

SMART HOME AUTOMATION SYSTEM USING LABVIEW

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Abstract—The Intelligent home system is the use of latest computer technology, network communication technology and automatiion technology, which combines all subsystem into a whole control system to communicate with family, family equipment automatic control, family safety precautions. In this paper we have elaborate Smart Home System designed and created by utilizing Wireless network based on microcontroller. A sample house environment monitor and control system that is one branch of the Smart home is addressed in this paper. The system is based on the Lab VIEW software which is main controller of the system and can act as a security guard of the home. The system can monitor the temperature, humidity, lighting, fire & burglar alarm, gas density of the house and have infrared sensor to guarantees the family security. The system also has internet connection to monitor and control the house equipment's from anywhere in the world. This seminar presents the hardware implementation of a multiplatform control system for house automation using LabVIEW. This sytem is called intelligent home also. The approach combines hardware and software technologies.

Keywords—Smart House, LabVIEW,Data Acquisition Card, Remote Control.

I. INTRODUCTION

Home automation is the use of one or more computers to control basic home functions and features automatically and sometimes remotely. An automated home is sometimes called a smart home concluding the family communication, family equipment automatic control, family safety precautions. As development of the electronic technology and communication technology, people have the high requirements for daily life and work, the smart home is more and more widely applied. Smart House is not a new term for science society but is still far more away from people's vision and audition. We can easily control home's mechanical systems and appliances over your cellular phone or Internet, and the lighting in your home can be set to save your money when you leave the room. The Internet provides even more incredible access to information and services[1].

In early days, people want to know family condition at any place, what's more, when their home come problem, they will soon receive relevant information, so that remote monitoring becomes a very important function for smart home system. But use wire transmission way can't satisfy people's need for remote monitoring, however, using LabVIEW software communication is able to overcome the disadvantages of wire transmission, can get rid of geographical constraints, thus realize data transmitted over a long distance.

This paper presents the LABVIEW software based smart house system which control the internal lighting, external lighting, fire alarm, burglar alarm, and temperature Systems in the house. LABVIEW is a development system for industrial, experimental, and educational measurement and automation applications based on graphical programming, in contrast to textual programming-however, textual programming is supported in Lab VIEW. LAB VIEW has a large number of functions for numerical analysis and design and visualization of data. Smart 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[2]. 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 burglar 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.

II. DESIGN

The smart house has two interfaces, computer interfacing, and remote control unit interfacing. 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

Lab VIEW makes 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,

It is connected Lab VIEW software for other applications. Fig 2 shows the block diagram of the smart house designed. Smart House consists of two type of controlling systems, which enable the user to control and monitor each system. It create database files which can store each orders in smart house, and can be scheduler the start and end times for each system in house.

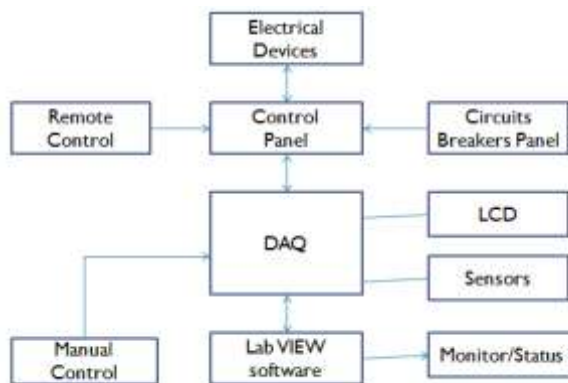


Fig.1. Smart House Block Diagram

The electrical devices are connected to LabVIEW software as the main controller for these systems. The purpose of data acquisition is to measure an electrical or physical phenomenon such as voltage, temperature, current, pressure, and sound. PC-based data acquisition uses a combination of modular hardware, application software, and a computer to take measurements. The LabVIEW software will control the internal lighting, external lighting, fire alarm, burglar alarm, and in the house. LABVIEW (short for Laboratory Virtual Instrumentation Engineering Workbench) is an easy platform and development environment for a visual programming language from National Instruments. PIR motion sensor is used to detect the internal lighting system of the house. The LM35 has an advantage over linear temperature sensors calibrated in ° Kelvin, so LM35 is used for heat detection and LDR (light dependent resistor) is used for smoke detection. Remote control is one of two interfacing devices used in smart house applications. The remote control is used to make some operation in the system by connection with LabVIEW software. It is used to control and to switch the load in every room in the house using the room unit receiver in every room.

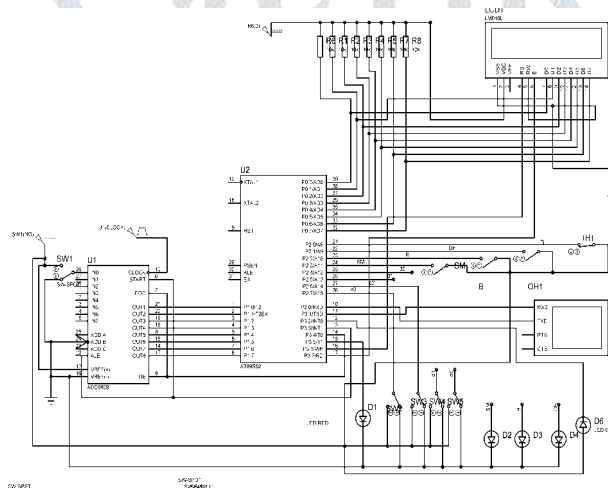


Fig.2. Interfacing Diagram of AT89S52 and Electrical Devices

IV. HARDWARE AND SOFTWARE

Here Software LabVIEW and Hardware DAQ unit and ARM7 is used to communicate each other.

A. Labview

LabVIEW (short for Laboratory Virtual Instrumentation Engineering Workbench) is a platform and development environment for a visual programming language from National Instruments. Originally released for the Apple Macintosh in 1986, LabVIEW is commonly used for data acquisition, instrument control, and industrial automation on a variety of platforms including Microsoft Windows, various flavours of UNIX, Linux, and Mac OS. The programming language used in LabVIEW is a dataflow language. Execution is determined by the structure of a graphical block diagram. LABVIEW is a development system for industrial, experimental, and educational measurement and automation applications based on graphical programs in contrast to textual programming -however, textual programming is supported in LABVIEW. LABVIEW now has several toolkits and modules which bring the LABVIEW to the same level of functionality as MATLAB and Simulink in analysis and design in the areas of control, signal processing, system identification, mathematics, and simulation. LabVIEW ties the creation of user interfaces (called front panels) into the development cycle. LabVIEW programs/subroutines are called virtual instruments (VIs). Each VI has three components: Block diagram, Connector pane, Front panel. Fig.4 shows LabVIEW based and remote control based intelligent home system[3].

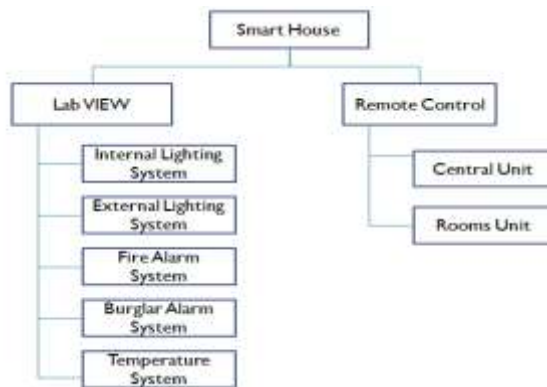


Fig.3. Lab VIEW Control of Smart Home



Fig. 4. LabVIEW Program, Login Monitor Screen

B. AT89S52

The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the AM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset[5]

C. Embedded ARM& Processor Module

Embedded ARM7 module contains features like Processor – NXP ARM7 LPC2378, 72MHz core speed maximum, Internal High-speed Flash:512Kbytes, SRAM:32Kbytes, 16Kbyte Ethernet SRAM, On board 512Kbit EEPROM, General purpose 2.54, Plug-in style enables modular product design,SPI, I2C, UART, Ethernet, CAN and GPIO lines available on pin-headers ,RTC with Battery Backup, Onboard RS232 driver interface lines available on pin-headers, MicroSD connector to handle up to 2Gbyte, Mini-USB Connector for USB2.0 device interface and optional 5volts power supply input for the CPU module, JTAG interface and SAM-BA ISP programming pins on pin-headers[7].

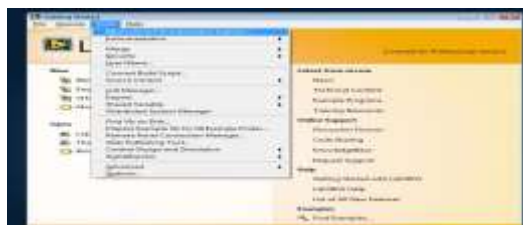
Fig. 5. Embedded ARM7 module



D. DAQ Unit

DAQ is act as interfacing between computer and outside world i.e between LabVIEW software and electrical appliances. It is used to measure an electrical or physical phenomenon such as voltage, current, temperature,pressure or sound. PC based daq uses a combination of modular hardware, application software and computer to take measurement.DAQ is process of acquiring signal from real world, digitizing the signal, analyze and presenting data. While selecting DAQ unit determine the physical properties that need to be measured now and in the future, Select transducers, Determine if any signal conditioning is required, the allowable analog-to-digital conversion error, the sample rate required to accurately capture the physical properties, Choose the DAQ device that will meet the requirements.fig 7 shows the initializing procedure in LabVIEW window[6].

Fig. 6. Initializing DAQ Process



V. RESULTS

We can control the outhouse lighting from LabVIEW window using the ‘ON’, ‘OFF’ buttons also it can be control by using remote control. If the Outhouse light is ‘ON’ then it shows the green symbol in front of outhouse lighting as shown in fig 7. It shows ‘OFF’ status on LabVIEW window when it is ‘OFF’. These status can indicated on LCD also.



Fig. 7. OUT HSL Status on LabVIEW Window

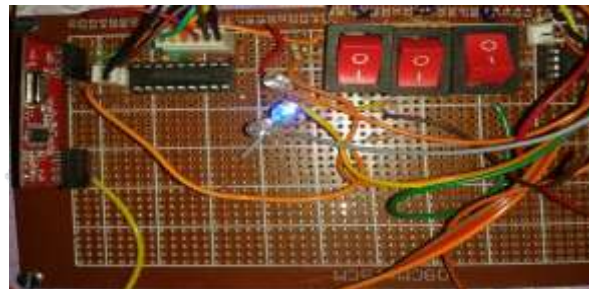


Fig. 8. LED Indication of OUT HSL ON

We can control the In house lighting from LabVIEW window using the ‘ON’, ‘OFF’ buttons also it can be control by using remote control. If the In house light is ‘ON’ then it shows the green symbol in front of in house lighting as shown in fig .8. It shows ‘OFF’ status on LabVIEW window when it is ‘OFF’. When In house lighting is operated by using remote control, it shows the green symbol in front of remote mode as shown in fig 9.



Fig. 9. OUT HSL Status on LabVIEW Window

Smoke detector and heat detector are used in the smart house. When these sensors indicates the outbreak of fire ,the fire alarm get ON at that time as shown in fig 11.At that time main relay will also ON to prevent the short circuit or to control the more outbreak of fire. Green symbol shows that the fire alarm and main relay is ‘ON’.



Fig.10. Fire Alarm and Main Relay Status on LabVIEW Window

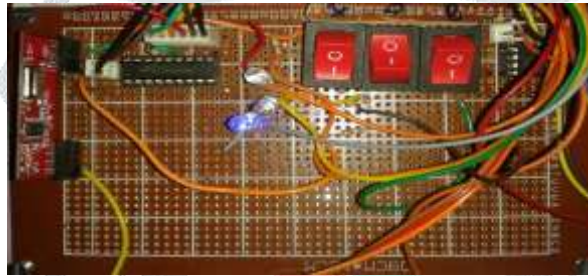


Fig.11. Fire Alarm and Main Relay Status on LabVIEW Window

Fig. 12. Burglar Alarm 'ON' LED Indication



Fig. 13. Burglar Alarm 'ON' LCD Indication



ADVANTAGES

Smart homes have the ability to make life easier and more convenient, Can monitor many things of daily living easily, LabVIEW gives an additional option of sending messages to user's computing devices, System gives users flexibility to control all the systems using LabVIEW from any remote place, LabVIEW with its G graphical programming language is ideal for creating flexible, scalable, and sophisticated applications.

LIMITATIONS

- Hardware design is complex. Cost of LabVIEW software is more .

CONCLUSION

Smart home can bring intelligent feelings for People's Daily life, Smart home applications will be more and more widely. The diversified smart home of The Internet of things will become the trend of smart home. The main objective of this paper is to design and implement a control and monitor system for smart house. Smart house system consists of many systems that controlled by LabVIEW software as the main controlling system in this paper. Also, the smart house system was supported by remote control system as a sub controlling system. The system also is connected to the internet to monitor and control the house equipment's from anywhere in the world using LabVIEW.

FUTURE SCOPE

In the future, Intelligent home will have more rich content, but not limited to the home appliances and the home environment control. The diversified intelligent home of The Internet of things will become the trend of intelligent home. Now the hardware used in designing of intelligent home system is little complex but in future it should be simple and more Compaq as compare to this implementation. In future this intelligent automation design can be extend for malls, big industrial applications and many other important applications also.

As mentioned earlier, the works on a complete and comprehensive Intelligent home that can work with all possible home appliances and can be controlled by all means in a effective way, are all scattered around and researched independently. Now that we designed a server and mobile application needed for controlling the intelligent home remotely, we must continue the work on completing the whole server and applications, and move through commercial manufacturing of such houses so that all these efforts on designing the intelligent home can come to reality.

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