Description and Working of Automatic Exam Control Room Security System- A Review

Prof. Kaushik Vipul R.[1], Dr. Vijay N. Patil[2]

[1] Assistant Professor, Parikrama Group of Institutions, Kashti, Ahmednagar, Maharashtra, India,
[2] Director, Parikrama Group of Institutions, Kashti, Ahmednagar, Maharashtra, India.

ABSTRACT: This article proposes and analyse a system which will replace the exam control room main door security in colleges, exam paper printing and distribution. Manual paper printing and distribution has many loopholes and have more chances of leakage of exam question papers. So, our idea is to secure the exam control room or secure the question papers and answer sheets. The article explains the different units such as hardware and software used in the proposed system and also explains the modelling and working of the basic components used in the proposed system such that Microcontroller (Arduino AT Mega 2560) and its architecture, IR Pair and its features, Magnetic door sensors and its specifications, PIR sensors, RFID Module, Fingerprint Module, 4*4 Matrix Switch Keypad Board, LCD, GSM Module, Buzzer, Relay and Door locks Servomechanism.

KEYWORDS: Arduino AT Mega 2560, IR Pair, Magnetic door sensor, PIR sensors, RFID Module, Fingerprint Module, 4*4 Matrix Switch Keypad Board, LCD, GSM Module, Buzzer, Relay,Door locks Servomechanism.

I.INTRODUCTION

Today colleges and university are facing more problems about security of question paper and answer sheets. There are lots of solutions available for other security issue and solution for this problem is not yet discovered. Arduino card was used, which is considered one of the modern programmable devices and utilize to control all security system the door will be opened automatically otherwise the system unauthorized person access is prohibited by designing a lock that stores the fingerprints of one or more authorize users. Otherwise provide control room alarm system or text message system give message to authorized person. Magnetic door sensor also used to sense door is open or closed. fingerprint scanner scan the authorized person thumb and the any one person try to open exam control room door then system activated and buzzer is on continuously sends the text message to authorized person. In this system provide also 4*4 matrix keypad this is password system by used authorized person. This is alternative to fingerprint sensor. Door lock mechanism is connected to main door of the exam control room in colleges.

Exam control room secured by using this system and also secured question papers and answer sheets. Authorized person follows the fingerprint or the password alternative to fingerprint then control room open successfully otherwise any one unauthorized person try to open exam control room then buzzer is on. And send text message to authorized person mobile number. Article [1][2][3] explain day to day life home security is very important factor. It is trending issue in 21st century. Security is primary concern everywhere and for everyone. Every person wants his home, industry, banks etc to be secured. This project describes a security system that can monitor an industry & home. This is a useful and simple security system. Here, our application uses Arduino as its controller to detect the presence of human and immediately buzzer alerts is given to intimate others. The temperature sensor LM35 is used to prevent Fire accidents by detecting the increase in temperature beyond a certain limit and buzzer alerts also magnetic sensor use to detect intrusion through doors & windows and also intimate buzzer alerts. This paper is based on embedded system where microcontroller is use for home security [4][5]. This system can operate using cellular phone with the help of GSM technology. This system is to implement microcontroller based controlled module that receives its instruction and command for cellular phone over the GSM network. This microcontroller then will carry out the issued Commands and then communicate the status of a given applicants or device back to the cellular phones.

In this paper, a novel architecture for flexible home security and monitoring system using Arduino microcontroller is proposed and implemented. The important of home security measures are elaborated using easily available programmable sensors like the PIR sensor, LM35 (Temperature sensor), by implementing this type of system we can secure entry point of our home as well as for more security we can use various sensors. In [6][7][8] papers Security problem is a major threat faced by every individual when away from home. Earlier system provides security manually which can easily break by intruders. Later, Password is mainly used for authentication but this method of authentication forces user to remember username/password combinations to access accounts. Password authentication also requires strong server security otherwise anyone can break into the database and read the passwords. Password authentication protocols fail when user doesn't address them seriously, at the same time constructing complex passwords and maintaining secrecy is a tiresome process. Fingerprint is basic method for authentication and it proves to be a unique identification for every individual. For their permanence and unique nature, they have been used for not only in identification but also in the field of security as criminal and forensic investigation for a long time.

Hence the biometric finger print system provides good solution to the home safety problem. Our proposed system is designed in such a way that it overcomes all the defects of previously available systems. User friendliness is given much importance in our system which makes it more comfortable to use than any other existing systems. Also it is built with open source hardware which makes it cheaper. In [9][10][11] papers Security represents protection of our life and assets. Ensuring safety of peoples and their valuable things is very important for the prevention of illegal handling. Hence, mainly focusing on door lock security or gate security is very important to avoid the further problems in monitored area. Even with the use of mechanical locks, the crime, robberies get happened due to the fact that such locks were easily broken. So, there is a need to invent other kind of locks which cannot be easily broken. So, many authors present different kinds of digital door locks, automatic password based door locks, software based door locks etc. which have been widely used in houses and offices. The prevention of unauthorized entry into buildings through the main doors is done by

using ordinary, electronically operated locks, digital codes and biometrics technique like the finger print technology or some are based on thumb printing only. Nowadays, advanced automatic door security systems are available with the use of palmtop recognition systems face recognition systems, face detection systems, wireless sensors, PIR sensors, RFID techniques, smart cameras and many more that helps people to make their home or organizations secure from long distance. Hence, people need not to be worry about the home security though they are away from home. Doors are to keep people out[12][13]. They are being made of metals not simply wood any longer. The security sectors are experiencing variousness as it has never seen before. So, demand is to audit the authenticity of currently available systems and need is to research for the creation of more reliable and good systems which operate smartly with no more efforts. The important thing is to provide higher security.

In today's technologically advanced world, autonomous systems are gaining rapid popularity so the advancement in latest technology is continuously and rapidly made on different latest automatic door lock security systems. The need for an advanced door lock security systems using new technologies is increases day by day as security become a very important or serious issue for everybody. Due to the recent trends in various methods of security for home, buildings, companies" vehicles etc, there is no need to worry about this security any longer, as automatic security systems are here to deal with it. This paper tries to focus all recent door lock security systems in a comprehensive way

II.SYSTEM MODEL AND COMPONENT ANALYSIS

I. Block Diagram:
Exam control room security system block diagram is showing in figure 1. It consist main microcontroller AT Mega 2560 to control all parameter of exam control room.
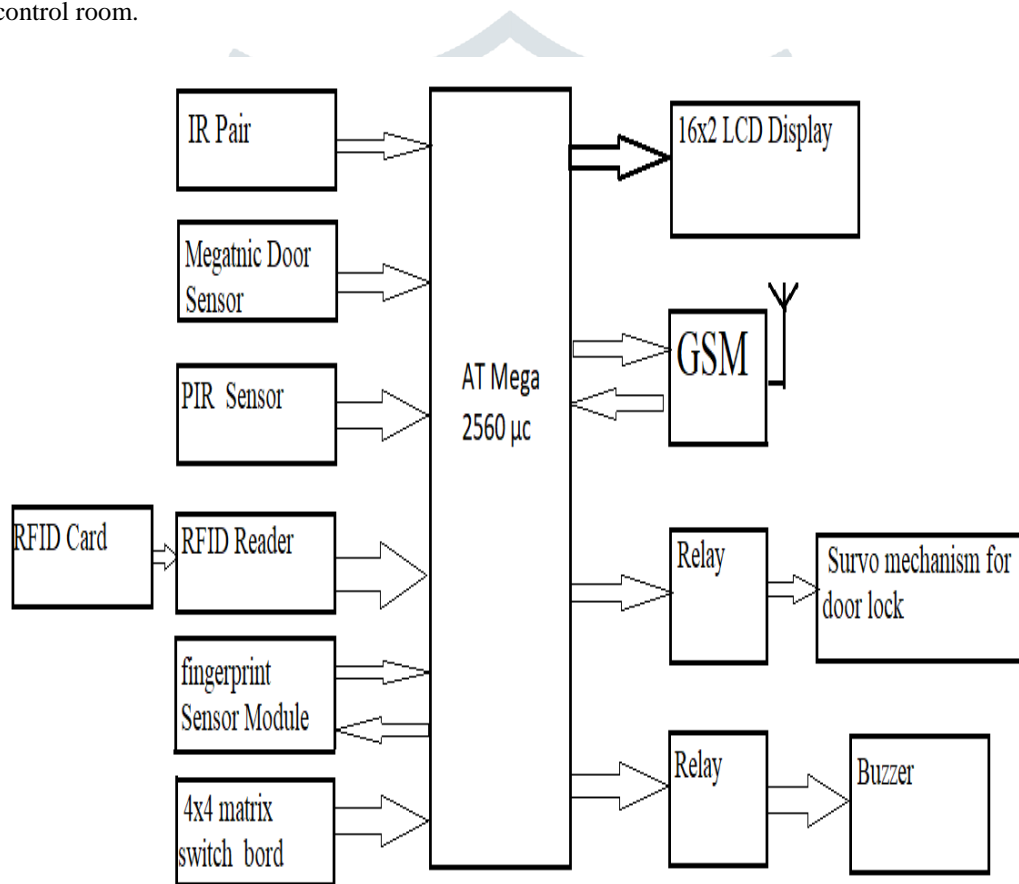

Fig.1 Block Diagram of Proposed System

Our proposed system overcomes all the security problems in existing system and provides high security and efficiency for exam control room.   This system enriched the level of security. Access is granted only for the user whose RFID code matches with fingerprint with the authorized code. Fingerprint is a boon solution for these problems which provides high level of recognition accuracy.4*4 matrix switch board for high security If this three system matches then the servo mechanism door lock will open form inside and IR pair will count the persons getting in the room and magnetic switch will become deactivated. Then the microcontroller will send the message through GSM to the head of the exam control or the principal of the college But if any one breaks the any one from 3 security checkpoint then then the message will be send to the principal and head also buzzer will be on.

II. Components Analysis:

1. Arduino (AT Mega 2560):
The Arduino Mega 2560 is a microcontroller board based on the ATmega2560 (datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Duemilanove or Diecimila

Fig.2 Arduino (AT Mega 2560)

Microcontroller ATmega2560
Operating Voltage 5V
Input Voltage (recommended) 7-12V
Input Voltage (limits) 6-20V
Digital I/O Pins 54 (of which 14 provide PWM output)
Analog Input Pins 16
DC Current per I/O Pin 40 mA
DC Current for 3.3V Pin 50 mA
Flash Memory 256 KB of which 8 KB used by bootloader
SRAM 8 KB
EEPROM 4 KB
Clock Speed 16 MHz

2. IR Pair:
An IR sensor is basically a device which consists of a pair of an IR LED and a photodiode which are collectively called a photo-coupler oran opto coupler. The IR LED emit IR radiation reception and/or intensity of reception of which by the photodiode indicates output of the sensor.
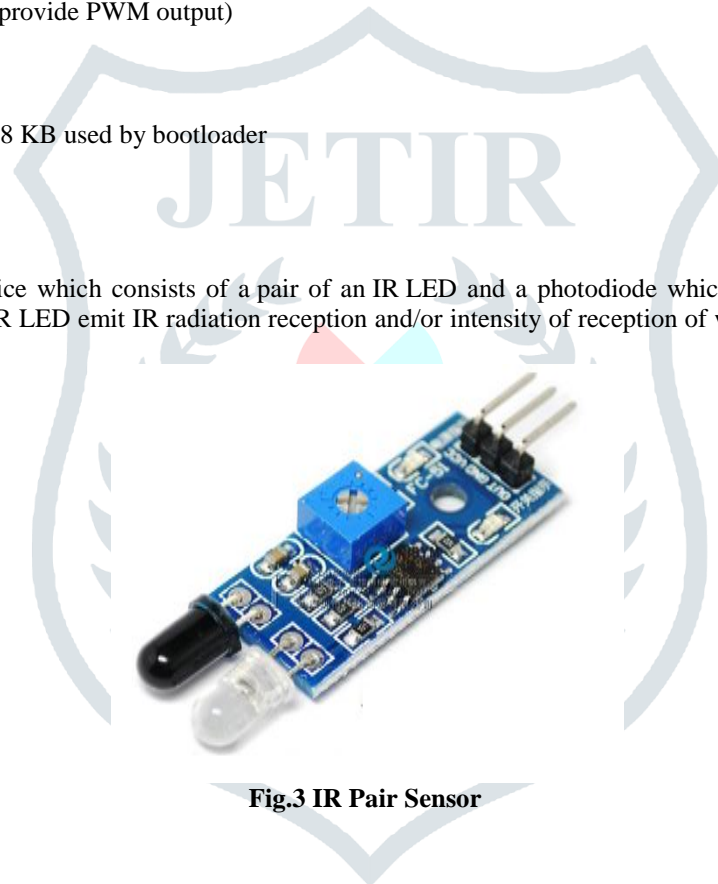

Fig.3 IR Pair Sensor

3. Magnetic Door Senor:
These sensor are attached to the door of exam control room they will get activated a burglar tries to open any one door .the alarm will be set on and message will be sent to authorized person of exam control room.

Fig.4 Magnetic Door Sensor

4. PIR Sensor:
A PIR-based motion detector is used to sense movement of people, animals, or other objects. They are commonly used in burglar alarms and automatically-activated lighting systems. They are commonly called simply "PIR", or sometimes "PID", for "passive infrared detector". An individual PIR sensor detects changes in the amount of infrared radiation impinging upon it, which varies depending on the temperature and surface characteristics of the objects in front of the sensor. An individual PIR sensor detects

changes in the amount of infrared radiation impinging upon it, which varies depending on the temperature and surface characteristics of the objects in front of the sensor.

5. RFID Module:

Radio-frequency identification (RFID) is a technology to record the presence of an object using radio signals. It is used for inventory control or timing sporting events. RFID is not a replacement for the barcoding, but a complement for distant reading of codes. The technology is used for automatically identifying a person, a package or an item. To do this, it relies on RFID tags. These are small transponders (combined radio receiver and transmitter) that will transmit identity information over a short distance, when asked. The other piece to make use of RFID tags is an RFID tag reader.

RFID can be used in a variety of applications such as:

Electronic key for RFID based lock system

- Access management
- Tracking of goods
- Tracking of persons and animals
- Toll collection and contactless payment
- Machine readable travel documents
- Smart dust (for massively distributed sensor networks)
- Airport baggage tracking logistics
- Timing sporting events
- Tracking and billing processes

6. Fingerprint Module:

This is a finger print sensor module with TTL UART interface for direct connections to microcontroller UART or to PC through MAX232 / USB-Serial adapter. The user can store the finger print data in the module and can configure it in 1:1 or 1: N mode for identifying the person. The FP module can directly interface with 3v3 or 5v Microcontroller. A level converter (like MAX232) is required for interfacing with PC serial port.

Fingerprint processing includes two parts: fingerprint enrollment and fingerprint matching (the matching can be 1:1 or 1:N).When enrolling, user needs to enter the finger two times. The system will process the two time finger images, generate a template of the finger based on processing results and store the template. When matching, user enters the finger through optical sensor and system will generate a template of the finger and compare it with templates of the finger library. For 1:1 matching, system will compare the live finger with specific template designated in the Module; for 1:N matching, or searching, system will search the whole finger library for the matching finger. In both circumstances, system will return the matching result, success or failure.

7. 4*4 Matrix Switch Keypad Board:

Typically one port pin is required to read a digital input into the controller. When there are a lot of digital inputs that have to be read, it is not feasible to allocate one pin for each of them. This is when a matrix keypad arrangement is used to reduce the pin count. Therefore, the number of pins that are required to interface a given number of inputs decreases with increase in the order of the matrix

8 LCD

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and 7-segment displays, as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

LCDs are used in a wide range of applications including computer monitors, televisions, instrument panels, aircraft cockpit displays, and indoor and outdoor signage. Small LCD screens are common in portable consumer devices such as digital cameras, watches, calculators, and mobile telephones, including smart phones. LCD screens are also used on consumer electronics products such as DVD players, video game devices and clocks. LCD screens have replaced heavy, bulky cathode ray tube (CRT) displays in nearly all applications. LCD screens are available in a wider range of screen sizes than CRT and plasma displays, with LCD screens available in sizes ranging from tiny digital watches to huge, big-screen television sets.

9 GSM

GSM (Global System for Mobile communication) is a digital mobile telephony system that is widely used in Europe and other parts of the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band. GSM, together with other technologies, is part of the evolution of wireless mobile telecommunications that includes High-Speed Circuit-Switched Data (HSCSD), General Packet Radio System (GPRS), Enhanced Data GSM Environment (EDGE), and Universal Mobile Telecommunications Service (UMTS).

GSM carrier frequencies

GSM networks operate in a number of different carrier frequency ranges (separated into GSM frequency ranges for 2G and UMTS frequency bands for 3G), with most 2G GSM networks operating in the 900 MHz or 1800 MHz bands. Where these bands were already allocated, the 850 MHz and 1900 MHz bands were used instead (for example in Canada and the United States). In rare cases the 400 and 450 MHz frequency bands are assigned in some countries because they were previously used for first-generation systems. For comparison, most 3G networks in Europe operate in the 2100 MHz frequency band. For more information on worldwide GSM frequency usage, see GSM frequency bands.

Regardless of the frequency selected by an operator, it is divided into timeslots for individual phones. This allows eight full-rate or sixteen half-rate speech channels per radio frequency. These eight radio timeslots (or burst periods) are grouped into a TDMA frame. Half-rate channels use alternate frames in the same timeslot. The channel data rate for all 8 channels is 270.833 kbit/s, and the frame duration is 4.615 ms.

The transmission power in the handset is limited to a maximum of 2 watts in GSM 850/900 and 1 watt in GSM 1800/1900.

10. Door Lock Servomechanism

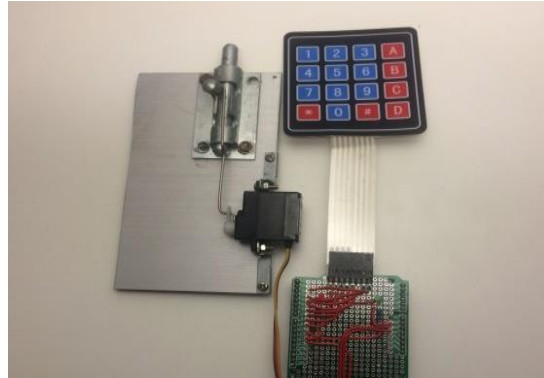Servo mechanism for door lock is used in the project .It connects to the door of exam control room.

Fig.5 Servomechanism for door lock

11. Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

While technological advancements have caused buzzers to be impractical and undesirable, there are still instances in which buzzers and similar circuits may be used. Present day applications include:

- Novelty uses
- Judging panels
- Educational purposes
- Annunciator panels
- Electronic metronomes

12. Relay

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays".

Magnetic latching relays require one pulse of coil power to move their contacts in one direction, and another, redirected pulse to move them back. Repeated pulses from the same input have no effect. Magnetic latching relays are useful in applications where interrupted power should not be able to transition the contacts.

III. ALGORITHMS AND SOFTWARE

1. Proteus

The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and electronic technicians to create electronic schematics and electronic prints for manufacturing printed circuit boards. It was developed in Yorkshire, England by Lab center Electronics Ltd and is available in English, French, Spanish and Chinese languages.

PCB Design: The PCB Layout module is automatically given connectivity information in the form of a net list from the schematic capture module. It applies this information, together with the user specified design rules and various design automation tools, to assist with error free board design. Design Rule Checking does not include high speed design constraints. PCB's of up to 16 copper layers can be produced with design size limited by product configuration.

Schematic Capture: Schematic capture in the Proteus Design Suite is used for both the simulation of designs and as the design phase of a PCB layout project. It is therefore a core component and is included with all product configurations.

Product Modules: The Proteus Design Suite is a Windows application for schematic capture, simulation, and PCB layout design. It can be purchased in many configurations, depending on the size of designs being produced and the requirements for microcontroller simulation. All PCB Design products include an auto router and basic mixed mode SPICE simulation capabilities.

Microcontroller Simulation: The micro-controller simulation in Proteus works by applying either a hex file or a debug file to the microcontroller part on the schematic. It is then co-simulated along with any analog and digital electronics connected to it. This enables its use in a broad spectrum of project prototyping in areas such as motor control, temperature control and user interface design. It also finds use in the general hobbyist community and, since no hardware is required, is convenient to use as training or teaching tool. Support is available for co-simulation of:

- Microchip Technologies PIC10, PIC12, PIC16, PIC18, PIC24, dsPIC33 Microcontrollers.
- Atmel AVR (and Arduino), 8051 and ARM Cortex-M3 Microcontrollers
- NXP 8051, ARM7, ARM Cortex-M0 and ARM Cortex-M3 Microcontrollers.
- Texas Instruments MSP430, PICCOLO DSP and ARM Cortex-M3 Microcontrollers.
- Parallax Basic Stamp, Free scale HC11, 8086 Microcontrollers.

2. Arduino

A program for Arduino may be written in any programming language for a compiler that produces binary machine code for the target processor. Atmel provides a development environment for their microcontrollers, AVR Studio and the newer Atmel Studio.

The Arduino project provides the Arduino integrated development environment (IDE), which is a cross-platform application written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one-click mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus.

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A program written with the IDE for Arduino is called a sketch. Sketches are saved on the development computer as text files with the file extension .ino. Arduino Software (IDE) pre-1.0 saved sketches with the extension .pde.

The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program avrdude to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

Due to the company's open source nature; there exist many free public libraries for developers to use to augment their projects.

IV. APPLICATIONS AND ADVANTAGES

1. Applications:
- 1. Exam control room security
- 2. Bank locker Security
- 3. Strong room Security
- 4. Home security

2. Advantages:
- 1. High Security
- 2. Low prize secured
- 3. Security and confidentiality
- 4. It's Easier to Install, With Faster Support

V. CONCLUSION

Thus the article explains the basic structure and system design for Automatic Exam Control Room Security System. The article also explains the basic blocks and components used in this system. It's a complete case study for the proposed system design. The system is very much helpful for real time security system. The System is one of the modern programmable devices and utilize to control all security system the door will be opened automatically otherwise the system unauthorized person access is prohibited by designing a lock that stores the fingerprints of one or more authorize users. Otherwise provide control room alarm system or text message system give message to authorized person. The proposed system is cheaper in cost and smaller in size and it can be applied in industries as well as public sectors.

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