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Design and implementation of a Micro controller based burglar alarm displaying

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ABSTRACT

Since burglar alarm systems are very imperative to the society, this work has been designed to solve the problem of accurate detection and location of intruders. This design work however is to: Detect intruders, Point of intrusion, and also Display location of intrusion. Micro controller based design of the burglar alarm displaying position is an improvement in the electronics sector. Electronics like this device can be coupled solely via the use of discrete components including counter, multiplexers, de-multiplexers, timers and latches; moreover the use of a micro controller for this design can be justified by the reduction in the number of components used in the course of the design which also improves the reliability durability and flexibility. This work is design in such a way that if sold in the market, the buyer gets as much service from the burglar alarm which is tantamount to the resources he paid for it and can also be kept or used in houses, cars etc.

Keywords: Alarm, Detector, Intruder, Microcontroller, Processor.

INTRODUCTION

This work covers the design and construction of micro controller based burglar alarm displaying position. In today's world of rapidly advancing technology, most conventional alarm systems only triggers a warning sound or siren when an intruder is detected without telling the location of the intruder. To improve on the afore-mentioned means of warning when an intruder is detected, this design is modified to tell the location of the point at which the intruder was detected.

Although the earliest people embarked on a lot of development in the field of science and technology. This led to the discovery of light production from electricity. Benjamin Frank, in his famous kite experiment in June 1752, demonstrated the identity of lightening and electricity that led to his "one-fluid" theory. In Electrical Engineering, the three key inventions that established electronics as a field and revolutionized the worlds of communication, control, instrumentation, music, and business, among others were the triode, the transistor and the integrated circuit.

The transistor, the major tool for electronic control was invented by a team of three men at Bell Laboratories in 1947. Although this first transistor was not a triode valve, it served as the beginning of a technological revolution that is still continuing. In 1951, William schockley invented the first junction transistor in the form of a semi conductor device. This led to many other semiconductor inventions including the integrated circuit (IC), a small device that contains thousands of miniaturized transistors. It is this technology of semiconductor transistor control, integrated circuit and John Neumann Computer theory that gave rise to the so called "single –chip microprocessor". The first set microprocessor came in the form of 4-bit microprocessor until 1986, when 8-bit chips took the lead. However, the bit count has risen to 32-bit nowadays. Availability of microprocessor in modern day electronic world has brought super performance in machines that were unimaginable in the years past. They offer better performance at lower cost and with simple construction than does equivalent instruments implemented with discrete logic chips. Furthermore, making changes and improvements is often as simple as writing new firmware. As a consequence, no competent designer can afford to ignore this versatile device. One of these devices is the 8051 family of microprocessors which served as the centre of this design work [1-4].

However, this burglar alarm uses a processor (Atmel 89S51) for its actualization and with time could work hand in hand with security cameras especially in places where a security camera can be easily noticed to detect an intruder and the intruder's location. Burglar alarms have become standard equipment in stores and other businesses, and they're becoming increasingly common in private homes as well [3]. If you've ever shopped for a home security system, then you know there are a wide variety of options available. These systems range from do-it-yourself kits you can

pick up for $10 to sophisticated whole-house security networks that must be installed by professionals. But, as it turns out, most alarm systems are actually built around the same basic design concepts [4, 5].

The microcontroller based burglar alarm displaying position is a digital system for processing information in which the information is represented by physical quantities, which are so constrained to take only discrete values that can be referred to as binary signals [6, 7].

In this design we have implored the use of both hardware and software to bring about the entire project. The hardware components are solely coordinated by the AT89C51 micro controller chip while the c programming language is used to program the chip

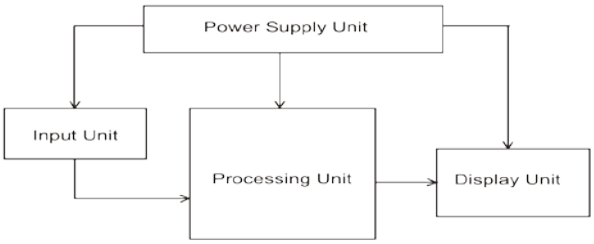

Figure 1:Block Diagram of The burglar alarm system.

From the figure above, the microcontroller is seen at the centre of design receiving the input as well as output to the other peripheral components. The block diagrams consist of four stages, which are:

Sensor Unit

The sensor unit is made up of the touch sensor, the light detector and the darkness detector. Each of these alarm sensing units make up the different type of intruder detection system implemented in this project.

Microcontroller (AT89C51):

This is an integrated circuit programmed with an ISP flash programmer to receive input signals and relating it to other interfaced sub-unit attached to it for their corresponding signals generation.

Display unit

The display unit is made up of the LCD screen to display the point of intrusion of the burglar. The display unit is used in the design to make it easy for security operatives and users using the system to locate the intruder easily.

Power Supply Unit

The transformer, bridge rectifier diodes, capacitors and a voltage regulator make up the power supply unit. This power unit gives out an output voltage of +5v.

A burglar alarm system helps detect unauthorized entry onto a company's premises. The system sends a signal to a central monitoring center when activated. The monitoring centers provide 24/7 service and will alert the local police to dispatch authorities to the scene. It is a proven fact that the risk of burglary is significantly reduced after a burglar alarm is installed [4,8].

DESIGN ANALYSIS

Introduction

This chapter deals with the design methods and then analysis employed in the design of the electronic dot- matrix display. These analyses are required to make the correct choice of component values for effective performance. The analysis is divided into modules namely

i. The power supply unit
ii. The light detector
iii. The darkness detector
iv. The processor unit
v. The display unit
vi. The alarm unit

Design of the Power Supply Unit

The power supply unit performs the function of converting an AC source to a DC power which is needed to power the circuit. A miniature 5V power supply adapter was incorporated into the design to power the different segments of the system.

Design of the Light Detector Unit

The design of the light detector unit was achieved using an LDR interfaced to an NE555 timer to detect presence of light. When an intruder flashes a torch or light device, the LDR resistance decreases and the NE555 is triggered through pin 2 and then sends out an output through pin 3 to the microcontroller pin as a high.

The light detector detects an intruder either trying to open a door in a security area in kept in darkness, once light is detected the alarm is activated and beeps.

Design of the Darkness Detector Unit

The design of the darkness detector unit was achieved using a Light Dependent Resistor (LDR) interfaced to an NE555 timer to detect absence of light. When an intruder blocks a lighting point or casts a shadow to block light falling on the sensor in the activated area, the alarm is activated and the display screen displays the zone where the intrusion is coming from [9].

Design of the Processor Unit

The design of the processor unit was achieved using a microcontroller. The processor unit takes care of taking the signals from the sensors and activating the alarm and display to show the point of intrusion or the place where the intruder is thereby making it easy for the intruder to be caught. The Processor unit controls the overall function of the system since it takes the signals from the sensor inputs and determines the necessary action to take by showing the zone of intrusion of the intruder or thief and also directing the security operative in apprehending the criminal by giving away the position of the criminal[8].

The processor unit was programmed to achieve the desired system result.

The Software Design

This is the written program that contains the bearer's intension. The screen displays the content of this program. With particular reference to this project, the essence of this program is to control which of the LEDS should come up at a particular time and the ones that should not. Hence with the program properly implemented, the digital clock would display time accurately. The software/firmware development was executed in the following phases [10];

i. Writing of the source code in C language.
ii. Compiling the source code using SDCC compiler.
iii. Programming the microcontroller with the output hex file from the compiler using ISP flash programmer.

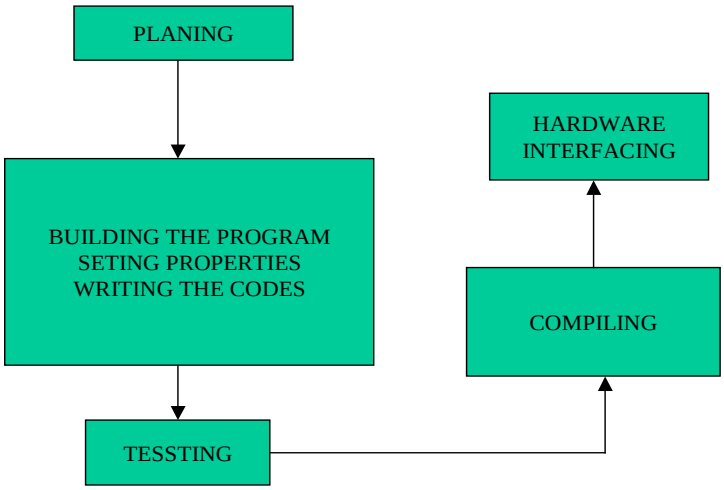

Figure 2. Software Design

RESULT AND DISCUSSION

Introduction

The construction of the project was done in three different stages. Which are testing on a breadboard, soldering on the Vero board and casing for the entire constructed work.

Bread Boarding

This is where the preliminary implementation of the project was done. Each of the various blocks in the diagram was tested separately on the bread board before being transferred to the vero board.

Vero Board

The final construction of the circuits was done on a vero boards. Integrated circuit sockets were used for ease of troubleshooting and parts replacement.

DISCUSSION

During the construction of this project, testing was carried out at different stages to determine if the result obtained at each stage met the desired specifications. After the design and implementation phase, the system built has to be tested for Durability, Efficiency, and Effectiveness and also ascertain if there is need to modify this design. The system was first assembled using a breadboard. All components were properly inserted into the breadboard from whence some tests were carried out at various stages.

To ensure proper functioning of components' expected data, the components were tested using a digital multimeter (DMM). Resistors were tested to ensure that they were within the tolerance value. Faulty resistors were discarded .The LM7805 voltage regulator was also tested, the resulting output was 4.99v which is just a deviation of 0.01v from the expected result of 5.00v.

The system was powered and operated upon using several possibilities. They include triggering more than one alarm at the same time and noting the output responses of the system hardware. The system displayed the corresponding point of intrusion and buzzer came on each time there were intrusion.

The completely coupled display performed well displaying the correct location of intrusion.

This goes to show that the use of a microprocessor in design effectively reduce the number of components and also make for active control of device and components using program code.

Figure 3 showing the burglar alarm systemFigure.

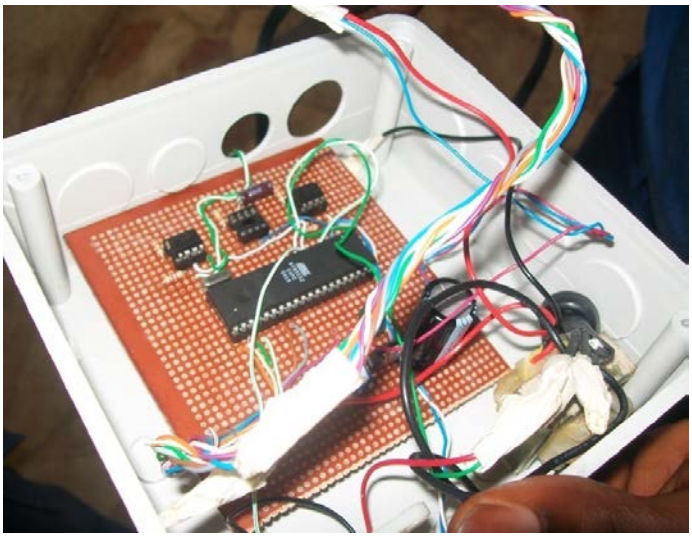

Figure: 4 Diagram above showing internal structure of burglar alarm

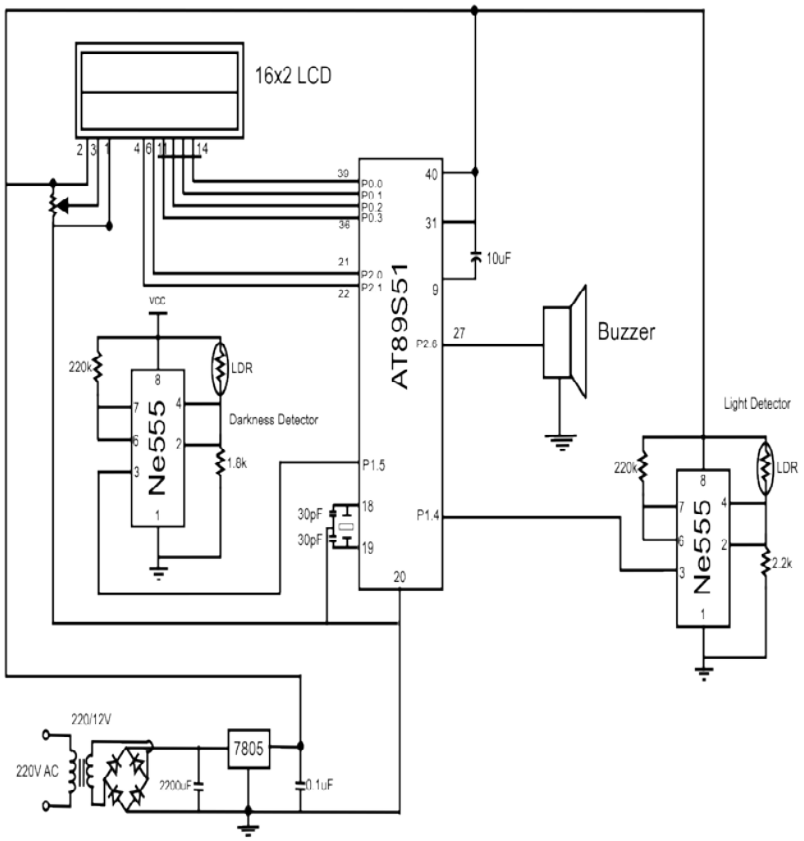

Figure 5: Complete Circuit Diagram

CONCLUSION AND RECOMMENDATION

Alarm systems are installed in buildings to protect people and assets. When an alarm has been triggered, a response to the alarm is needed. Normally, a security guard is sent to the location where the alarm went off to check the premises and try to find the cause of the alarm. If the security at the location has been breached, caused by for example a burglary or a fire, a fast response may limit the potential damages and loss of assets.

This project has basic steps taken in the design and construction of burglary alarm system in an electrical/ electronic workshop, Institution, Houses, etc these places which are well equipped, model for students of electrical/electronics to enhance and impact in them adequate knowledge on the various electrical devices and components.

Again, different electronics components were studied under this condition like Resistor, Transistor, Capacitor, Rectifier, Led etc. their functions, properties and types even Transformer (12) volts was used as the project makes use of a lot of electronic devices.

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