Intelligent Home Monitoring System

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ABSTRACT

Intelligent home system is the use of advanced computer technology, network communication technology and automatic control technology, which combines the relevant subsystem into a whole control system concluding the family communication, family equipment automatic control, family safety precautions. 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 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. Such system is named smart house systems. The approach combines hardware and software technologies.

Keywords - Smart House, LabVIEW, PIC16F877A, Data Acquisition Card, Remote Control.

I. INTRODUCTION

Smart home system is the use of advanced computer technology, network communication technology and automatic control technology, which combines the relevant subsystem into a whole control system 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. We believe that the Internet will become the next essential utility in the home. Similar to the use of water, electricity and gas, the Internet will become common and

expected. Smart Home Systems are also known as "Computer Homes", "Electronic Houses", "Intelligent Homes",

"Interactive Homes", "Home Informatics" and "Home Telematics".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. 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. LITERATURE REVIEW

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. We believe that the Internet will become the next essential utility in the home. Lots of advanced techniques have been proposed for smart home system. The different technologies that could provide for smart home communication are X10, Insteon, Zigbee and Z-Wave. X10, developed in 1975 by Pico Electronics of Glenrothes, Scotland, allows compatible products to talk to each other remotely over the already existing electrical wires of a home. The first "home computer" was an experimental system in 1966. The Smart House Project was initiated in the early 1980's as a project of the National Research Centre of the National Association of Home Builders (NAHB) with the cooperation of a collection of major industrial partners. There have been several smart home projects undertaken by individuals over the last few years. The most popular of these has been Microsoft founder Bill Gates' residence on Mercer Island east of Seattle. The European Telecommunications Standards Institute (ETSI) has divided M2M intelligent home systems into three parts including area networks, communication networks and applications. Fig 1. Shows an area network is composed of data end points, which are usually sensors, compact microprocessors, subscriber identification module (SIM) cards and smart meters. Sensor data (usually an alert) is sent to microprocessors via communication circuit. Microprocessors then deliver these alerts to a radio module, which converts the instructions into packets and sends them over the communication network [4].
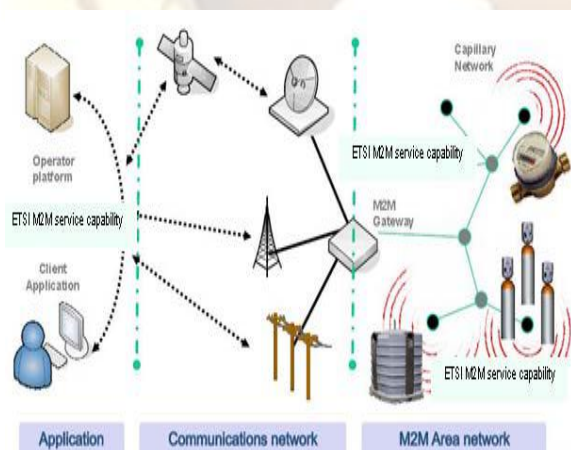

Figure 1 . ETSI M2M Network Architecture

The Telecommunications Industries Association (TIA), has established the working group TR 50 for Smart Device Communication (SDC). The European Alliance (ESNA) and National Institute of Standards and Technology (NIST) are other organizations which are specifying standards for M2M.This section of the paper discusses technique earlier in literature for smart home system using LabVIEW.

III. 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, and it is connected Lab VIEW software for other applications. Fig 1 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.
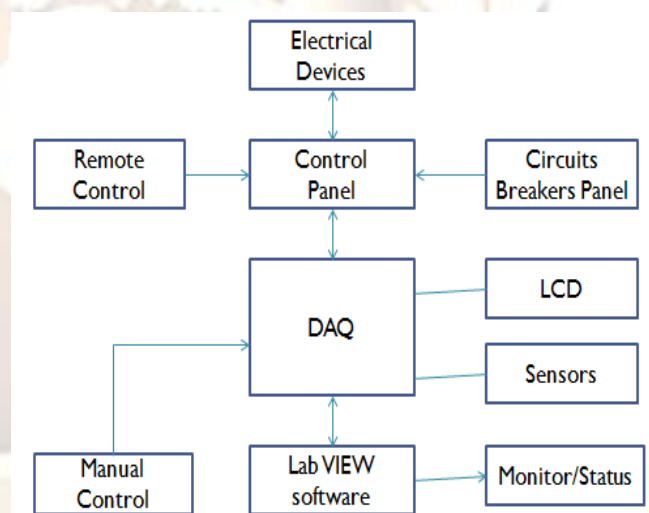

Figure 2 Smart House Block Diagram

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 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 Lab VIEW 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 easy

platform and development environment for a visual programming language from National Instruments. PIR motion sensor is use to detect the internal lighting system of house. The LM35 has an advantage over linear temperature sensors calibrated in ° Kelvin, so LM35 is use for heat detector and LDR (light dependent resistor) is use for smoke detector. Remote control is one of two interfacing device used in smart house application. The remote control is used to make some operation in the system by connection with LabVIEW 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.

IV. HARDWARE AND SOFTWARE

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

1. LABVIEW

Lab VIEW (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, Lab VIEW 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 Lab VIEW, 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 program in contrast to textual programming -however, textual programming is supported in LABVIEW. LAB VIEW now has several toolkits and modules which brings 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. Lab VIEW ties the creation of user interfaces (called front panels) into the development cycle. Lab VIEW programs/subroutines are called virtual instruments (VIs). Each VI has three components:

- Block diagram
- Connector pane
- Front panel

However, the front panel can also serve as a programmatic interface. This implies each VI can be easily tested before being embedded as a subroutine into a larger program The graphical approach also allows non-programmers to build programs by simply dragging and dropping virtual representations of the lab equipment with which they are already familiar. The Lab VIEW programming environment, with the included examples and the documentation, makes it simpler

to create small applications. This is a benefit on one side but there is also a certain danger of underestimating the expertise needed for good quality programming. Fig.2 shows LabVIEW based control intelligent home system.
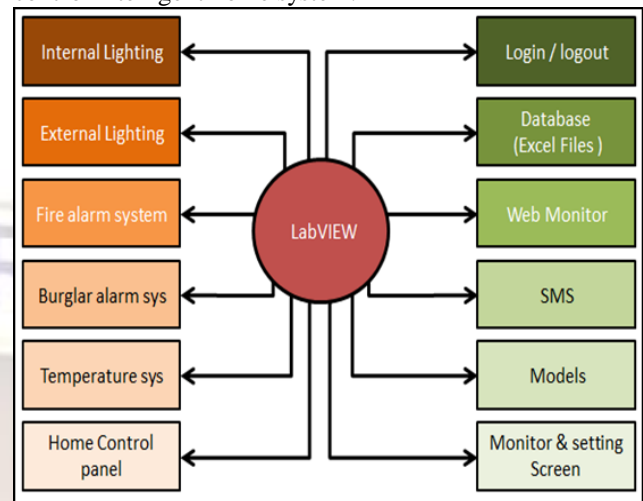

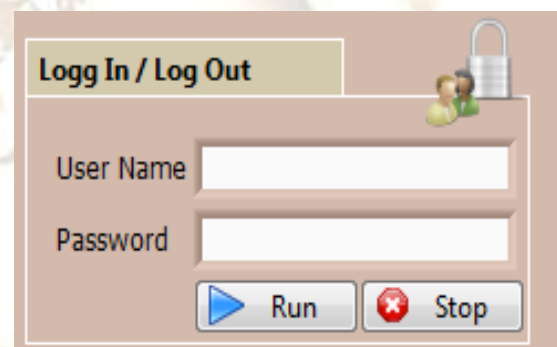**Figure 3. Lab VIEW Control of Smart House**

Figure 4 LabVIEW Program, Login Monitor Screen

Lab VIEW Support for thousands of hardware devices, including: Scientific instruments, Data acquisition devices, Sensors, Cameras, Motors and actuators, Familiar programming model for all hardware devices, Portable code that supports several deployment targets Lab VIEW makes the process of integrating hardware much easier by using a consistent programming approach no matter what hardware you are using[7]. The system also is connected to the internet to monitor and control the house equipment's from anywhere in the world using Lab VIEW. Monitor screen is designed using LabVIEW allows monitoring to all parts of smart house system that connected with LabVIEW via Data Acquisition Card. It has two login; one for monitor access and the other for setting access as shown in Figure 4.

2. EMBEDDED ARM7 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.

Figure 4. Embedded ARM7 module

3. 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 5 shows the initializing procedure in LabVIEW window.
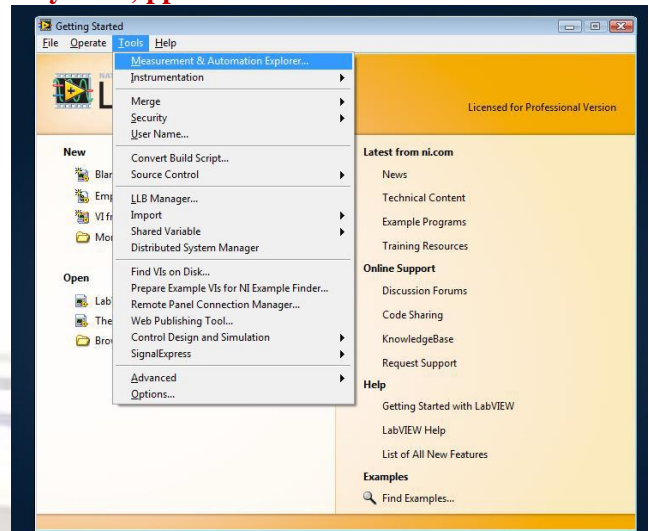

Figure 5. Initializing DAQ Process

The first step to using the DAQ is to instruct the operating system to communicate with it.o do this use the Measurement and Automation Explorer (MAX) MAX can be opened from LabVIEW by selecting Tools >> Measurement & Automation Explorer. Plug in the USB 6008 to the computer USB port.Open up the Measurement & Automation Explorer (MAX).Once MAX has opened, expand the Devices and Interfaces folder. After this, expand the Ni-DAQmx devices folder. Note under the NI-DAQmx Devices the NI USB-6008: "Dev 1"

V. CONCLUSION

Smart home can bring intelligent feelings for People's Daily life, Smart home applications will be more and more widely. In the future, Smart home will have more rich content, but not limited to the home appliances and the home environment control. 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.

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