

A MULTI SENSOR REMOTE HOME SECURITY SYSTEM USING LabVIEW

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Abstract–This paper provides an effective and smartway for monitoring and controlling the activities in the house. This could be done even when the owner is far away from the house. The parameters such as temperature of the house, concentration of gas, intrusion of strangers into house and light intensity. These parameters are obtained through sensors by a process called data acquisition and are monitored by LabVIEW. LabVIEW is a virtual instrument used to check the performance of any system with higher accuracy. Data acquisition can be done using NI DAQ cards or microcontrollers. This multi sensor remote home security system is built using microcontrollers as the primary concern is to provide a security system at an affordable cost. LabVIEW software continuously monitors the house and sends signal to alarm system if any abnormal change occurs in the sensor values. In addition to the above features, this product also yields an effective way to control the lighting in our house. This is done through LDR. Furthermore a message stating the abnormal occurrence in the house will be forwarded to the user's mobile through GSM module.

Thus the user will be updated about the home security.

Keywords: Data acquisition, LabVIEW, GSM module, Remote- security system.

I INTRODUCTION

In a world where industrialization is at arapid growing phase and price of all fundamental commodities are at its hike, people are driven and forced to earn more money to lead a sustainable living. Henceforth people work all through the day in all the possible ways to yield nominal capital. The more and more we earn money the more danger intrudes into our life. As most of the people work in the companies during daytime, there is no assurance for security in the home. As a result we could frequently glance through the news on burglary and fire accidents occurring in various regions of our country.

II LITERATURE REVIEW

Dr.BashilHamed et al., has well described the importance and necessity of installing a security system in almost all the houses to lead a safe and secure life. In addition to this he also explained the role of LabVIEW in monitoring the house [1]. Kunalkumar et al., explained various ways to control the home appliances using LabVIEW through wireless technology. This paper provides us the information regarding the design and implementation of block diagram in LabVIEW [2]. B.V.Sumangala et al., explained the advantages of LabVIEW over embedded systems. This paper made us to implement our project idea in LabVIEW domain. Besides various advantages, the major advantages of LabVIEW are more readability, highly accurate results, flexibility and reduction in the size of the product [3]. Rosslin John Robles et al., work briefly explains machine to machine communication employed in home security system. This converts a home to smart home where we can connect all the devices and appliances in our home so they can communicate with each other and with you. Anything in our home that uses electricity can be put on the home network and at our command. Whether you give that command by voice, remote control or computer, the home reacts. Most applications relate to lighting, home security, home theater and entertainment and thermostat regulation. Security has been an important issue in the smart home applications. Conventional security systems keep homeowners, and their property, safe from intruders [5].Janani Prasad et al., explained the ways to reduce the power consumption by the security system using LabVIEW. Though the security system needs to be turned ON for 24*7 to ensure the continuous monitoring of the ambience of the house, it is very essential to reduce

the power consumed by the system [6]. By combining all the views and stats of the above papers we will be able to form the basic layout for the security system. A well-furnished design for any security system was proposed by Xu, Jingzhi. He states that the smart home system consists of three components: physical components, control system and communication system. In this paper, basic structure of a smart home system and a comparative analysis of different smart home system with its components were discussed [7].

Krishna S et al., work indulges the importance of security system in this techno-wizard world and most precisely to elder citizens. As per the survey done by S. Irudaya Rajan, by 2050, the world population will peak to three hundred million. In that population, more would be elder than younger. The situation arises; where elder people live alone without assistance really require constant monitoring [8]. Sleman, A et al., paper sorted down the various possible ways of interfacing the transmitter kit of the security system (which comprises of the sensors, controllers and PC) with the receiver (most probably the smartphone of the user). This work clearly distinguishes the wired and wireless communication between transmitter and receiver. Furthermore it also clarifies the advantages of wireless over wired communication [9]. Several technologies can be used to interface the transmitter and receiver circuits wirelessly. But using GSM would be cost effective and it also supports long distance communication. The merits of GSM over other wireless technologies were listed in the article published by Sikandhar H.K et al., [10].

Apart from all these paper-works and references it was actually the real life incidents which made us to develop a product on security system. This paper could be realized the importance and need to install a security system in every house by examining the survey undertaken by the state and central government on the losses incurred by the government due to fire accidents and burglary.

III METHODOLOGY

A Power source

There are two types of power supply required for this product. One is the 12V dc power supply which powers the microcontroller. This can be supplied using portable batteries. The other is a 230V ac power source which powers the electrical appliances in the house and the PC which runs the LabVIEW software.

B. Sensing Unit

This unit comprises of different sensors connected to a controller to perform different tasks. For instance, a thermistor is used to detect the room temperature continuously so as to determine whether fire accidents occur in the house. A digital computer system cannot directly measure the physical parameters such as temperature, pressure, light intensity, gas concentration etc., For this purpose sensors are used. Sensors act as an interface between the real world and the PC. To be more precise sensors are the input devices for the security system.

C. Data acquisition unit

As mentioned earlier the sensors will sense the physical parameters and the output will be in the form of analog signals or electric impulses. But a computer cannot process analog signals directly. Henceforth an additional kit is required to link the sensor output with the system. As we are using LabVIEW for processing all data, some specialized NI-DAQ kits can be used. The drawback of using these kits is its cost. These kits are pretty expensive and if any hardware failure occurs it will lead to huge loss. On the other hand, we can make use of microcontrollers for data acquisition. This will cost very less amount when compared to the previous one. Microcontroller can be connected to LabVIEW using RS232 cable (Serial communication).

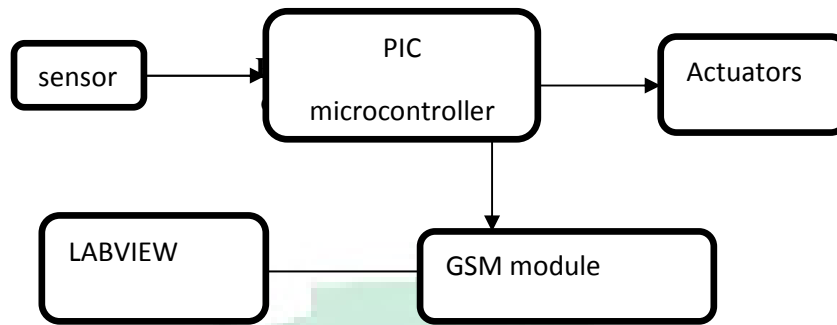


Fig1: Basic layout which includes all the units

D. Monitoring unit

LabVIEW performs the monitoring process. Lab VIEW stands for Laboratory Virtual Instrumentation Engineering Workbench. Lab VIEW is a graphical programming language used to create programs called VI which are in a pictorial form called a block diagram, which eliminates a lot of the syntactical details of other programming languages like C and MATLAB that use a text based programming approach. Lab VIEW is available for all the major platforms and is easily portable.

E. Responding unit

This unit comprises of the actuators or motors, switching circuits and alarm circuits. This unit receives the signals from LabVIEW and controller and reacts correspondingly. For instance, if a fire accident occurs in the house it will be sensed by the thermistor and the corresponding signal will be sent to the controller. The controller in turn sends the signal to actuator system which switches ON the sprinkler system. All these will be continuously monitored by LabVIEW.

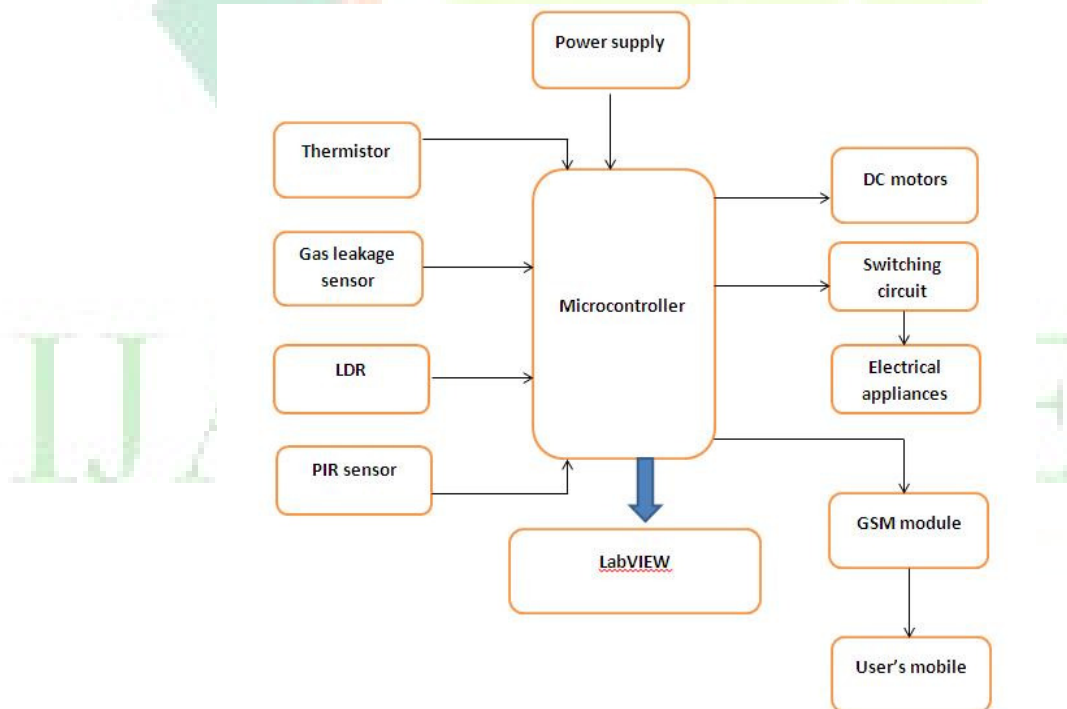


Fig 2: Block diagram

F. Communicating system

All the above units put together will form the transmitter circuit of the security system. The receiver will be the smartphone of the user. As the user needs to monitor his/her house remotely (i.e. without physical contact with the house) wireless communication needs to be implemented. This is done using GSM module.

Thus by integrating all the above units we will be able to design the basic block diagram for the security system which is shown in the Fig 2.

IV DESCRIPTION

As mentioned in the title this security system uses multiple sensors to read the environmental parameters. This is done to ensure that the ambience of the house is well secure and safe. The various sensors (used in this product) and its application are listed below.

I Thermistor: A negative temperature co-efficient thermistor is used in this product. A thermistor reads the room temperature continuously. When the temperature of the room increases beyond the threshold level, the resistance across the wire will decrease and the output signal will be send to the controller.

II Gas leakage sensor: As the name suggests this sensor is used to detect the leakage of gas in house.

III PIR sensor: This sensor is used to detect the intrusion of strangers into the house without the user's access. This sensor can be attached to the doors and windows where the possibility of intrusion of strangers is high.

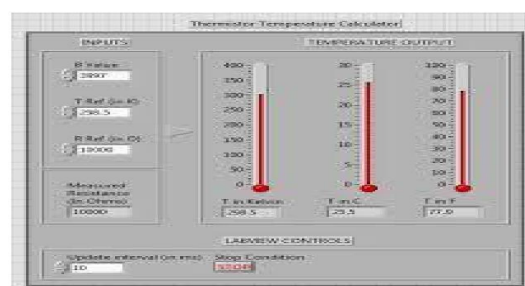
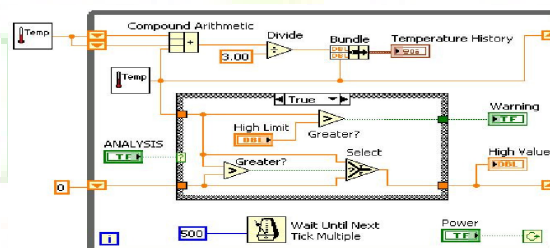
IV LDR: Light Dependent Resistor is used to ensure that the energy is consumed appropriately. For instance, lights in the house will be set OFF during noon time and turned ON during evening. Based on the intensity of the sunlight we can control the electrical appliance

These sensors will read the ambience of the house and respond to the controller if any abnormalities in the sensor value occur. As the microcontroller is interfaced with the LabVIEW through RS232 cable, the sensor read values will be virtually displayed on PC. Henceforth LabVIEW offers more readability and accuracy.

The controller will also send messages to the user's mobile through GSM (wireless communication) module if any incidents occur in the house. The DC motors are actuated by the controllers if any fire accident or gas leakage occurs. DC motors symbolizes the exhaust fan or water sprinkling system. Switching circuits represents the relay which gets actuated when current passes through it. Relay circuit connects the electrical appliances in the house with the main power supply. The circuit remains open until current passes through the relay

V RESULTS & DISCUSSION

This project is set up to design an effective security system with an affordable cost. Including LabVIEW in this design adds another feature to the cap of this project as it could be able to examine what happens in the circuit visually. A good illustration for this is the continuous monitoring of room temperature via LabVIEW. A model block diagram and the virtual thermometer are shown below for reference.



VI CONCLUSION

Thus a multi sensor remote home security system is an effective way of reducing the fire accidents and burglary in houses. This product ensures that the house owner can lead a safe and secure life. Furthermore they can concentrate on their work without any worry about their belongings in their house. Providing such a product at an affordable cost encourages all classes of people to buy the product and install it in their house with ease. This further offers a chance of inclining the Indian economy. Recently Central government has announced about the smart city project and sorted down twenty cities to implement this project. We hope that a security system will be one of the projects to be implemented in this scheme. This security system not only provides the security but also transforms a home to a smart home where the control of all the activities in the home by using mobile. Henceforth this product might bring fruitful outcomes to the economy.

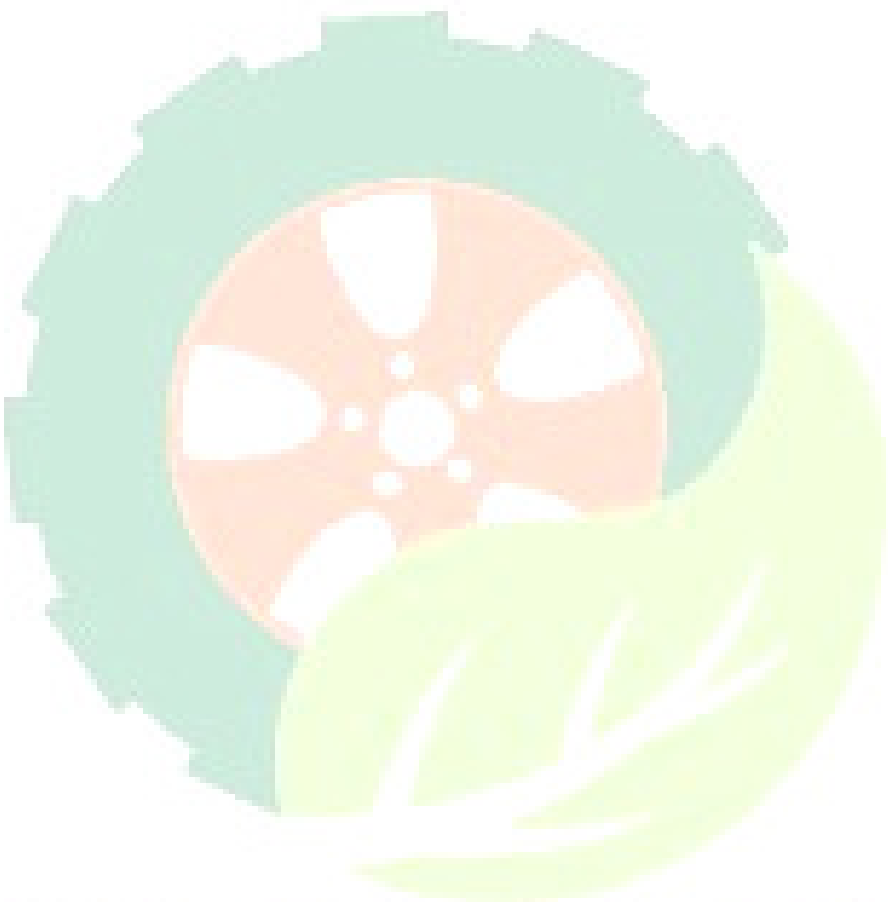
VII FUTURE SCOPE

This product could be enhanced in its performance by adding or modifying certain features:

1. A digital camera could be added to the circuit to capture the image of the intruders as this will provide higher accuracy of the ambience of the house. As LabVIEW supports image processing, there is no need to go for additional software tools.
2. This product could be built on dot net framework to connect the transmitter circuit with a server so that we could reduce the receiver circuits. This is applicable for apartments.

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