

# *Password Protected Smart Office Security System using Arduino*

## *Password Protection*

Umme Habiba Barsha

Department of Computer Science and Engineering,  
Brac University, 66 Mohakhali, Dhaka, Bangladesh  
umme.habiba.barsha@g.bracu.ac.bd

Nigah Hossain

Department of Computer Science and Engineering,  
Brac University, 66 Mohakhali, Dhaka, Bangladesh  
nigah.hossain@g.bracu.ac.bd

Samaul Haque Tasdid

Department of Computer Science and Engineering,  
Brac University, 66 Mohakhali, Dhaka, Bangladesh  
samaul.haque.tasdid@g.bracu.ac.bd

Md Rifat Uddin

Department of Computer Science and Engineering,  
Brac University, 66 Mohakhali, Dhaka, Bangladesh  
md.rifat.uddin@g.bracu.ac.bd

**Abstract**— Password protected smart office security system is required not only for home but also anywhere security problems. For the home/bank/office and for the purposes of safety, this security is included; everyone wants to take appropriate measures to prevent intrusion. Intruder will take advantage of taking any unauthorized works these days and can breach any major security issues. In order to protect any home or organizations, the keypad locked system is important. We present the concept and production of affordable co-operatives in this paper. This paper describes a multilevel protection framework based on sensors. It provides a PIR sensor, a digital lock based on passwords. Using Arduino and GSM, this wireless sensor network consists of sub-systems such as PIR sensors, alarm module, buzzer, relay, digital lock system in a single automated architecture for the functional implementation of the smart home system.

**Keywords**— *Arduino UNO, LCD, LED, Relay, Password protected security system*

## **INTRODUCTION**

Arduino is a framework that is open source and consists of both software and hardware. A programmable circuit board is hardware, i.e. Microcontroller and its software is an integrated computer-based development environment platform that is used to write and upload code to the Arduino board. In most electrical and electronic applications, it is generally used because Arduino does not require a separate piece of hardware, i.e. The programmer is responsible for uploading code to the physical board, although most Programmer are for uploading code to the physical board whereas most previous microcontrollers need separate programmer to load code onto the physical board. In addition to that Arduino IDE uses a simplified version of C++ that makes easy to learn the program. Finally, Arduino gives a standard form factor that shares microcontroller use into a package that is more

available. This board supports everything that the microcontroller does.

Requirements for the implementation of apps for greater simplicity. The board can be operated either by a computer-connected USB port or by an AC-DC adaptor or an external battery. The Arduino UNO unique feature is that it is possible to choose the power supplied through a USB link or an external power supply. Non-USB power may either come from an AC to DC adaptor or from a battery. The battery terminals +ve and -ve are linked to the power connector pin headers Vin and Gnd respectively. The board can be supplied with a maximum of 6 to 12 volts of external DC supply. If the board is supplied with less than 7 volts on the input/output pins, the board may supply less than 5 volts and the board may be unstable. If the board is supplied with more than 12 volts, the voltage regulator can overheat and overheat. Therefore, the recommended range is 7 to a12 volts to the Arduino board.

## **Literature Review:**

Security has become an important issue. Home security is becoming a necessity as the intrusions are increasing. A traditional home security system gives the signals in the form of alarm. Monitoring systems are common in many areas in this industrialized world. Home security is the best deterrent. It should provide security and safety features for the office by the alarm. These alarms can be the residents from natural and human dangers. Existing Methods The existing method uses various technologies for controlling unauthorized access and providing security for houses and offices. Technologies such as GSM, ZigBee, WSN are used. Let us consider the different existing systems as follows. [1]

Home/Office security is becoming necessary nowadays as the possibilities of intrusion are increasing day by day. A traditional home security system gives the signals in term of alarm. The Global System for Mobile Communications (GSM) based security systems provides enhanced security

whenever a signal from the sensor occurs and the message is sent to the given number. This also provides home automation. Conventional security systems keep owners and their property safe from the intruders by giving an indication. Home/ Office security plays an important role to protect valuable things at home from intruders. IR sensor is placed to detect the person. [2]

On detecting a person passcode will be opened to enter the secret code. By entering the correct passcode based on owner's reply door will be opened. Whereas on wrong passcode buzzer alert is given. The communication is carried out by GSM. [3]

The evolution of fingerprinting technology gives security to various places. Two stage verification process are used for smart homes, they are by using device fingerprints and login credentials. It provides geographical location while computing fingerprint. This device identification can identify about 97.93% of the devices. [4]

Microcontroller based automated home security system is password protected with a LED-based resistive screen which operates by detecting a difference in light intensity captured by photodiode which is emitted by surrounding red LEDs and reflected. Fire alarm system uses temperature sensor which senses a sudden increase in temperature and activates the alarm. [5]

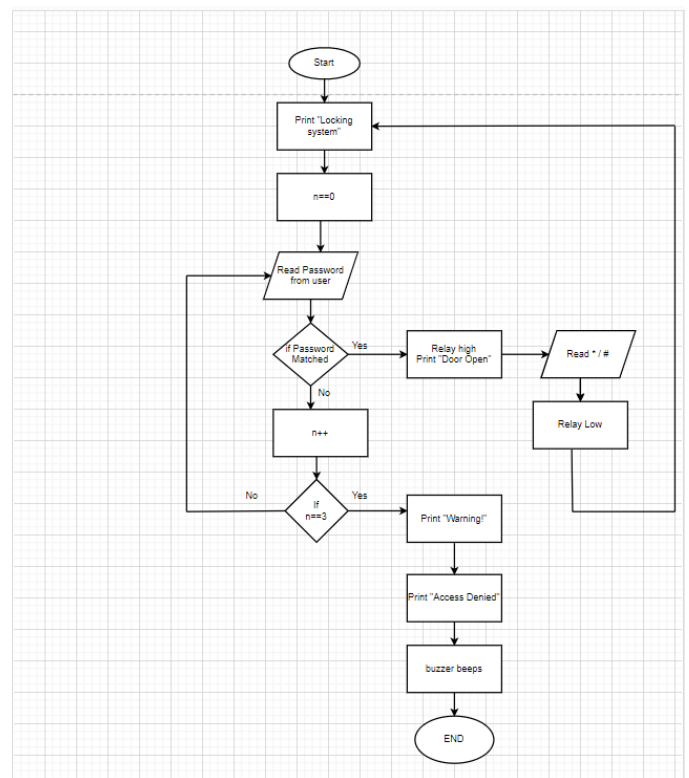
## Methodology:

### Product Description:

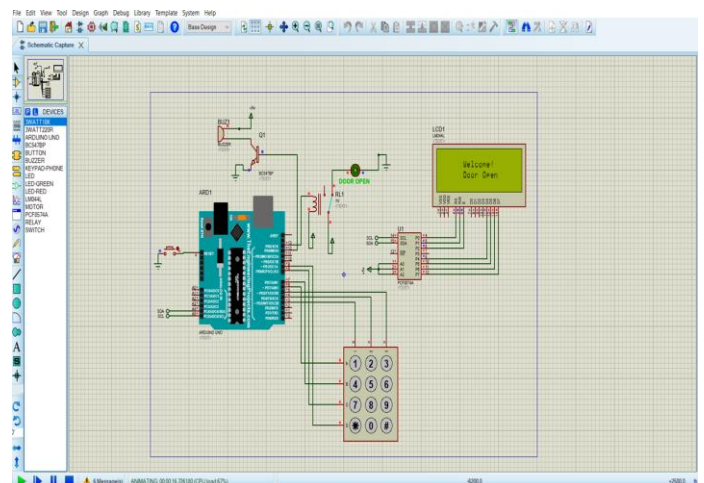
We built our 3D model using Autodesk fusion 360 software. We sketched a door first. Then we attached all the components that are used in our password protected security system on the door. The LCD, keyboard and buzzer are attached at the frontside of the door and the relay and Arduino Uno board are attached at the inner side or backside of the



door.



## System Architecture

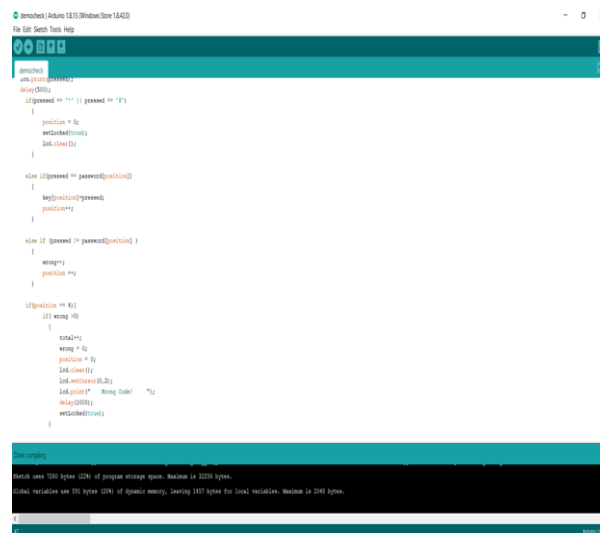


This is our Password Protected Home Security project which is in brief a door locking system using an arduino. In this project we have used Arduino as our development board. We have used the I2C keypad as our input device. Additionally, we used a buzzer which works as an output device. For display, we have used a 20x4 alphanumeric LCD which will show the prompt whether we have put the password correctly or not. Moreover, in order to interface this LCD with the Arduino UNO, we have used a remote 8-bit I/O expander for I2C-bus. As a door lock we are using a relay where we have also connected a green LED. It will only light up when the door is unlocked. At first, we connected the I2C keypad which in practical we will use a touch keypad. This is a 4x3 keypad 3

column and 4 rows. We connected column 1 with PD3 which is the 3 pin of the arduino. Then, We connected column 2 with PD4 which is the 4 pin of arduino. After that, We connected column 3 with PD5 which is the 5 pin of arduino. Moreover, We connected row A with ~PD7 which is the 6 pin of the arduino in this way We connected row B with PD7 which is the 7 pin of the arduino. Similarly, We connected row C with PB0 which is the 8 pin of the arduino. Lastly for the keypad We connected row D with PB1 which is the 9 pin of arduino. After that we connected the buzzer in the PB4/MISO in the 12 pin of the arduino. If a person puts the wrong password three times this buzzer will be triggered. For the door lock we have used a relay and we have connected the relay with PB5 which is 13 pin of arduino. If the correct password is pressed then the relay will open the gate, with the relay one green LED is connected with it. It will turn green when the relay gate opens. In order to connect the LCD with the arduino we are using a 8-bit I/O expander for I2C-bus. As there are not enough I/O ports in the arduino this is really a useful component. In this I/O expander LCDs D4-D7 is connected with I/O expanders P4-P7 respectively. We connected the SDA and SCL in arduino's PC4 and PC5. In the PD0 we have connected a vibration motor if someone gives the wrong password it will vibrate, and in PD1 we have connected a camera module so that from inside of the house people can see who is outside the house. Moreover, in PD2 we have connected a pressure sensor, so if anyone is trying to break the door or create huge pressure it will trigger the buzzer. In our draft project we couldn't implement the pressure sensor and camera module in the proteus. However, the rest of the project works 100%. You can check and run the whole project in this link below: <https://github.com/rifatud1/Password-Protected-Home-Security-System.git>

### Software:

In order to build this project we have used multiple softwares. For circuitry we have used **Proteus 8 Professional**. Here, we have used all the necessary components and merged each other. As this is an arduino based project for the firmware we used **Arduino IDE**. Here, we have written all the logics and instructions in C++. For 3D designing we used **Autodesk 360 Fusion** to elaborate the 3D structure of our project.



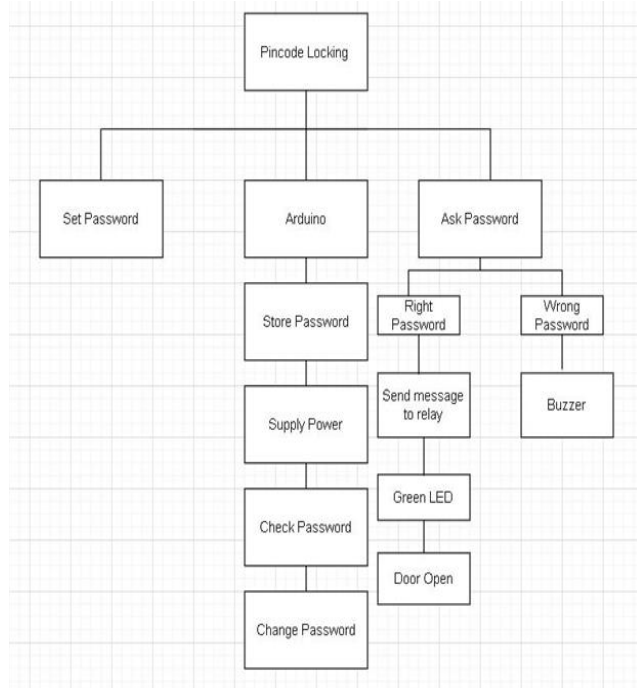
### Cost Analysis:

Required tools	Price(bdt)
Arduino Uno R3 as a microcontroller	450
3*4 touch pad	320
Channel relay	62
buzzer	15
20x4 LCD screen	300
Push button switch	5
I. I/O Expander Module PCF8574	240
II. Total	1392

### Modular development

In this project we build an advanced easy to use proteus password protected smart office security system. This proteus password protected smart office security system is applicable to places where security and privacy are dominant. Security and privacy are very essential yet challenging in this modern era. An era where privacy is a concern to everyone. Here is

general modular diagram of our project.



### Navigation

In our project we used Arduino to navigate the whole project. Beside that we used a relay switch in order to open our door system. And in the programming we can use regular computer navigation to edit and reprogram our Arduino Uno.

### Actuator

In our project we used electromechanical relay switch as an actuator. A relay is a binary actuator as it has two stable states, either energized and latched or de-energized and unlatched. An electromechanical relay consists of three terminals namely common (COM), normally closed (NC) and normally opened (NO) contacts. These can either get opened or closed when the relay is in operation.

### Description of the Module

In our project we used Arduino Uno, I2C LCD and 4X3 Matrix Keypad. The user has to enter an exact pin code before granting access. LED and electromechanical relay switch were used to open door. Here the user first have to set a password in Arduino uno. The Arduino will restore the password in its memory. After setting the password the system can be used. When someone tried to enter the door the person need to enter the correct password. After giving correct password the relay will flash a green led and will open the door. If the user type password wrong the buzzer will buzz.

We used Arduino as it's a power saving and cost saving easy to use device. We used a 4X3 Matrix Keypad because of its user friendliness and easy of usages. Also we used a simple LCD display, a buzzer, a led and relay switch for the simplicity, cost effectiveness and accurate result.

### Exp. Section

#### Material

The material we used in our project is Arduino Uno, I2C LCD, 4X3 Matrix Keypad, Wire, LED, Relay and Buzzer. Here Arduino Uno is a microcontroller board dependent on the ATmega328P (datasheet). It has 14 computerized input/output pins (of which 6 can be utilized as PWM outputs), 6 simple data sources, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB association, a force jack, an ICSP header and a reset button. The I2C LCD module includes a PCF8574 chip (for I2C correspondence) and a potentiometer to change the LED backdrop illumination. The benefit of an I2C LCD is that the wiring is straightforward. You just need two information pins to control the LCD. This Matrix Keypad 4 X 3 has 12 catches, organized in a phone line 3x4 lattice. The keys are associated into a matrix, hence just 7 microcontroller pins (3-sections and 4-lines) are needed to filter the cushion. A Buzzer is a sound flagging gadget, which might be mechanical, electromechanical, or piezoelectric (piezo for short).

#### Method

The 4X3 Matrix Keypad is connected to 3,4,5,6,7,8,9 input pins of Arduino. The buzzer connected with pin no 12 and the relay is connected with the pin no 13 of Arduino/ The LCD also connected with Arduino. The Arduino itself connected with a power supply. The LED light connected with the relay and then connected with lock.

#### Result:

Our proteus password protected smart office security system using arduino framework is appropriate to places where security and protection are central. Utilizing a secret pincode framework is secure when contrasted with the customary actual key locking framework. As in our test our system is accurate. It runs perfectly. Also it bell the buzzer when someone puts incorrect password three times. Beside that upon entering the relay switch enables the door to open and LED to blink. So the result of our project is successful.

#### Conclusion:

This proteus password protected smart office security system framework is material to places where security and protection are fundamental. Security and protection are extremely fundamental yet challenging in this cutting edge period. A time where protection is a worry to everybody. Imagine a scenario where somebody gets hold of the way in to your storage, room or office. That is to say, the individual can take your valuable resource, arranged reports or anything that you hold dear to. Thus this project can be perceived by people groups and future work can be done. Different innovation and update can be performed is the venture. This venture can be modified by different microcontroller furthermore, different methods.

## ***References***

- 1 A, J.Chandramohan & Ramalingam, Nagarajan & Satheshkumar, K. & Ajithkumar, N. & Gopinath, P.A. & Ranjithkumar, S.. (2017). Intelligent Smart Home Automation and Security System Using Arduino and Wi-fi. International Journal Of Engineering And Computer Science. 10.18535/ijecs/v6i3.53.
2. Rai, Donald & Kumar, Nitesh & Rasaily, Deepak & Gurung, Pravin & Tamang, Tenzing & Chetri, Chandan & Kami, Palman & Bhutia, Gaden. (2019). Arduino-GSM Interfaced Secure and Smart Cabin for Smart Office. 203-206. 10.1109/ICCT46177.2019.8969013.
3. Prasetyo, T & Zaliluddin, D & Iqbal, M. (2018). Prototype of smart office system using based security system. Journal of Physics: Conference Series. 1013. 012189. 10.1088/1742-6596/1013/1/012189.
4. Chan, Zhen & Shum, Ping. (2018). Smart Office: A Voice-controlled Workplace for Everyone. ISCSIC '18: Proceedings of the 2nd International Symposium on Computer Science and Intelligent Control. 1-5. 10.1145/3284557.3284712.