

Electronic Eye for Security System

Saurabh Vinayak Lawate¹ and M. S. Ali²

*M.E (Electrical & Electronics)
Department of Electrical and Electronics Engineering,
PRMCEAM, Amravati University, Badnera*

Abstract

Electronic eye describes the design and implementation of Door image capture using Microcontroller based security system for home and offices. It provides the user with efficient and reliable security system for Door image capture for home, offices and industries that supports the use of an sensor at the door to send the signals to control unit of electronic eye with buzzer alarm for security purpose with image capture as soon as the door opens with image capture at the output of laptop or PC with VB application.

Keywords— Microcontroller, Electronic eye, security system, control unit, sensor, VB application.

Introduction

Security is primary concern with day to day life and properties in our environment. This paper describes effective security alarm system that can monitor image capture system with the help of VB application. As soon as door opens sensor gets activated with image captured with help of Web camera in PC captured image gets saved within VB application. It also serves function of sensing and detecting false intrusion (using input sensory device and gives early warning devices alarm and remotely controlled security system). The term false intrusion here is used to mean any form of attempt to gain entry without proper pre design protocols.

Robbery has become common in our day to day life. Countering it, Security systems with Web cameras are commercially available. These systems are powered entire time and they capture videos, images throughout the day and hence consuming large amount of electricity. In most the places remote surveillance is needed. These system captured image as door opens alarm gets on with transferring data through microcontroller control unit with image can be seen on PC or Laptop with VB application software.

Security system has been concern of worldwide. As technology is emerging every second, abundant home based or office based or industries based security systems have been developed and implemented to keep welfare security safe. Home security system is an essential mean of protecting homes from illegal invasion and false intrusion. A general home security system consists of CCTV, Web cameras, Buzzer alarm. Web camera or CCTV capture image in 24 hours to identify what goes around the house and in the house around the door which holds evidences if there is false intrusion in house breaking around the door of captured areas. The power consumption is also considerably large as camera is always on to keep recording non-stop and for capturing images. The power consumption is considered as concern of installing a security system.

Methodology

Early days with advancement of technology things are becoming simpler and easier for users. Automated systems/machines are being preferred over manual system. In this paper the basic definitions needed to understand the Project better and further defines the technical criteria to be implemented as a part of this project. Automation reduces the need of human work and also the use of control systems and information technologies reduces the need for human work in the production of goods and services. In the scope of industrialization, home automation is a step beyond mechanization. For machineries mechanization provided human operators with machinery to assist them with the muscular requirements of work, where automation greatly reduces the need for human sensory and mental requirements as well. Automation in security system plays an increasingly important role in the world economy. Automatic security systems are being preferred over manual system. Through this paper we have tried to show home automatic security system control of a house as a result of which power is saved to some extent with the help of home automation for door image capture for security system. The block diagram for the proposed system is shown in fig.1 below:

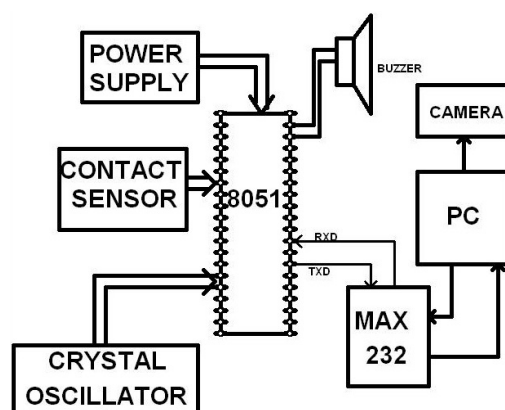


Fig.1. Block Diagram of Hardware System Design

As per the above block diagram the camera is connected to PC and the microcontroller with contact sensor and buzzer is connected via RS232. There are hardware and software tools used to design the proposed system. The tools and sensors used in system are following:

Door image Contact Sensors[6]

The NOM02B4-DR11G contact image sensor (CIS) module integrates a red LED light source, lens and image sensor in a compact housing. The module is designed for document scanning, mark reading, gaming and office automation equipment applications and is suitable for scanning documents up to 256 mm wide with a scanning rate of 410 sec/line. The analog output signal is processed by a digitizing comparator referenced to an externally supplied voltage level to produce a serial digital output. The NOM02B4-DR11G module employs proprietary CMOS image sensing technology from ON Semiconductor to achieve high-speed performance and high sensitivity.



Fig.2. Door Image Contact Sensor

- Light Source, Lens and Sensor are integrated into a Single Module.
- 256 mm Scanning Width at 8 dots per mm Resolution.
- 410 sec/Line Scanning Speed @ 5.0 MHz Pixel Rate.
- Two-Level Tracking Digital Output.
- Differential LVDS Input and Output Signals.
- Supports B4 Paper Size at up to 52 Pages per Minute
- Red LED Light Source.
- Wide Dynamic Range, Low Power.
- Compact 272.0 mm x 24.3 mm x 21.5 mm Module Housing.
- Light Weight 2.4 oz Packaging.
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant.

Web Camera

Web Camera Image Save is currently based on 'Video for Windows' API (VFW), which is a very old and problematic programming interface for capturing camera images/video, available in all versions of Windows. This programming interface has some limitations. It doesn't work well with more than one camera. If you have more than one camera plugged to your computer, unfriendly dialog-box of VFW will appear on the screen and you'll requested to choose the desired camera. VFW may cause Web Cam Image Save to hang in some circumstances, for example, if we unplug the Web Cam while Web Cam Image Save is running. Controlling the camera settings, like brightness and contrast, is done with external dialog-boxes provided by 'Video for Windows'

The wireless camera used here designed using video and image monitoring system, for detecting the presence of things which are exactly at the entrance of the restricted zone at door of home security system. This type of automatic wireless video and image monitors is quite suitable for the isolated restricted zones, where the tight security is required. The principle of remote sensing is utilized in this, to detect the presence of any things/persons at very near to particular point.



Fig. 3. Web Camera

A video camera collects the images from the reference points and then converts into electronic signals. The collected images are converted from visible light into invisible electronic signals inside a solid-state imager. These signals are transmitted to the monitor. This type of automatic wireless video monitors is quite suitable for the isolated restricted zones, where the tight security is required. Once upon a time much importance is not given for the security system. But now-a-days security has become a major problem and need has aroused to develop different types of security systems for various applications to safe guard the zones of various types like industries, offices, homes etc.

- High-resolution CMOS color sensor.
- 5M pixels (software enhanced).
- USB Hi-speed connection.

- Video mode: 24 bit true color.
- Optical 2-glasses lens with sharp and bright image quality.
- Image focus: 3Cm to infinity.
- Automatic brightness adjustment and color compensation.
- Manual focus.
- Work with VB application and other internet video chat.

Buzzer

The burglar alarm is built around the 89C51 microcontroller from Atmel. This micro controller provides all the functionality of the burglar alarm. A maximum of 8 sensors can be connected to the burglar alarm. A power supply voltage of +5 VDC is available for each sensor at the corresponding wiring terminals.

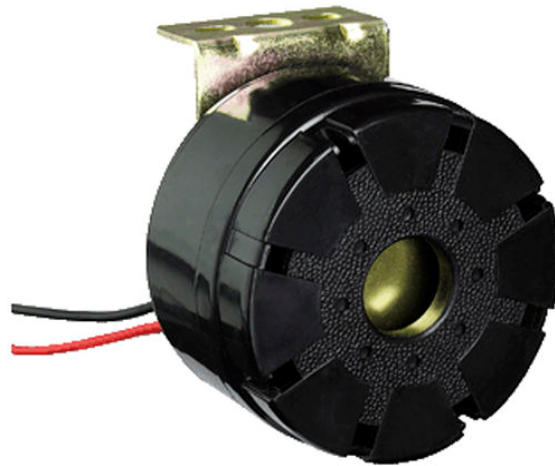


Fig.4. Buzzer

On-Off Electronic Switched

In electronics, a switch is an electrical component that can break an electrical circuit, interrupting the current or diverting it from one conductor to another. The most familiar form of switch is a manually operated electromechanical device with one or more sets of electrical contacts. Each set of contacts can be in one of two states, either 'closed' meaning the contacts are touching and electricity can flow between them, or 'open', meaning the contacts are separated and non-conducting.

A switch may be directly manipulated by a human as a control signal to a system, such as a computer keyboard button, or to control power flow in a circuit, such as a light switch. Automatically-operated switches can be used to control the motions of machines, for example, to indicate that a garage door has reached its full open position or that a machine tool is in a position to accept another work piece. Switches may be operated by process variables such as pressure, temperature, flow, current, voltage, and force, acting as sensors in a process and used to automatically

control a system. For example, a thermostat is an automatically operated switch used to control a heating process. A switch that is operated by another electrical circuit is called a relay. Large switches may be remotely operated by a motor drive mechanism. Some switches are used to isolate electric power from a system, providing a visible point of isolation that can be pad-locked if necessary to prevent accidental operation of a machine during maintenance, or to prevent electric shock.

RIDE Software

RIDE is a fully featured Integrated Development Environment that provides seamless integration and easy access to all development tools. From editing to compiling, linking, debugging and back to the start, with a Simulator, ICE, Rom Monitor or other debugging tool, RIDE conveniently manages all aspects of the Embedded Systems development with a single user interface. The project manager creates links between the various files that comprise a project and the tools necessary to create that project. A project is dedicated to a particular target: 89C51, XA, ST6 or other microcontroller.

Flash Magic Software

NXP Semiconductors produce a range of Microcontrollers that feature both on-chip Flash memory and the ability to be reprogrammed using In-System Programming technology. Flash Magic is Windows software from the Embedded Systems Academy that allows easy access to all the ISP features provided by the devices. These features include,

- Erasing the Flash memory (individual blocks or the whole device)
- Programming the Flash memory
- Modifying the Boot Vector and Status Byte
- Reading Flash memory.
- Performing a blank check on a section of Flash memory.
- Reading the signature bytes.
- Reading and writing the security bits.
- Direct load of a new baud rate (high speed Communications) Sending commands to place device in Boot loader mode.

Web camera Image Saver

Web Cam Image Save is simple WEBCAM capture utility that allows to easily capturing a still image from our camera every number of seconds that we choose, and save it into image file (.jpg,.png,.bmp) on our disk. We can format the saved image filename with the date/time that the image was taken according to our preference, for example: c:\images\img20110725_123256.jpg.

Web Cam Image Save also adds a label with the date/time that the image was captured into the image, by using the font, color, and date/time format that we choose. We can also capture a single camera image from command-line, without displaying any user interface.

Microsoft Visual Basic application

Visual Basic is an advanced version of BASIC programming language with visual and event driven programming. It is helpful in creating a graphical user interface in many applications with help of the components available on the window. Visual Basic 6.0 is the latest version used in this work. Figure shows the screenshot for the electronic eye for door image capture home security system in visual basic.

The Visual basic program has used here for producing the interface of secure door capture image for home security purpose. It mainly consists of the interface that connects the electronic eye (control circuit) and the VB application programming in PC. The VB application software to interface hardware system connected to the PC using the COM ports and provides GUI for user. COM ports of hardware system and PC can be easily selected from the boxes provided on the interface. The GUI basically provides user friendly environment to operate and monitor the system.



Fig.6.Screen Shot for Created Main screen for Electronic Eye for Security System

Analytical Results

The results are shown in the Fig. 8 and Fig. 9. The contact sensor scans for intrusion movement around the access door. And on detecting motion, it triggers the buzzer alarm system module and to capture the image and gives the processed result (Fig. 8 and Fig.9). If access is granted, the alarm turned on as soon as the person may enter the room the web camera captured image and image will be saved through VB application software in webcamerasave.



Fig. 7. Screenshot of Electronic Eye form

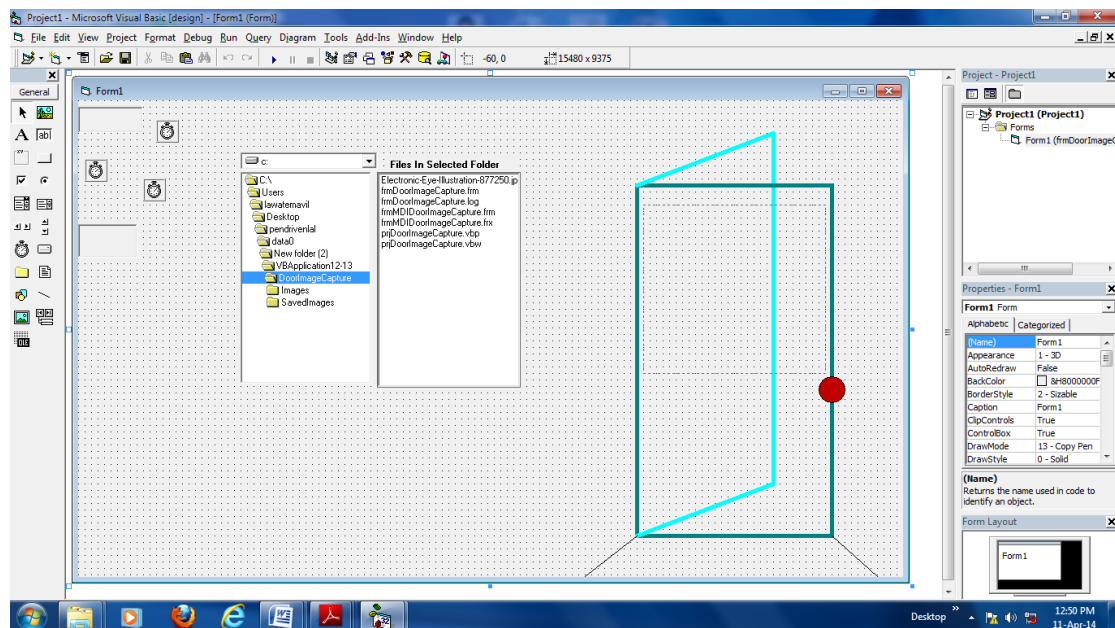


Fig.8. Screenshot of Main Program form

From the above results shown, we can see that our system has completed all its main functions such as Image Capture through Web Camera as soon as door opens with buzzer alarm gets on. Thus Images gets saved in c:\images\img20110725_123256.jpg., in PC or Laptop.



Fig. 9. Image captured when door opens.

Conclusion

Hence, Microcontroller based Electronic Eye for security system, device that utilizes Sensor input as key for users' access. It has been successfully demonstrated that, this will serve as a device for securing personal wares in environments where it is deployed against intruders by setting off appropriate alarm for every door opens. Therefore, it can be said that the objectives have been met, hence conclusion is made that this is a successful undertaking design and implementation of Door image capture using Microcontroller based security system for home and offices. It provides the user with efficient and reliable security system for Door image capture for home, offices and industries that supports the use of an sensor at the door to send the signals to control unit of electronic eye with buzzer alarm for security purpose with image capture as soon as the door opens with image capture at the output of laptop or PC with VB application output.

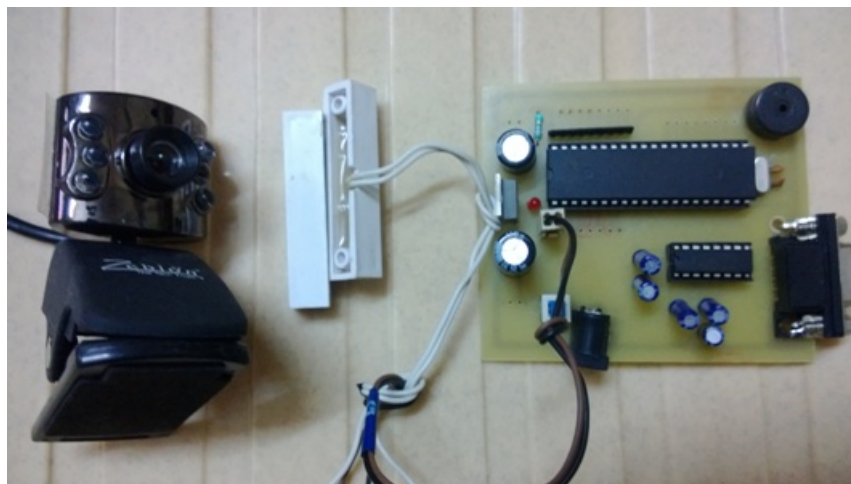


Fig.. 10. Photo of project on Electronic eye for security system.

References

- [1] <http://ftp.emmicroelectronic.com/EMMarin/MCU/Kit6819>.
- [2] “ Koninklijke Philips Electronics N.V, ” P89V51RD2 8-bit 80C51 5V low power 64 kB Flash microcontroller with 1 kB RAM, 2004, Revsion pp.01-01.
- [3] Data Sheet of LM7805API, LM7804API, Semiconductor technical, Bipolar Integrated Circuit data in KEI (Korea Electronics Co.LTD), April 1998, pp. 1-19.
- [4] Data Sheet of MAX232, MAX2321, Dual EIA-232 Driver and Reciver in TEXAS Instrumentation, SLLS047L February, 1989 and Reviced March, 2004, pp. 1-11.
- [5] Data Sheet of Crystal Oscillator MKE02P64M20SF0, Freescale Semiconductor Document technical, Bipolar Integrated Circuit data in KEI (Korea Electronics Co.LTD), Revision 3, July 2003, pp. 9-33
- [6] <Http://www.onsemi.com/orderlit>, DataSheet of NOM02A4-AG01G 200DPI Contact Image Sensor Module
- [7] Data Sheet of Crystal Oscillator MKE02P64M20SF0, Freescale Semiconductor Document technical, Bipolar Integrated Circuit data in KEI (Korea Electronics Co.LTD), Revision 3, July 2003, pp. 9-33
- [8] <http://www.zebion.in>, Data sheet of Web camera for PC.
- [9] J. S. Kartik, K. R. Kumar and V. S. Srimadhavan, “Security System with Face Recognition SMS alert and Embedded network Video monitoring Terminal, ” IJSPTM, Vol 2, No 5, pp. 9-19, October 2013.
- [10] I. C. Wakefield, H. E. Sonder, W. M. Lee S. Jacobs and C. P. Bean, “VB.Net Developers Guide, ” 2000, pp. 1-741.
- [11] Jer-Vui Lee, Yea-Dat Chuah and Chin-Tin Chai, A Multilevel Home Security System, International Journal of Smart Home Vol. 7, No. 2, pp. 49-60, March, 2013.