Journal of Instrumentation Technology, 2013, Vol. 1, No. 1, 1-5
Available online at http://pubs.sciepub.com/jit/1/1/1

DOI:10.12691/jit-1-1-1

Importance of Home Alarm System Based on LABVIEW Software

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Received December 28, 2013; Revised September 05, 2013; Accepted November 14, 2013

Abstract This paper presents the basic purpose of a home alarm system is to keep us and our family safe, and keep our home safe from crime. This system is based on the LABVIEW software and can act as a security guard of the home. When the alarm is triggered, it emits a loud sound design to frighten away intruders. An alarm security system is absolutely essential for anyone who wants to protect their property from those who might try to steal it. Similarly it can protect anyone who is living in the home. An alarm system has following components- the input devices (which trigger the alarm), the output devices (which communicate the alarm like speakers) and the control panel (networks between the devices and is an interface for user). This system has keypad at front door and sensors at back doors and side windows which activate or deactivate the alarm based on programming in LABVIEW software.

Keywords: *buzzer alarm, LABVIEW, sensor, front panel, block diagram*

Cite This Article: Guneet Kour, and jaswanti dhiman, "Importance of Home Alarm System Based on LABVIEW Software." *Journal of Instrumentation Technology* 1, no. 1 (2013): 1-5. doi: 10.12691/jit-1-1-1.

1. Introduction

The purpose of home alarm system is to alert the homeowners to unauthorized entry attempts into the houses. Home security systems should be evaluated by and installed in regard to the areas in which burglars are most likely to enter your residence. in which burglars are most likely to enter your residence. Studies have shown that most intruders or would be intruders will enter through a front door, by either forcing it open or simply kicking it in. Others enter through ground floor windows or the back door of the home which may offer more privacy and less lighting than a front door entrance. With the development of new electronic technologies and their integration with older, traditional building technologies, smart house is at last becoming a real possibility. A Home security system as shown in Figure 1, however, offers many more benefits.

A smart home or building is a home or building, usually a new one that is equipped with special structured wiring to enable occupants to remotely control or program an array of automated home electronic devices by entering single command. For example, a homeowner on vacation can use a Touchtone phone to arm a home security system, control temperature gauges, switch appliances on or off, control lighting, program a home theatre or entertainment system, and perform many other tasks [1]. Possibly 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 [2]. The motivation is to facilitate the users to automate their homes having ubiquitous access. The system provides availability due to development of a low cost system. The home appliances control system with an affordable cost was thought to be built that should be mobile providing remote access to the appliances and allowing home security. Home security has been a major issue where crime is increasing and everybody wants to take proper measures to prevent intrusion. In addition there was a need to automate home so that user can take advantage of the technological advancement in such a way that a person getting off the office does not get melted with the hot climate [3]. There are many other reasons why people need security at their homes**.** The first reason that this system is established is to create a peace of mind for people. So that they can feel safe inside or outside their homes. This will help them to execute their work without any fear of their security. The other reason is to help in getting timely information about visitors at house. Through the use of security cameras users are able to monitor the situation at their homes and get timely information about persons visiting their homes [4].The main electronic control for a home security system is the security system control panels which have circuitry and contact points to connect to security alarm sensors, sirens, security cameras, telephone connections and remote keypads. These contain circuitry for four, eight or more hardwired home security zones, telephone line monitor, keypad, battery bays and several remote Keypad [5]. Conventional security systems keep homeowners, and

their property, safe from intruders. A smart home security system, however, offers many more benefits. Home automation technology notifies homeowners of any problems, so that they can investigate. Artificial intelligence programs keep track of the homeowner's habits, and other important information, and , and notify emergency personnel when necessary [6].

This paper presents a LABVIEW based Home alarm system that allows user to protect home from all sides using sensors and keypad by providing security on detection of intrusion via alarm signal using Buzzer alarm.

Figure 1. Home Security System

2. Problem Formulation

To protect home from unauthorized entities, three possible cases are taken as shown in Figure 2.

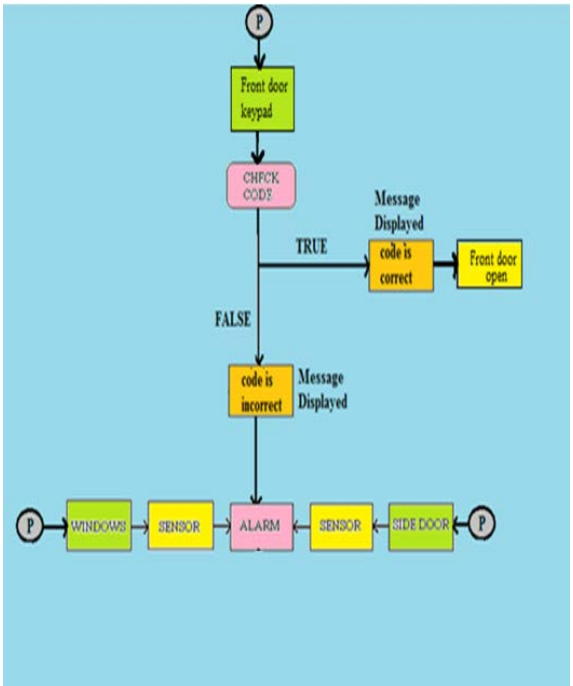

Figure 2. General functional diagram, where, P stands for person

First case considers entry from front door only where keypad is connected. Other two cases consider the possible entries from side doors or side windows. 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 Figure 2, we assume that a person can enter the home either through front door, side door or windows. In first case, 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. If again the code is not correct then buzzer alarm will ring. It is noted that after 3 seconds, our system automatically clears the code which we enter earlier. In second case, the person will enter through side doors or the windows. The side door and side windows have sensors with them. Sensor senses the signal and transmits it to the alarm. In this way when any person comes from any of the entry zone, the whole procedure is followed in a similar manner.

3. LABVIEW Software Description

The NI LABVIEW software is used for a wide variety of applications and industries. LABVIEW is a highly productive development environment for creating custom applications that interact with real-world data or signals in fields such as science and engineering. The net result of using a tool such as LABVIEW is that higher quality projects can be completed in less time with fewer people involved. So productivity is the key benefit, but that is a broad and general statement. It is unique because it makes this wide variety of tools available in a single environment, ensuring that compatibility is as simple as drawing wires between functions. It 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 it. It has a large number of functions for numerical analysis and design and visualization of data. It now has several toolkits and modules which brings it 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, and more.

The programming language used in LABVIEW, also referred to as G, is a dataflow programming language. Execution is determined by the structure of a graphical block diagram (the LV-source code) on which the programmer connects different function-nodes by drawing wires. These wires propagate variables and any node can execute as soon as all its input data become available. Since this might be the case for multiple nodes simultaneously, G is inherently capable of parallel execution. Multi-processing and multi-threading hardware is automatically exploited by the built-in scheduler, which multiplexes multiple OS threads over the nodes ready for executions. LABVIEW ties the creation of user interfaces (called front panels) into the development cycle. It programs/subroutines are called virtual instruments (VIs). Each VI has three components: a block diagram, a front panel and a connector panel. The last is used to represent the VI in the block diagrams of other, calling VIs. Controls and indicators on the front panel allow an

operator to input data into or extract data from a running virtual instrument. However, the front panel can also serve as a programmatic interface. Thus a virtual instrument can either be run as a program, with the front panel serving as a user interface, or, when dropped as a node onto the block diagram, the front panel defines the inputs and outputs for the given node through the connector panel. 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 dragging and dropping virtual representations of lab equipment with which they are already familiar. The LABVIEW programming environment, with the included examples and documentation, makes it simple to create small applications. This is a benefit on one side, but there is also a certain danger of underestimating the expertise needed for high-quality G programming. For complex algorithms or large-scale code, it is important that the programmer possesses an extensive knowledge of the special LABVIEW syntax and the topology of its memory management.

The most advanced LABVIEW development systems offer the possibility of building stand-alone applications. Furthermore, it is possible to create distributed applications, which communicate by a client/server scheme, and are therefore easier to implement due to the inherently parallel nature of G. LABVIEW (short for Laboratory Virtual Instrumentation Engineering Workbench) is easy platform and development environment for a visual programming language from National Instruments. The purpose of such programming is automating the usage of processing and measuring equipment in any laboratory set up.

LABVIEW consists of two windows: Front Panel and Block Diagram. A key benefit of LABVIEW over other development environments is the extensive support for accessing instrumentation hardware. Drivers and abstraction layers for many different types of instruments and buses are included or are available for inclusion. These present themselves as graphical nodes. The abstraction layers offer standard software interfaces to communicate with hardware devices. The provided driver interfaces save program development time. The sales pitch of National Instruments is, therefore, that even people with limited coding experience can write programs and deploy test solutions in a reduced time frame when compared to more conventional or competing systems. A new hardware driver topology (DAQmxBase), which consists mainly of G-coded components with only a few register calls through NI Measurement Hardware DDK (Driver Development Kit) functions, provides platform independent hardware access to numerous data acquisition and instrumentation devices. The DAQmxBase driver is available for LABVIEW on Windows, Mac OS X and Linux platforms. Although not a .NET language, It also offers an interface to .NET Framework assemblies, which makes it possible to use, for instance, databases and XML files in automation projects. In terms of performance, it includes a compiler that produces native code for the CPU platform. The graphical code is translated into executable machine code by interpreting the syntax and by compilation. Its syntax is strictly enforced during the editing process and compiled into the executable machine code when requested to run or upon saving. In the latter case, the executable and the source code are merged into a single file. The executable runs with the help of the LABVIEW run-time engine, which contains some precompiled code to perform common tasks that are defined by the G language. The run-time engine reduces compile time and also provides a consistent interface to various operating systems, graphic systems, hardware components, etc. The run-time environment makes the code portable across platforms. Generally, its code can be slower than equivalent compiled C code, although the differences often lie more with program optimization than inherent execution speed. Many libraries with a large number of functions for data acquisition, signal generation, mathematics, statistics, signal conditioning, analysis, etc., along with numerous graphical interface elements are provided in several LABVIEW package options. The number of advanced mathematic blocks for functions such as integration, filters, and other specialized capabilities usually associated with data capture from hardware sensors is immense. In addition, it includes a text-based programming component called MathScript with additional functionality for signal processing, analysis and mathematics. MathScript can be integrated with graphical programming using "script nodes" and uses a syntax that is generally compatible with MATLAB**.** The fully modular character of its code allows code reuse without modifications: as long as the data types of input and output are consistent, two sub VIs are interchangeable.

The LABVIEW Professional Development System allows creating stand-alone executables and the resultant executable can be distributed an unlimited number of times. The run-time engine and its libraries can be provided freely along with the executable. A benefit of the its environment is the platform independent nature of the G code, which is (with the exception of a few platform-specific functions) portable between the different LABVIEW systems for different operating systems (Windows, Mac OS X and Linux). National Instruments is increasingly focusing on the capability of deploying LABVIEW code onto an increasing number of targets including devices like Phar Lap or VxWorks OS based LABVIEW Real-Time controllers, FPGAs, PocketPCs, PDAs, Wireless sensor network nodes, and even Lego Mindstorms NXT.

With LABVIEW, it is very easy to program different tasks that are performed in parallel by means of multithreading. This is, for instance, easily done by drawing two or more parallel while loops. This is a great benefit for test system automation, where it is common practice to run processes like test sequencing, data recording, and hardware interfacing in parallel. Due to the longevity and popularity of the its language, and the ability for users to extend the functionality, a large ecosystem of 3rd party add-ons has developed through contributions from the community. This ecosystem is available on its Tools Network, and is a marketplace for both free and paid LABVIEW add-ons. There is a low-cost LABVIEW Student Edition aimed at educational institutions for learning purposes. There is also an active community of LABVIEW users who communicate through several e-mail groups and Internet forums.

3.1. Front Panel

Front Panel is user interface part of LABVIEW. It consists of four Toggle Switches and four alarms as shown in Figure 3.

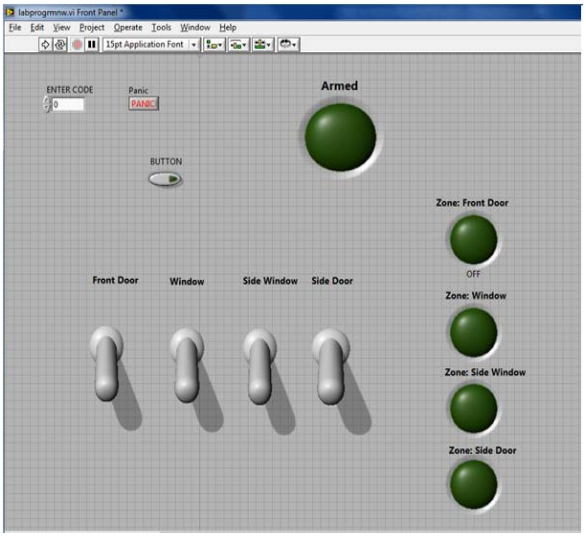

Figure 3. Front panel showing home alarm system on LABVIEW

3.2. Block Diagram

Block Diagram is programming part of LABVIEW. It explains how actually home alarm system works under false condition as shown in Figure 4.

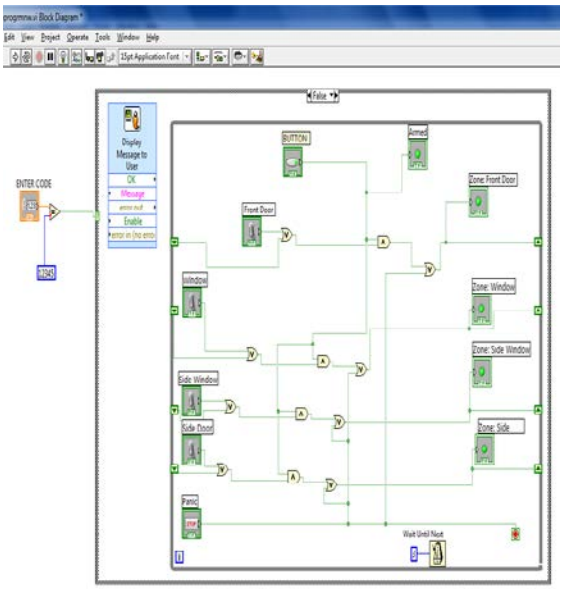

Figure 4. Block diagram of home alarm system

4. Results

If the person will enter the code through keypad at front door and the code is not matched with the fixed value of code then a written warning will be displayed i.e. code is incorrect as shown in Figure 5 and buzzer alarm will ring. If entered code is matched with fixed code then a message will be displayed that code is correct as shown in Figure 6 and buzzer alarm will not ring. If the person will enter through side doors or the windows. Then side door and side windows sensors sense the signals and transmit it to the alarm and buzzer alarm will ring at that time.

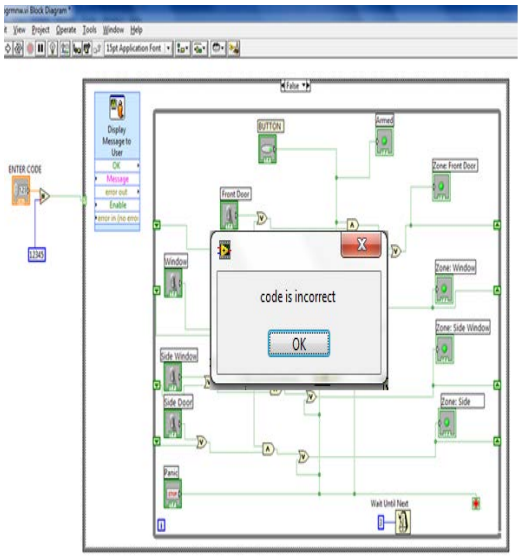

Figure 5. Home alarm system under false condition

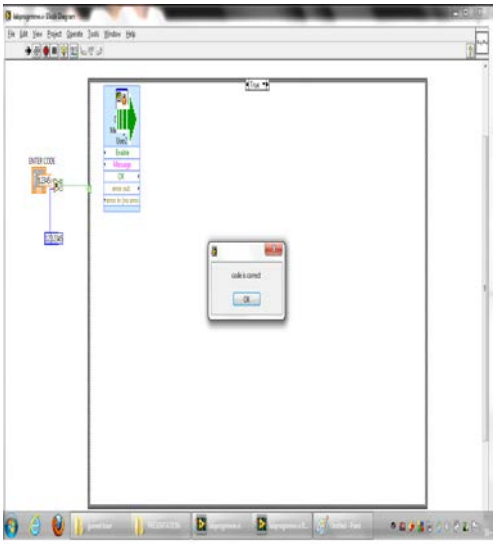

Figure 6. Home alarm system under true condition

5. Conclusion

This paper represents importance of home alarm system against any illegal activities. Installing home security systems are not status symbols anymore but rather they have become a great necessity in today's environment. A properly secured and monitored home can definitely give you that peace of mind for you and for our family. The fear of theft and burglary always annoys many people. When lock and keys become less safe, one can seek the help of electronic security systems or Home Alarm System. Various applications of Home Alarm Systems are in: Buildings, Hospitals, Banks, Electrical control rooms, Heat treating furnaces, Data and telecommunication etc.

Acknowledgement

The authors would like to express their special thanks to Mr. Ajay Sharma for his valuable guidance and encouragement in the work related to Lab view software and to Dr. S.K. Badyal for his contribution on preparing

the final version of this paper. They would also like to acknowledge Department of Electrical Engineering, Mahant Bachittar Singh College of Engg. & Technology, Jammu, India for their constant support.

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