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Control4 Smart Home System using Lab VIEW

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Abstract- Smart home is a house that has intelligent control over the activities performed frequently in daily life to achieve more comfortable and safety life. A smart home is a home that is equipped with special structured wiring to enable occupants to remotely control or program an array of automated home electronic devices by entering a single command. Information and Communication Technology (ICT) has recently been relocated into the house internal environment from an external entity. Smart home implementation is based on the Lab VIEW software. This project includes many systems such as, internal light system, external light system, burglary alarm system and temperature system. Each of us needs comfort and safety in our life. Many real systems used in building don't have the flexibility and the ability to give users all comfort and safety that they need. Making a complete system is a big challenge because of the need to make many controlling system which can run in the same time. The aim of this project is to map the processes yielding optimal utilization of smart home technology, to ensure as many users as possible having access to the technology most relevant for their needs.

Keywords: Smart home, Lab view, Security, Automation.

I. INTRODUCTION

A. Smart home

Smart home technology is a collective term for information- and communication technology (ICT) as used in houses, where the various components are communicating via a local network. The technology can be used to monitor, warn and carry out functions according to selected criteria. Smart home technology also makes the automatic communication with the surroundings possible, via the Internet, ordinary fixed telephones or mobile phones [7]. Smart home system uses advanced computer technology, network communication technology and automatic control technology, which combines the subsystem into a control system including lighting control, temperature control, fire and burglar alarm control, main house power supply switching system. The smart house has two interfaces

- Computer interfacing
- Remote control unit interfacing

In computer interfacing, Lab VIEW software is the main controller unit which controls all the subsystems in the home. In addition to Lab VIEW interface for the smart house, remote control interfacing is used to monitor internal lighting system, external lighting system, temperature system, burglary alarm system [1][2].

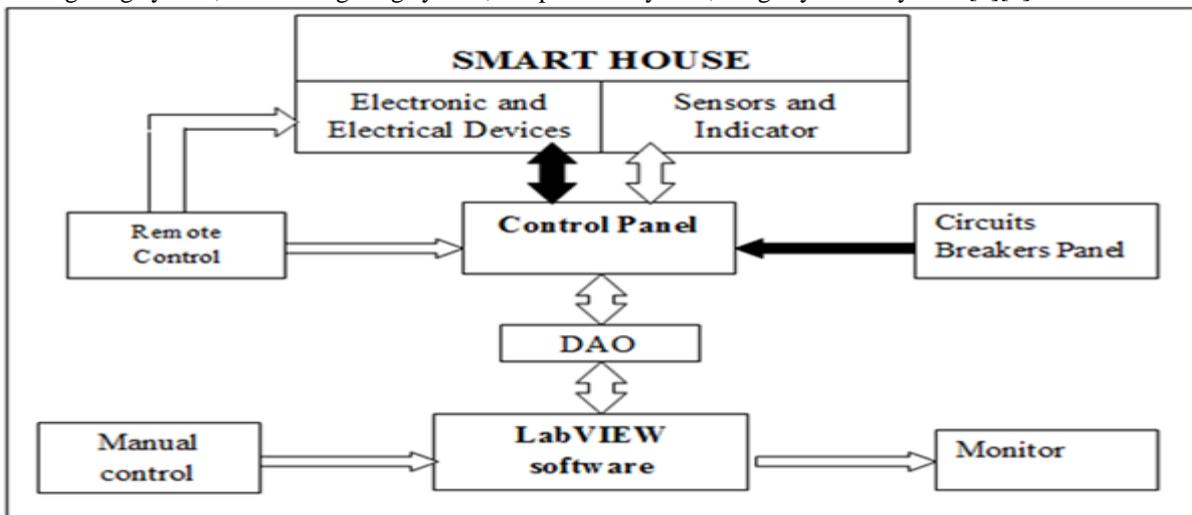


Fig. 1 Smart home block diagram



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Fig.1 shows the block diagram of smart home. Smart house mainly consists of electronic and electrical equipment's. They include sensors and indicators in order to sense and indicate the signal. All the subsystems are connected to Lab view software as the main controller unit of the system. Lab View takes various inputs from connected sensors and processes it according to defined program and then it provides logical output to whole house power system [2]. The main purpose of data acquisition is to measure an electrical phenomenon such as voltage, temperature, current and sound. DAQ hardware acts as the interface between the computer and the subsystems. It primarily functions as a device that digitizes incoming analog signals so that the computer can interpret them. The Lab VIEW software will control the internal lighting, external lighting, temperature, fire alarm, burglar alarm in the house. Each component usually performs a single function and there is no synchronization with other components [5]. The remote control is used to make some operation in the system by connection with Lab VIEW software. It is used to control and to switches the load in every room in the house using the room unit receiver in every room.

B. Lab VIEW

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.

II. DESIGN

Lab View takes various inputs from connected sensors and processes it according to defined program and then it provides logical output to whole house's power system. Its additional features is that it is having power protection system also, so when any fault occurs inside home the protection system immediately traps the main power source.

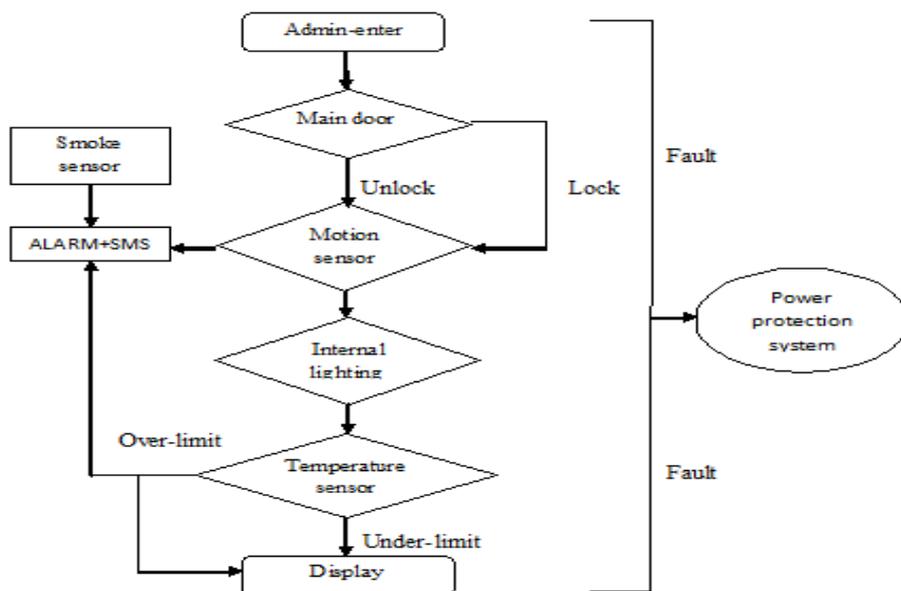


Fig. 2 Flow Chart for Smart House

1. LAB VIEW CONTROL

The Lab VIEW will control the internal lighting, external lighting, temperature, burglar alarm systems in the house.

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.

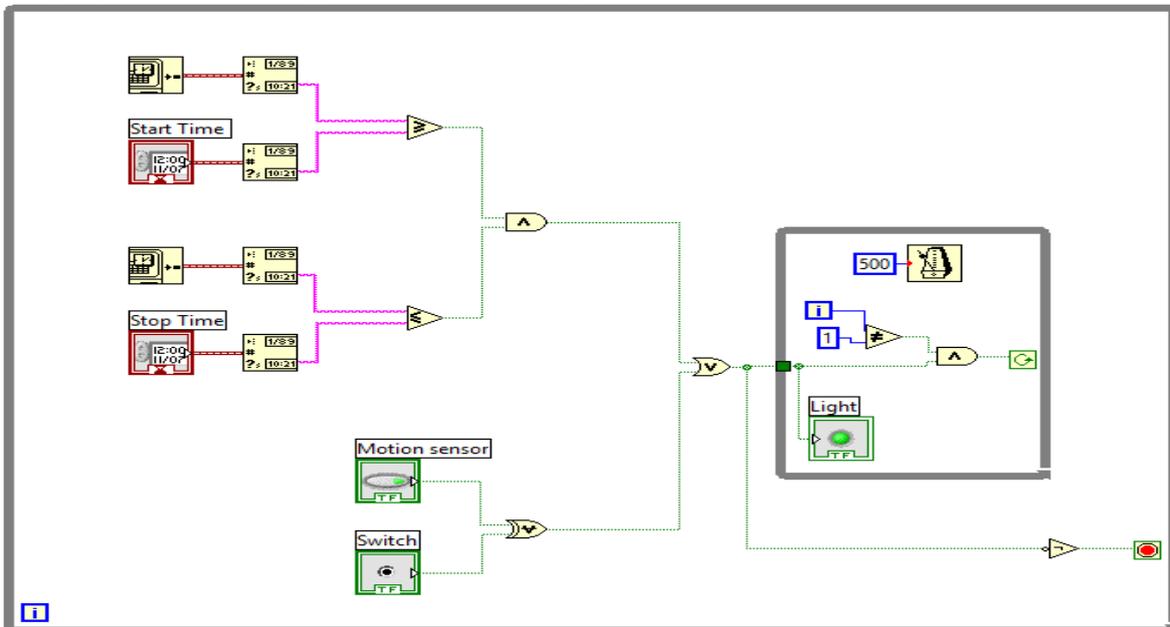


Fig. 3 Block diagram of internal lighting system

B. External lighting System

External lighting system depends on the reading of sun cell. Lab VIEW receives the digital signal from the DAQ which converts the analog signal received from the sun cell to digital signal and Lab VIEW will analysis it. Depending on the time of morning and night time the Lab VIEW software program control the status of external light lamps.

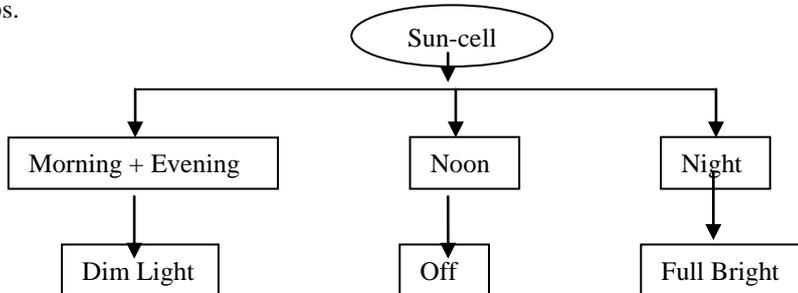


Fig. 4 External Lighting System

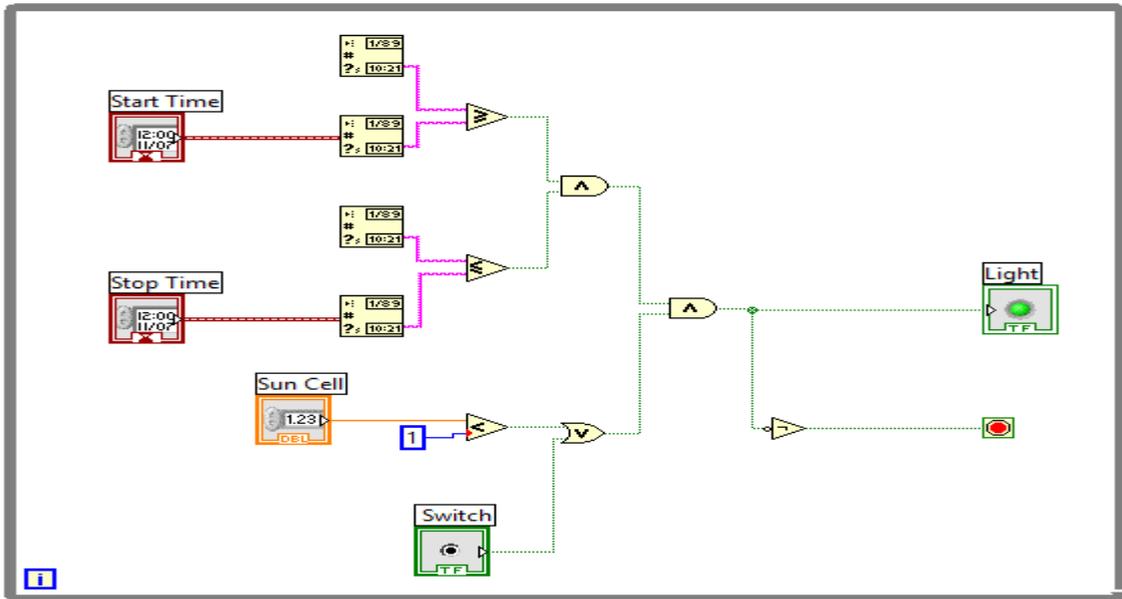


Fig. 5 Block diagram of External lighting system.

C. Temperature System

The main object in temperature system is the reading of temperature value from LM35 temperature sensor. The main use of LM35 temperature sensor is that it is the easiest of all the temperature sensors because it is an integrated circuit that outputs a voltage proportional to the temperature in degree Celsius and the sensor itself takes care of non-linear effects. LM35 sensor is connected directly with DAQ. Lab VIEW reads the signal from LM35 sensor as variable analog value. After processing, Lab VIEW will send a cooling or heating signal to the system.

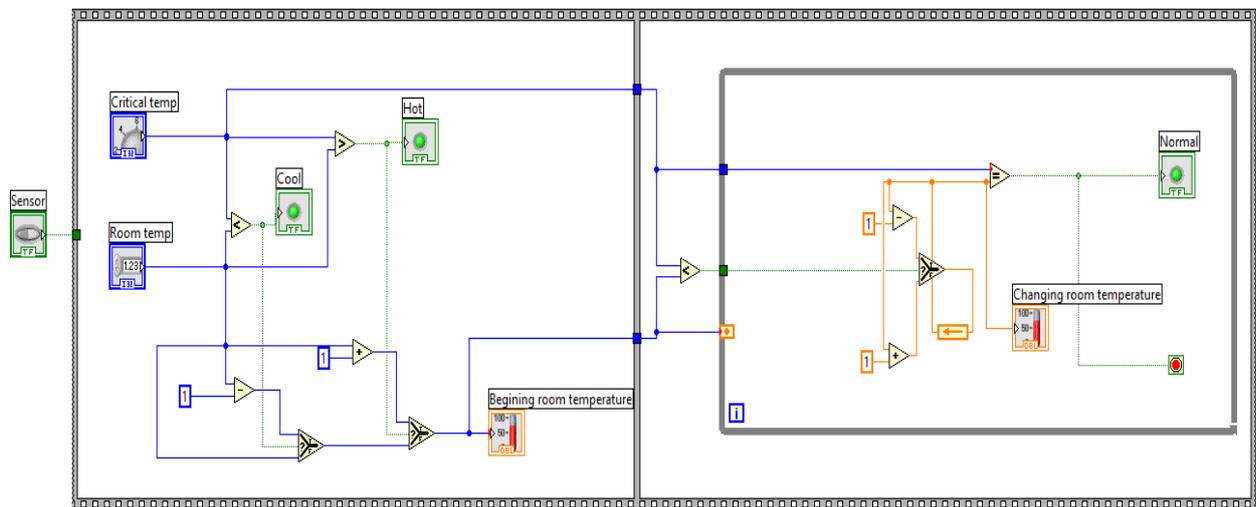


Fig. 6 Block diagram of Temperature system.

D. Burglar Alarm Systems

The LABVIEW software based home alarm system which act as a security guard of the home. The basic purpose of a home alarm system is to keep us and our family safe, and keep our home safe from crime. When the alarm is triggered, it emits a loud sound design to frighten away intruders. To protect home from unauthorized entities, consider an entry from front door only where keypad is connected. The home alarm system is created in lab view by setting a suitable code for alarm to work. The code for actual alarm is fixed. To run the home alarm system in lab view, the setup made as shown in Fig. 7, we assume that a person can enter the home through front door, the person will enter the code through keypad; if the code is not matched with the

fixed value of code then a written warning will be displayed, then buzzer alarm will ring. It is noted that after 3 seconds, our system automatically clears the code which we enter earlier.

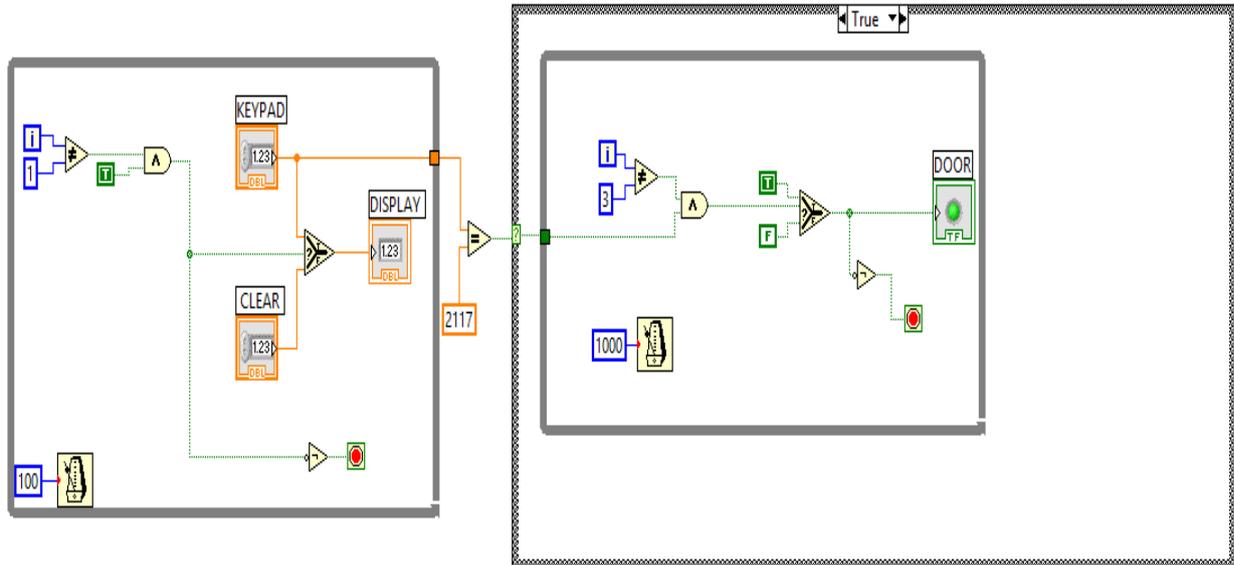


Fig. 5 Block Diagram of Burglar Alarm System

2. REMOTE CONTROL UNIT

Remote control unit is another interfacing device used in smart house application. Remote control used to send control signal to the central control unit in the system to make specific operation which is connected to Lab VIEW software. There are three parts in the remote control system that is transmitter unit, central receiver unit, and rooms receiver units. Transmitter unit enables the user to control the two difference receiver units. The receiver part in the remote control unit is Central receiver unit which is in contact with the Lab VIEW to make some central operation in the house. Room receiver unit is to control a room load via remote Control.

III. CONCLUSION

The main objective of this paper is to control the system and to monitor the internal lighting system, external lighting system, temperature system and security system. Smart home provides fully automatic, secured and energy efficient system. The smart home technology provides totally different flexibility and functionality than the conventional installations and environmental control systems. Also, the smart house system can be supported by remote control system as a sub controlling system using ELVIS kit. The system also is connected to the internet to monitor and control the house equipment's from anywhere in the world using Lab VIEW.

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