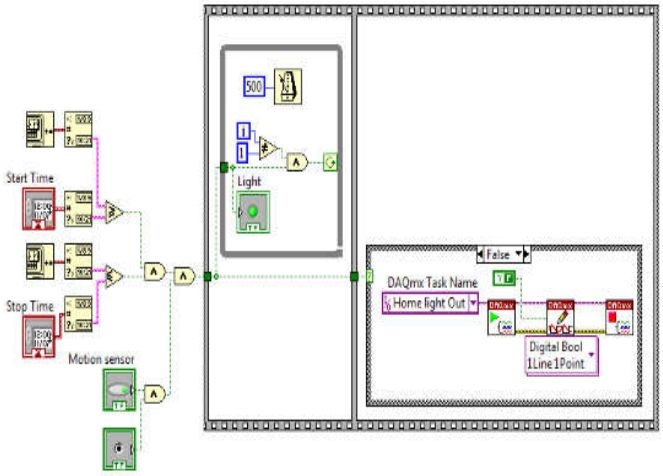

Figure 6. Inside light system circuit diagram

4. Outer light framework: 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 like morning or night. Outside light system circuit diagram is shown in Figure 7.

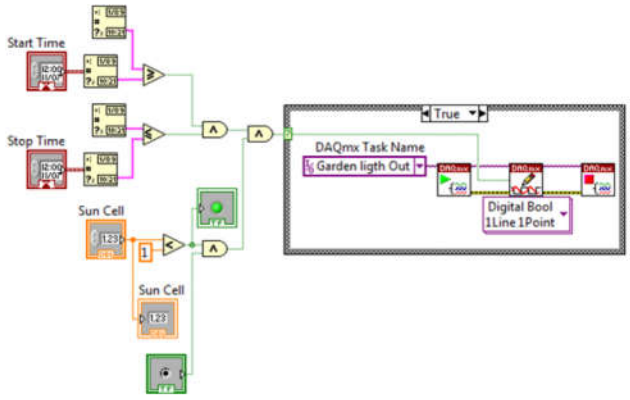

Figure7. Outside light system circuit diagram

5. Temperature framework: The basic element in temperature system is the reading of temperature value from temperature sensor. For that, thermocouple is used.

Thermocouple is connected directly with DAQ. Lab VIEW reads the signal from thermocouple as variable analog value. After processing the structure in the program, Lab VIEW 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 programming, PWM system is used to control the heating and cooling devices. TIP41 transistor is used, since it has the ability to switch on/off for several pulse in its base in a little period of time. By the Lab VIEW software program user can be monitor the system by the Lab VIEW front panel monitor screen

V. SUMMARY

Now a days savvy home technology is developing day by day. Savvy home is a smart house, which utilizes information technology to monitor the environment, control the electric appliance and communicates with the outer world. This paper describes the major frameworks like temperature, lighting, fire and theft alert to ensure security of the family. Hardware implementation of a multiplatform control system for house automation using Lab VIEW has been studied.

VI. CONCLUSION

Design and virtual implementation of savvy home control framework using Lab VIEW has been presented in this paper. The main task of this work is to control and monitor various systems in the house and outside the house using Lab View. The systems studied are namely fire caution framework, theft alert (Burglar) framework, inside light framework (Home light) and outer light (Garden light) framework and temperature systems. Hardware and software interfacing is done using NI Lab View software. Each system has been successfully implemented in the Lab View software. The author is expected this system can be connected to the internet to monitor and control the house equipment's from anywhere in the world.

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