

DESIGN AND IMPLEMENTATION OF MICROCONTROLLER INTRUDER BURGLAR ALARM SYSTEM

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Abstract

This project work presents the design and Implementation of an intelligent intruder burglar alarm system. This system is a security system to be deployed in areas where intrusion is not expected. This system has six major parts listed as follows; the power supply unit, the control system, the motion sensor, the LCD display, the activation buttons and the security alarm system. The power supply unit is made up of; the a.c power source. The motion sensor used in this work is the PIR sensor. The LCD used is the 4 by 16-character LCD and displays the presence of intrusion if any intrusion is detected. The alarm system is a low-cost alarm module which is triggered by the control system through a transistor switch arrangement in the event of any intrusion. An activation and deactivation buttons allow users to activate or deactivate the system as need arises. The microcontroller ATMEGA328P controls the automatic and intelligent operation of the entire system. The resulting security system is a low cost but very efficient intelligent

Keywords: intelligent, microcontroller, intruder, detection, device

1.0 INTRODUCTION

The drastic increase in crime rate throughout the world has made the need for security systems very intensive. Every individual feels insecure and wants his personal as well as his surrounding life to be peaceful and secured. A lot of work has been done in this regard. The History of security systems can be traced back to the beginning of human existence; nations, and kingdoms built high rising walls to secure their territories [1]. They posted watch men at the watch posts to

survey their environment in order to ensure there is no security breach. Also in the event of security breaches, an alarm is sounded in the form of a trumpet to alert people around so that they will quickly prepare for a rapid response to the breach. Modern security systems are full of sensors and automated rapid responses by the security system [2]. This device functions as a major security alarms used in residential, commercial, industrial, and military properties for protection against burglary (theft) or property damage, as well as personal protection against intruders. It is an electronic device that is connected to the battery being installed in and gets activated when the owner of the building is leaving the building by pressing the activation button. When the system is activated, if intruder open and enters the building the alarm will start to blow after 20 seconds indicating that unauthorized has entered the building. The device and the “deactivation” switch are not seen but, it has an LCD which shows that the alarm has been activated and it can only be deactivated by the owner of the building when return.

Security system are gaining increase importance in recent times to protect life and valuable resources, many advanced method of providing security have been developed and are in use in the last few decades[3]. Of this one important area is the security system required for military /strategic applications, which has advanced greatly. But such systems being complex and expensive are useful to high end application only. However with recent progress in technology and the growing need for increased security in civilian and other applications, many low cost solutions for security system have now emerged [4]. In the field of Burglar Alarm Systems using modern approaches has become a major means of providing security in all applications, both military and civilian [5]. Due to high state of insecurity being experienced in the entire world the need to keep the occupants of the office aware of any intrusion into their premises cannot be overemphasized.

1.1 DEFINITION OF TERMS

A.C –Alternating Current, D.C –Direct Current, PIR – Passive Infrared Receiver, LDR – Light Dependent Resistor, LCD –Liquid Crystal Display, LED – Light Emitting Diode, PIN – Personal Identification Number, C.P.U – Central Processing Unit., RAM – Random Access Memory, ROM – Read Only Memory, CPTED - Crime Prevention Through Environmental Design, IESNA - Illuminating Engineering Society of North America

2.0 LITERATURE REVIEW

2.1 Brief History of Security System

The main purpose of this design is to develop a low cost security system as several security gadgets available are very costly to afford. Security has been there from the inception of human beings. The need for security arose due to the insecurity caused by men and beast. A nation could rise and attack another, defeat them and cart away with their precious properties. Most of these attacks were successful especially when people involved were not expecting them, since as men we must have some unguarded times, for example, while sleeping. Initially security guards were employed to monitor and keep security at those unguarded times. With time it was also discovered that due to human limitations of the security guards, a lot of security breaches were always recorded. This led to the development of machines meant to assist the human security agents. These machines can detect breaches in security like intrusion, illegal access etc, and report back to the human security agents. Several security systems have been designed over the years, several of which include surveillance systems, security lighting system, alert systems,

biometric security systems, defensive security system etc. In this project we will be looking the security burglar alarm system.

2.2 Security Systems Already Existing

When it comes to security systems there are a handful of different models and many other different types of security systems such as access security system, surveillance security system, wireless security system, intruder security system, home security system, personal security system, security alarm systems etc. but we will concentrate on security alarm systems since this work is based on that type of system.

2.3 The Proposed System

The proposed system is a microcontroller base Intruder burglar alarm system. The control system which is the microcontroller is being driven by the hex files (machine code) which were generated from the arduino program. The arduino program is a high level open source development program that is made up of a unique combination of C++ and C language program. This was translated from the pseudo codes and the flow chart. The control system receives information from the PIR sensors, interprets them and takes decision on what action to carry out, while displaying its resolutions on the LCD screen for the users to see. The system takes intelligent decisions based on the sensor information, and automatically executes its decisions. The alarm is set off once intrusion is detected.

2.4 The Microcontroller base intruder Burglar Alarm System

The microcontroller Based Intruder burglar alarm system is a low cost security system. This system is installed in homes and activated when the occupants have gone out, in order to track

intruders. This system is made up the power supply unit, the alarm unit, the control system, the PIR (motion detection sensor), the LCD display, and the activation and deactivation buttons. As simple as the system is, it will save many homes from being bugled by unwanted intruders.

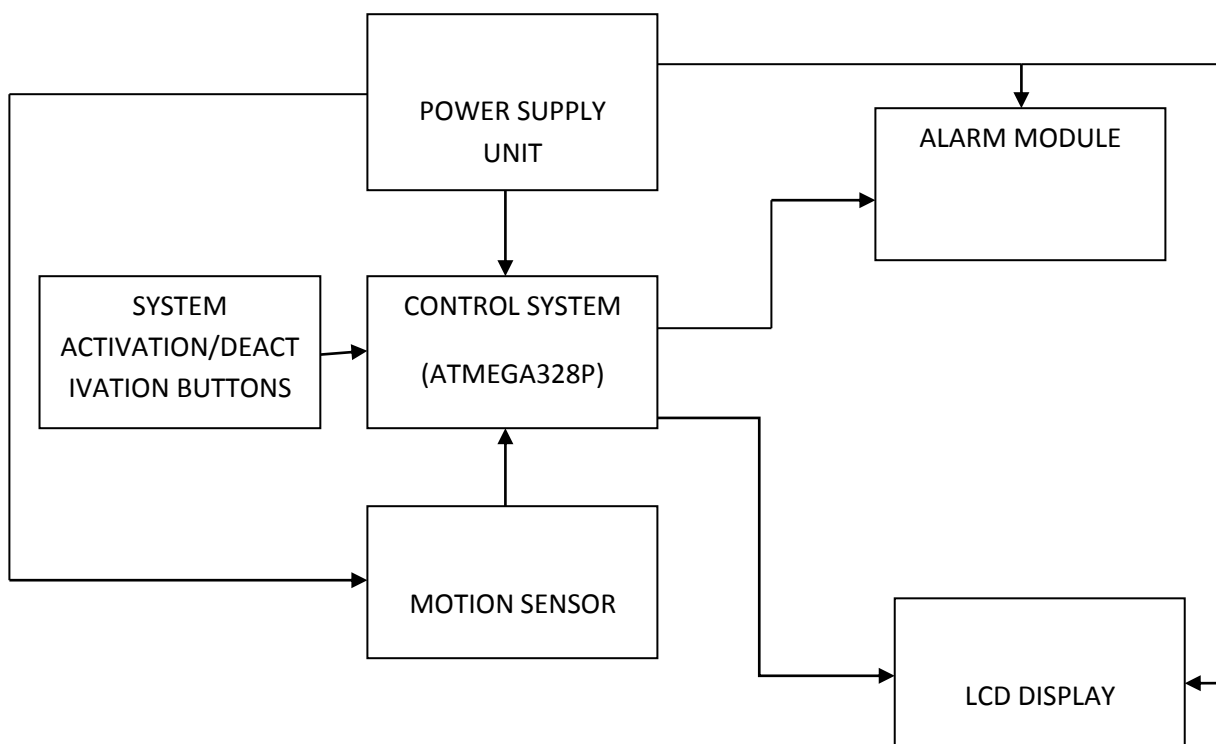


Figure 2.0: Block Diagram of Microcontroller Intruder Burglar Alarm System

The block diagram in Figure 3.0 shows the various units that make up the system.

The ATMEGA328P microcontroller is in charge of the general control of the system. The PIR sensor is the motion detector that detects any motion within the restricted area being monitored. The Passive Infrared sensor (PIR sensor) is an electronic device that measures infrared (IR) light radiating from objects in its field of view. PIR sensors

are often used in the construction of PIR-based motion detectors. Apparent motion is detected when an infrared source with one temperature, such as a human, passes in front of an infrared source with another temperature, such as a wall. All objects emit what is known as black body radiation. It is usually infrared radiation that is invisible to the human eye but can be detected by electronic devices designed for such a purpose. The term passive in this instance means that the PIR device does not emit an infrared beam but merely passively accepts incoming infrared radiation. In passive infrared motion detectors, a sensor containing an infrared-sensitive phototransistor is placed in the area to be protected. Circuitry within the sensor detects the infrared radiation emitted by the intruder's body and triggers the alarm. The problem with using this type of detector is that it can be falsely triggered by warm air movement or other disturbances that can alter the infrared radiation levels in an area. In order to prevent this problem, newer systems use two infrared sensors which monitor different zones within a protected area. Logic within system triggers the alarm only when the two zones are activated in sequence, as would occur if a person walked through the protected area.

3.0 METHODOLOGY USED FOR THE PROJECT DEVELOPMENT

The methodology adopted for the hardware development is the top-down design method. Here, we started from the implementation and the testing of PIR sensor module, followed by the implementation and testing of the control system, that is, the ATMEGA328P with all its configuration components and LCD display. Then, we implemented and tested the transistor switching, followed by the alarm module and testing of the control system, Figure 3.1 shows the block diagram of the top-down design method.

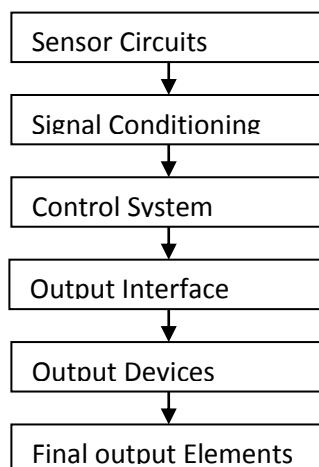


Fig 3.1 The Block Diagram for Top Down Design Approach

The sensor used is here is a passive infrared detector (PIR) sensor. The activation and Deactivation buttons are also input signals to the microcontroller. They inform the microcontroller of when to be active and when to be inactive. The sensor signals from the PIR sensor is now conditioned and fed into the microcontroller for appropriate interpretation and control operation. The interpretation is now used to monitor the presence of intrusion. Once intrusion is detected the alarm module is activated to alert the security operatives and even the neighborhood of a possible security breach. The state of the system each time is displayed on the LCD. The control system typically is the ATMEGA328P microcontroller and the entire components needed to properly configure it for proper operations. The output interfaces and final output element here is basically the transistor switching unit that switches the alarm module, using the control switching signals from the microcontroller. The final output elements are those elements that execute the real world desired actions, in this case the alarm module. They assist the control system in carrying out its decisions in the real world.

On the other hand, the methodology adopted for the software development is the pseudo codes and flow chart method of program development. The desired action expected to be performed by

the control system is carefully represent by our pseudo codes and the flow chart. The software implementation controls the general operation of the system.

3.1 The Control Algorithm or Pseudo Codes

The construction hardware circuit is useless if there is no software program to drive it. The sequence of operation used to solve a problem or achieve a desired output is often called control algorithm or the pseudo codes. It is this sequence of operation that constitutes the action of the control system. A very simple way of representing these sequences of actions is by the use of flow chart. Another method is to use pseudo coding; that is, English-like constructions of the actions the controller is expected to execute step by step. These form a guide in writing the required arduino program codes for the systems operation. A program can be defined as an orderly sequence of machine instructions that can be obtained by compilation using a high level or low-level programming language statement. The written program is burnt into the microcontroller (ATMEGA328P) using arduino uno board. Fig.3.2 shows the control algorithm, which are the Pseudo codes, while Fig. 3.3 shows the control flow charts that depicts the control sequence of the system.

START

Assignment of i/o bits and ports to their desired labels

Initialize all memory locations and bits to their starting values

Check if the activation button is pressed

If pressed then activate the burglar alarm system, else stay on Stand by Mode and keep checking for activation.

Check PIR sensor for INTRUDER, IF INTRUDER detected then Activate the ALARM system ELSE keep checking for INTRUDER

Fig3.2: Control Algorithm or Pseudo Codes

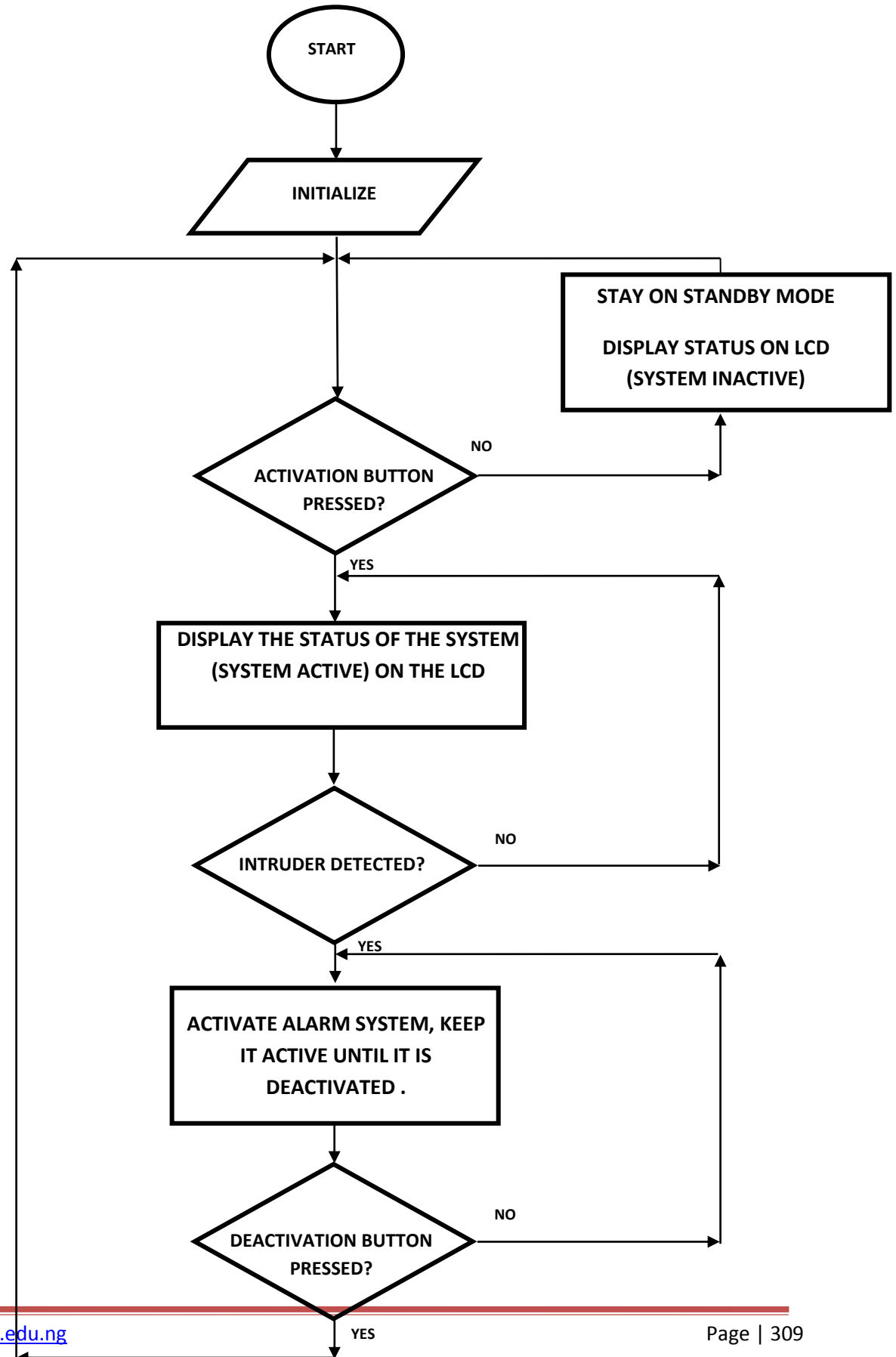
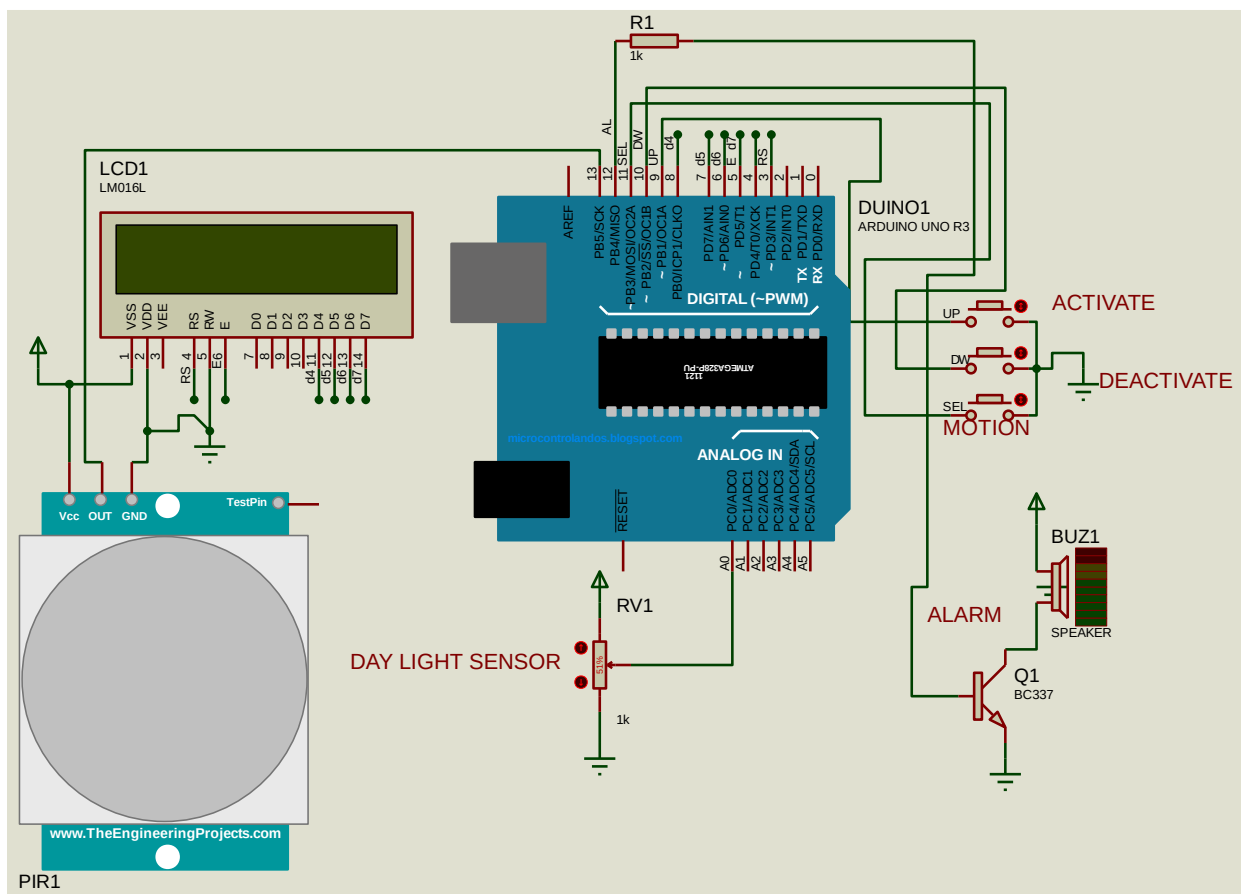


Figure 3.3 System Flow Chart

Figure 3.4 COMPLETE CIRCUIT DIAGRAM



4.0 Conclusion

The need for security devices in our nation today cannot be over emphasized. Most security devices available in the international market are very costly. The microcontroller burglar Intruder alarm system is a very effective security system and is a low cost security system. Thus this project will give all classes of homes access to procure and deploy this system for the security of their lives and properties.

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