

A Novel Implementation Of Smart Home Control Using Labview

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ABSTRACT

Now a days the technology has been advanced to the extent that it can be very useful in domestic purposes. Automating our home activities simplifies the way of living and it can be used to facilitate an easy life to elderly and disabled people. Smart home is a result of continues change in technology and will keep changing with advancement technology. This system has been implemented using labVIEW Software. This paper includes many subsystems such as external lighting system, internal lighting system, temperature system, burglar alarm system, liquid level indicating system, fire and smoke alarm system. The main view of this paper is to map the process yielding optimal utilization of smart home technology to ensure as many user as possible. It minimizes the cost, power consumption and it provides the flexible and securable life. This smart home provides more security than conventional system.

Keywords: Automation, LabVIEW, Message alert, MyRIO, Smart home

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I. INTRODUCTION

1.1 Smart home:

Smart home is a home that uses information technology to monitor the environment, control and adjust the activities and communicates with the outer world. Smart home is a home modernization system has been developed automatically. The smart home automated control system is an integrated system to facilitate elderly and disabled people with an easy-to-use home automation system that can be fully controlled using labVIEW

Smart home means-

A home that 'listens' to you

A home that 'talks' to you

A home that 'protects' you

A home that 'adjusts' to your life style.

smart home control system requires an advanced computer technology with labVIEW software and automatic control technology with myRIO. This technology combines the subsystems which are external lighting, internal lighting, burglar alarm, temperature, automatic liquid level indicator and Fire and smoke alarm systems. This approach combines the hardware and software technologies.

The smart house has two interfaces

1. Computer interfacing
2. Remote control unit interfacing
3. myRIO interfacing

In computer interfacing labVIEW software is the main unit which reads the data from out side the world and process it. Remote control unit interfacing can be used to monitor the status of the

subsystems which are external lighting, internal lighting, temperature, burglar alarm , automatic liquid indicator , fire and smoke alarm systems. myRIO interfacing can be used for hardware implementation of prototype multiplatform control systems for home automation.

FIG 1.1 Shows the block diagram of overview of smart home. FIG 1.2 shows the block diagram of smart home. Smart home mainly consists of electrical and electronic components. They include sensors to sense the environment, indicators to indicate the status, processors to process the data and controllers to control the processed data. All the subsystems are connected via labVIEW software which will act as main controller unit of the home automation system. LabVIEW takes various inputs from all the connected sensors and input devices and process it according to predefined software and then it provides logical output to the house system. labVIEW software with myRIO can be used to build a multiplatform home automation system.

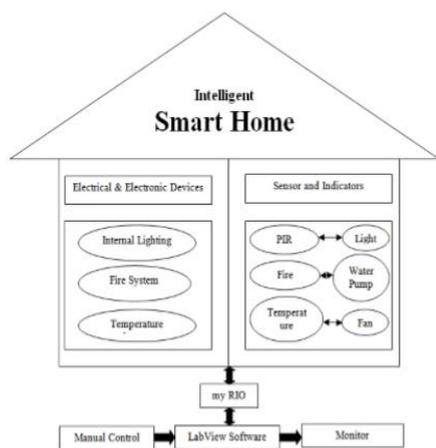


FIG 1.1 overview of smart home
SMART HOUSE

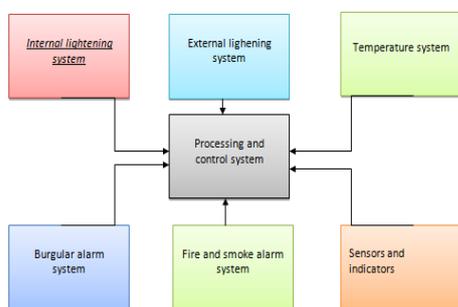


FIG 1.2 block diagram of smart home

1.2. Labview:

Lab VIEW stands for Laboratory Virtual Instrumentation Engineering Workbench. It started in 1983 by a company National Instruments which popularly stands for NI. Like C, JAVA, the LabVIEW software is known as 'G' language. LabVIEW software platform developed by NI is a virtual instrument software platform based on graphical programming and using it to develop various instruments and virtual circuits has a unique features. It has a very rich and flexible user interface, can be combined with many programming languages, supports many network environments and is widely used in industrial control field, engineering projects of measurement and simulation and so on. It uses software to implement hardware circuits and various instruments, so low cost, high flexibility and short project developing period make its practical value in engineering very strong [4].

Requirements of present day generation change very quickly, need flexibility to create their own solutions. We can adapt a virtual instrument to our particular needs without having to replace the entire device because of the application software installed on the PC and the wide range of available plug-in hardware [6].

LabVIEW software providing graphical programming software and modular hardware to bring together theoretical concepts and real-world applications. We are using NI tools to foster the experiential learning environment and realizing designs that are changing the world around them with the application of graphical system design.

1.3. myRIO:

MyRIO is a real time embedded for evaluation. It was introduced by National Instruments. Using myRIO, it is easy to design complicated systems and to solve real life problems quite efficiently and quickly. Its processing speed is almost ten times of the standard general micro-controllers and microprocessor. We can use this device in the systems where there is a need of quick responses e.g. CNC machines, two wheeled self balancing robots, robots performing different human operations. NI myRIO is shown in the FIG 1.3.1.

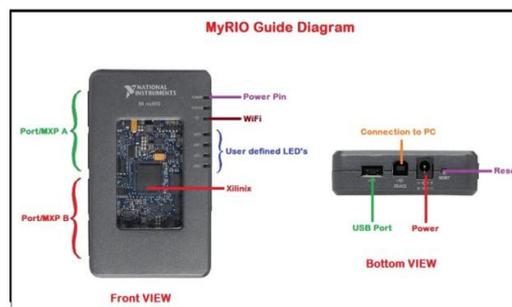


FIG 1.3.1 myRIO guide Diagram

The block diagram of the myRIO helps to understand the internal structure of a device. NI myRIO block diagram is shown in the FIG 1.3.2.

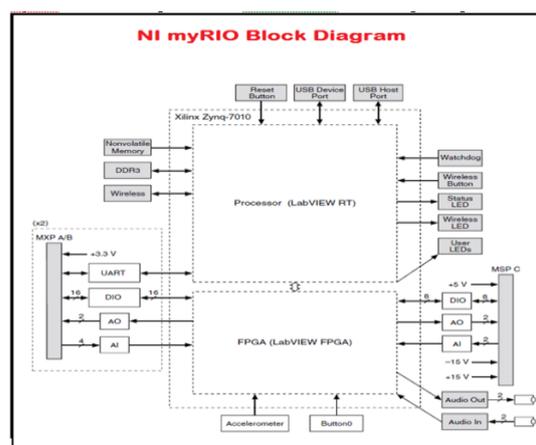


FIG 1.3.2 NI myRIO block diagram

myRIO has dual core ARM cortex A9 programmable processor. It has a Xilinx Field Programmable Gate Array (FPGA). FPGA support we can avoid the complicated syntax used in C language and in many other. We just have to create

logic instead of writing the complicated code with the proper syntax. So, it has reduced the student's difficulties while designing complicated systems. The processing speed of myRIO is quite higher than the standard micro controllers. So, it can be used to solve real life problems and it can be easily used in efficient systems which need a quick output response. It supports different languages e.g. C, C++ and Graphical language (FPGA)[8].

II. DESIGN

With the development of new technologies and their implementation, traditional technologies, smart house is at last becoming a real possibility. In this paper we use labVIEW software with myrio can be used to connect all the subsystems and to control these operation for home automation. The software operation of labVIEW is shown in FIG 2.1

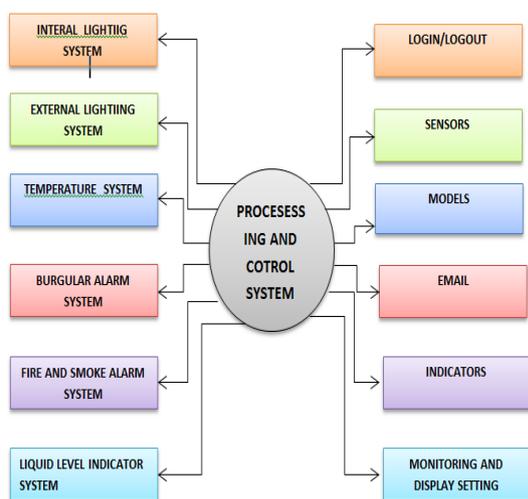


FIG 2.1 software operation of labVIEW

2.1 Internal Lighting System:

The internal lighting system consists of motion sensor which is connected to myRIO through labVIEW software program which senses the human motion. This system will make automatic lighting when there is any movement inside the home which will be known with the help of motion sensor. The start time and stop time shown in the following figure which will be used to enable the operation of internal lighting system. The timer circuit can be used to glow a lamp for fixed period of time. If we don't want to glow a lamp we need to switch off manually. The operational block diagram of internal lighting system can be shown in Fig 2.2.

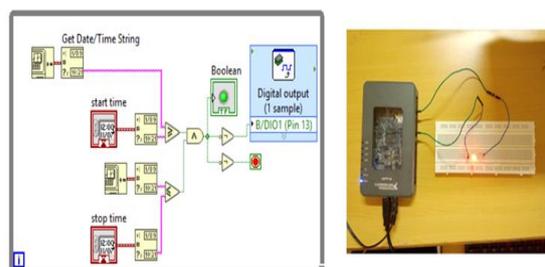


Fig 2.2 block diagram of internal lighting system

2.2 External Lighting System:

The external lighting system can be used to glow lamp during night times. During morning and evening dimmer will be on. And during night times lamp will glow. This can be operated using sun cell sensor which is connected to myRIO through labVIEW software program. The following figure shows the operation prototype of hardware external lighting system. start time and stop time can be used to enable the operation of external lighting system. The operational block diagram of external lighting system is shown in Fig 2.3.

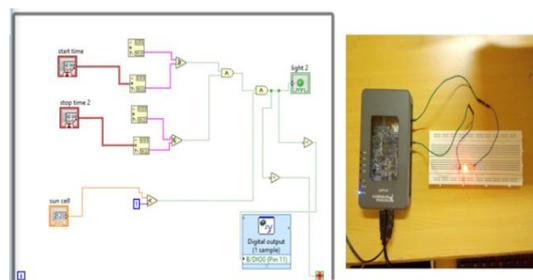


Fig 2.3 block diagram of external lighting system

2.3 Temperature System:

The main functioning of temperature system is to maintain a constant temperature inside the home irrespective of outside environmental changes. When the motion sensor detects the human motion both internal lighting and temperature systems are activated and corresponding operation will be performed. In this the owner need to set the room temperature to a required value which is called as critical temperature. By comparing this with the current temperature the system decides room temperature either hot or cold. By receiving the current status of room temperature the control system changes the room temperature to the critical temperature. The operational block diagram of temperature system is shown in Fig 2.4.

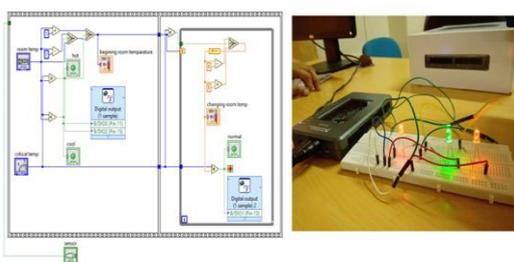


Fig 2.4 block diagram of temperature system

2.4 Fire And Smoke Alarm System:

The labVIEW software based Fire Alarm System which can maintain a constant temperature of a predefined value. Due to environmental changes the temperature in the home may varied to either cool or hot. The fire alarm system can be construct in labVIEW software. In this we use flap sequence which is used to control the two sections. The first section process the the data of room temperature and then decides the current room temperature either hot or cool and sends this data to the next section. The section process the data using labVIEW and myRIO and sets the temperature to the critical predefined temperature. So that we can maintain a constant temperature irrespective of environmental changes always. The operational block diagram of fire and smoke alarm system is shown in Fig 2.5.

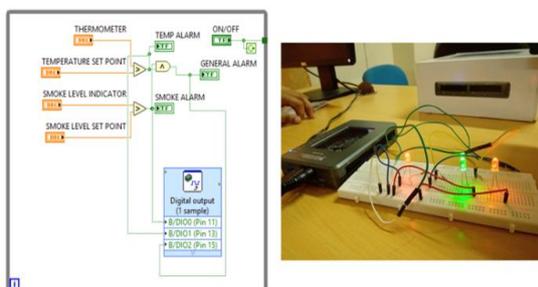


Fig 2.5 block diagram of fire and smoke alarm system

2.5. Burglar Alarm System:

The labVIEW software based home alarm system which can act as safe and security guard of the home with an immediate message alert. The basic idea of burglar alarm system is to keep us and our family safe. If any unknown person trying to enter into the home immediately the owner will get a messege alert so that he can protect his home from crime etc. The keypad can be used to enter the password set by the owner. If the entered password is not match with the predefined one owner will get an email alert. This facility makes the smart home more safety and securable. The display can be used to monitor the entered password. The software operational block diagram of burglar alarm system is

shown in Fig 2.6 and the mail indication of the burglar system by using cloud is shown in Fig 2.7.

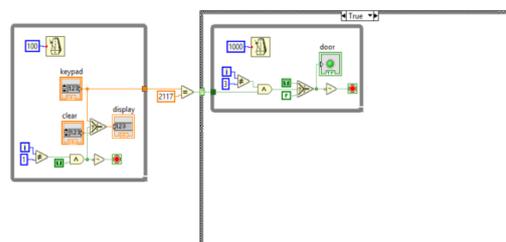


Fig 2.6 block diagram of burglar system

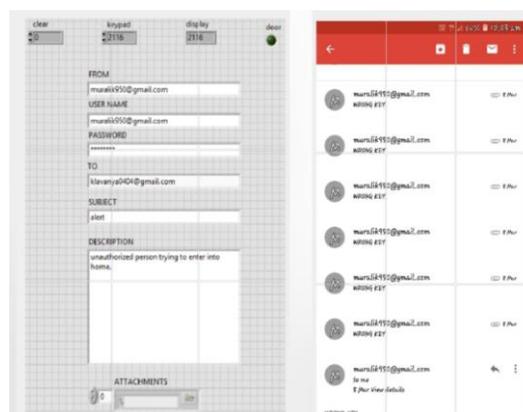


Fig 2.7 output diagram of ugrlar alarm system

2.6 Automatic Liquid Level Control System:

LabVIEW based automatic liquid level control system ca be used to indicate and control the tank level. The timer circuit ca be used to specify the speed of tank increment and decrement.

The tank system was controlled with a desktop personal computer. This computer was equipped with a National Instruments, NI and the LabView graphical programming language. If the level of water goes beyond a certain minimum or maximum limit, specified by us, then an LED will be turned ON. The software operational block diagram of automatic liquid level control system is shown in Fig 2.8.

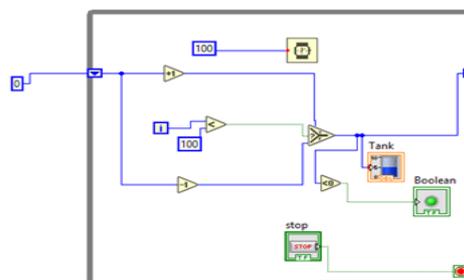


Fig 2.8 block diagram of automatic liquid level control system

III. CONCLUSION

A novel design of a smart using labVIEW software with the help of myRIO to increase the accuracy and speed of the sub systems and to monitor the internal lighting system, external lighting system, temperature system, burglar system, fire and smoke alarm system and automatic tank level control system. smart home using labVIEW and myRIO can minimizes the power losses and effective cost and it provides fully safe, securable and energy efficient home. Software and hardware implementation of smart home automation provides different flexibility than the other conventional installations and control system.

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