IJSTE - International Journal of Science Technology & Engineering | Volume 3 | Issue 09 | March 2017
ISSN (online): 2349-784X

Home Automation using LabVIEW

S. Jermilla
Student
Department of Instrumentation & Control Engineering
Saranathan College of Engineering, Panjappur, Trichy, Tamil Nadu, India

S. Kalpana
Student
Department of Instrumentation & Control Engineering
Saranathan College of Engineering, Panjappur, Trichy, Tamil Nadu, India

R. Preethi
Student
Department of Instrumentation & Control Engineering
Saranathan College of Engineering, Panjappur, Trichy, Tamil Nadu, India

D. Rachel Rich Darling
Student
Department of Instrumentation & Control Engineering
Saranathan College of Engineering, Panjappur, Trichy, Tamil Nadu, India

MS. T. Devashena
Assistant Professor
Department of Instrumentation & Control Engineering
Saranathan College of Engineering, Panjappur, Trichy, Tamil Nadu, India

Abstract

The main purpose of the project is to ease man's life and to make it more sophisticated we go for home automation. It prevents the energy wastage by switching off the electrical appliances in the absence of human. In this project the home appliances like fan, bulb, and password based door lock system will be controlled in LabVIEW. By the use of relays which connect home appliances and it will make the on/off control action. Here the PIR sensor is used to recognize the human's presence .Based on the PIR sensor output the control action will be taken automatically for the home appliances.

Keywords: myRIO, Thermistor, LDR, Pmod keypad

I. INTRODUCTION

Now-a-days, home automation are being exercised intensively as to setup standards for building efficient smart home suited to custom and regional requirements. When the person is not available in home it is not necessary to turn on and off the electrical appliances manually. This prevents the wastage of electricity.

II. BLOCK DIAGRAM

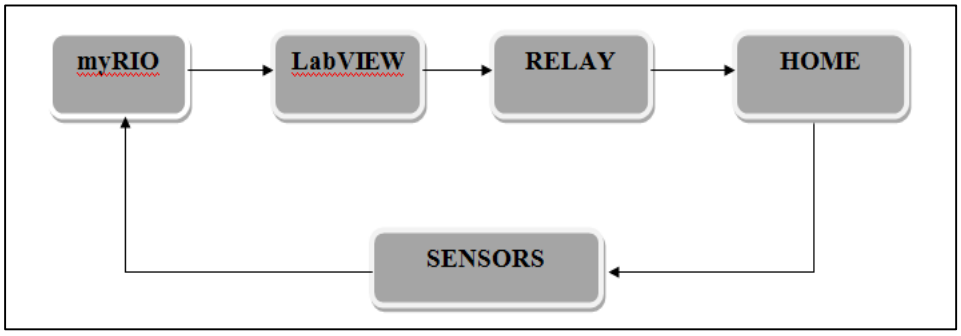

Fig. 1:

A. myRIO

It is a real time embedded evaluation board made by National Instruments. It is a student embedded device features with input and output slots on both sides of the device in the form of MSP and MXP connectors. It includes analog inputs, analog outputs, digital I/O lines, LED's, a push button ,an onboard accelerometer ,a Xilinx FPGA, a dual core arm cortex-A9 processor .It is used to develop applications that utilize its onboard FPGA and microprocessor.

B. THERMISTOR

The thermistor is temperature sensitive resistors. It is a contraction of "thermal" and "resistor" – is a two-terminal semiconductor device whose resistance varies with temperature. Most thermistors are of the negative temperature coefficient (NTC) type, meaning their resistance varies inversely with temperature. Thermistors are inexpensive and reliable temperature sensors. They are easy to use, durable, and respond predictably to a change in temperature. Thermistors are available in different shape such as rod, disc, bead, and washer and so on. They are used for simple temperature measurements since their output is not in millivolts as that of thermocouples. Hence they are not used in high temperature measurements and used only in the temperature ranges they work.

C. LDR

A Light dependent resistor is also known as photo resistor, whose resistivity is a function of incident electromagnetic radiation. Hence they are light sensitive devices. They are made up of semiconductor materials with high resistivity. LDR the resistance decreases with increasing light intensity. A photocell is a two-terminal device fabricated from cadmium sulfide (CdS) .Its resistance varies with light intensity in the visible spectrum of 400 to 700 nm. The photocell has a resistance that varies over many orders of magnitude: 10 k at moderate illumination, less than 100 at high illumination, and more than10Min darkness.

LDR works on the principle of photo conductivity. Photo conductivity is an optical phenomenon in which the conductivity of the material increases when light is absorbed by it. When photons falls on the device, the electrons in the valence band of the semiconductor material are excited to the conduction band. The photons must have higher energy than the band gap of semiconductor material to make the electrons jump from valence to conduction band. Hence when the light with enough energy strikes on the device, more and more electrons are excited to conduction band which results in large number of charge carriers as a result large amount of current flows through the device when the circuit is closed and therefore the resistance of the device has been decreased.

D. Pmod KEYPAD

A keypad provides an essential component for a human user interface. The keypad pushbutton switches wired in a 4_4 matrix can be scanned to determine single and multiple key presses. The keypad contains sixteen single pole single-throw (SPST) pushbuttons arranged in 4_4 grid. Because the keypad normally receives a sequence of single- button presses and occasionally two-or even three- button combination presses, the matrix connection based on shared row lines and column lines needs 8 connections to the NI myRIO digital input-output lines instead of the perhaps more expected sixteen connections that would be required to properly sense all 216=65536 possible switch open-closed patterns.

III. SOFTWARE TOOLS LABVIEW WITH PC

LabVIEW is an integrated development environment designed specifically for engineers and scientists. Native to LabVIEW is a graphical programming language that uses a data flow model instead of sequential lines of text code, empowering to write functional code using a visual layout that resembles the thought process. Laboratory Virtual Instrument Engineering Workbench is a system designed platform and development environment for a visual programming language from national instruments. LabVIEW is mainly used for data acquisition, instrument control and industrial automation on a variety of operating systems including Microsoft windows, various versions of UNIX, Linux and macOS

IV. SCHEMATIC DIAGRAM

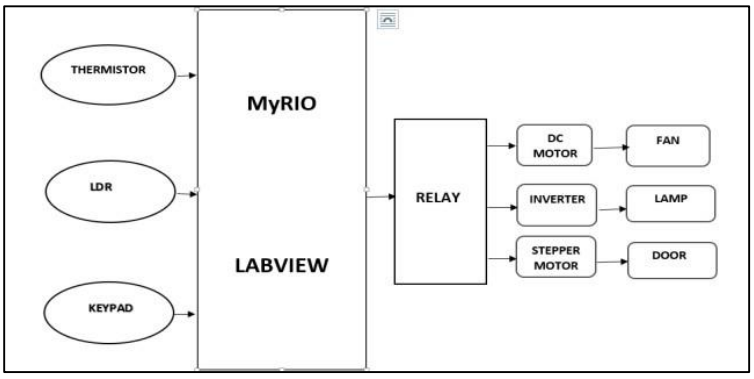

Fig. 2: WORKING

In light automation ldr is used to sense light intensity and produces an output voltage Vx. Voltage divider technique is used to sense the voltage across the resistance R in the fig(3). Using Vx we can calculate the resistance Rx across the ldr. As we know Rx is inversely proportional to the light intensity, using the following equation we can calculate the light intensity in the house

Rx= ((Vdd-Vx)/Vx)R

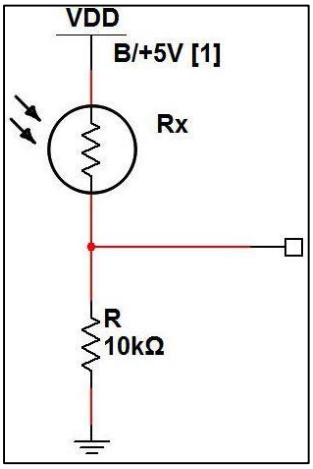

Fig. 3: Connection of ldr circuit

At room temperature for moderate illumination we get resistance Rx close to 10Kohm, at dark condition Rx is more than 10Mohm and at high illumination we get Rx less than 100ohm. Hence after calibration if Rx is greater than 5Kohm we set high signal to myRIO for the relay circuit connected with the bulb. As a result when the light intensity is low the bulb gets turned on.

In fan automation we use thermistor with negative temperature co-efficient which produces an output resistance Rt close to 10 K ohm at 25deg Celsius as shown in fig(2) .Using voltage division technique output voltage Vt across R is found. From this the resistance RT is obtained using the formula,

Rt= R ((Vdd-Vt)/Vt)

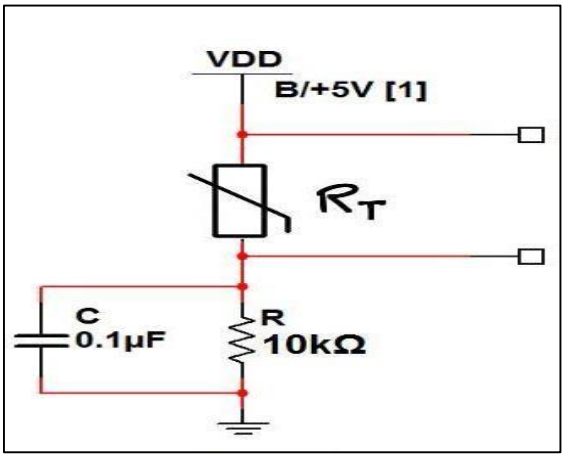

Fig. 2: Connection of thermistor circuit

At room temperature Rt was found as 9Kohm so when it becomes lesser than that a high signal was sent to myRIO for relay circuit connected with the fan. As a result when the temperature is high the fan gets turned on.

For door lock system, a keypad with matrix wiring is used to give the input. It contains 16 switches with 4 pull-up resistors and 4 current limiting resistors. SPST switches are connected in4*4 matrix. Drive signal is given through columns and the output signal is measured across rows. When a switch is pressed it produces a low signal while checking that column. When the switch is not pressed a high signal is produced due to the pull-up resistors. In this way we can detect single press or multiple press of switches. The output from the keypad is compared with the password set in the LabVIEW and when the password matches a high signal is given to the relay circuit coupled with timer board which helps in opening the door.

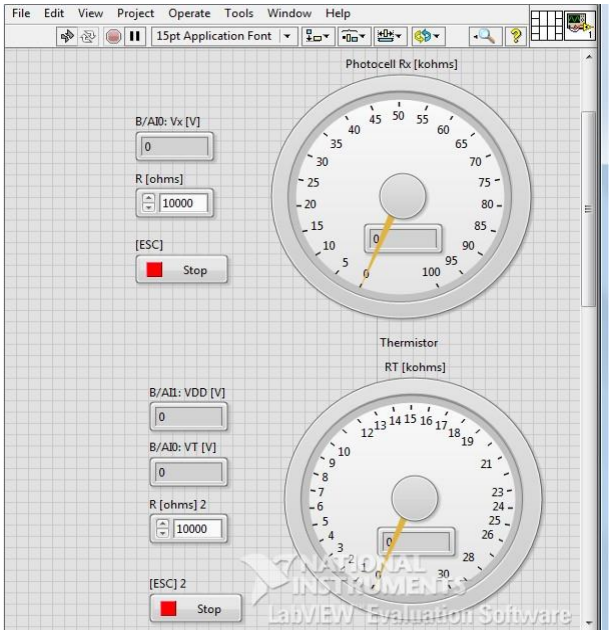

Fig. 5: FRONT PANEL OF FAN & LIGHT AUTOMATION

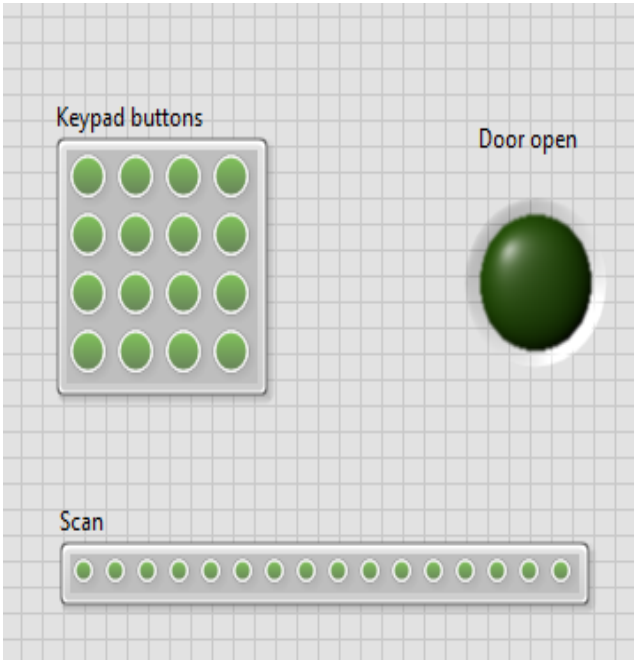

Fig. 3: FRONT PANEL OF DOOR LOCK SYSTEM

V. CONCLUSION

The main objective of this paper is to design a control system and provide security for smart house. Home automation is done using LabVIEW software interface with NI myRIO as the main controlling system. The system also is connected to monitor and control the house equipment's using LabVIEW. This project can be further extended to detect the presence of human beings using motion sensor and this can be an added advantage for the security system also.

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