Android Based Smart Door Locking System with Multi User and Multi Level Functionalities

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Abstract: Smart door locking system is not a new concept. However with the advancement in technology, these systems also have become more advanced. The android based smart door lock system discussed in this paper is basically designed for multi mode operations like multi user and multi level user operation. Such system is very much required in Bank and Business organization. The system also gives functionalities for general user, where single user is authorized to operate the lock. The cost effective implementation with advanced functionality and easy to use interface makes the system very useful.

Keywords: Arduino Uno, Android, Smart Phone.

I. INTRODUCTION

Android Based Smart door locking system is designed to address the problems of unauthorized access, trespassing and intrusion. Banks, corporate offices, financial organization, jewellery shops, and government organization are some of the common targets where unauthorized access, trespassing and intrusion take place. Normally the motives behind such activities are stealing money, jewels or any classified documents for financial gain. The purpose of Android Based Smart door locking system is to provide a smart solution to overcome these challenges and provide a feasible solution. The project is implemented using Arduino Uno with the use of Bluetooth technology. Arduino Uno is a microcontroller board. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller.

The door microcontroller is controlled using the Android App. Android App interface with door microcontroller through Bluetooth. The Bluetooth technology operate over unlicensed 2.4GHz frequency, it can link digital devices within a range of 10m to 100m at the speed of up to 3Mbps but it depending on the Bluetooth device class.

II. LITERATURE SURVEY

There are many automated advanced door locking system has been developed and it's popularly used in commercial buildings and organization. Some of these automated doors locking system are based on RFID (Radio-Frequency Identification). The RFID cards are used as a key. The RFID card reader detects and validates the user accessibility. When the card is brought near the reader, it identifies the radio frequency of the card and thus verifies the key. However these systems are expensive. Various control systems have been designed over the years to prevent access to unauthorized user. The main aim for providing locks for our home, school, office, and building is for security of our lives and property. It is therefore important to have convenient way of achieving this goal. Automatic door locking system has become a standard feature on many different types of buildings and homes [2][4].

Lia Kamelia, Alfin Noorhassan S.R, Mada Sanjaya and W.S., Edi Mulyana has implemented a "Door – Automation System Using Bluetooth", The implementation is based on Android platform. So the implementation cost is less and affordable by a common user. With the wireless Bluetooth connection in microcontroller permits the system installation in more easy way [3].

Shilpi Banerjee has implemented an "Automatic Password Based Door Lock System". This system works on pre-decided password concept. It increases the security level to prevent an unauthorized unlocking done by attacker. In case the user forgets the passwords, system gives the flexibility to the user to change or reset the password. This automatic password based lock system gives user more secure way of locking-unlocking the system [5]. Arpita Mishra, Siddharth Sharma, Sachin Dubey, S. K. Dubey has implemented a "Password Based Security Lock

System", the system works using keypad to enter a password to the system. If entered password is correct then door is open by motor which is used to rotate the handle of the door lock. System also includes extra features like adding new users and changing old password etc [1]. We surveyed many smart doors locking system. We found that these products are very expensive. Some of the implementation mentioned in the literature survey is very cost effective in implementation but do not provide multi user or multi level functionalities. We identified these requirements and thought to develop a system which is cost effective in implementation and having more advanced features like multi user and multilevel. These features are the need of time and such functionalities will make the system more useful.

III.PROPOSED SYSTEM

The main feature of the proposed system is its multi mode functionalities. The proposed system works on various different modes which are as follows: - .

▪ Normal Mode: - In this mode a single user can login and use the system. This module provide the following features:-
o User can login using the 4 digit registered PIN.
o User can lock or unlock the door with the password.
o User can recover the password if forgot the password, using registered email address.
o User can reset the PIN.

▪ Multiuser Mode: - This mode is useful when more than one users are authorized to operate lock. This module provide the following features:-
o Individual user can login using the 4 digit registered PIN.
o User can lock or unlock the door with their individual password.
o Individual user can recover the password if forgot the password, using registered email address.
o Individual user can reset the PIN.

▪ Multilevel Mode: - This mode is useful when the locking and unlocking operation has to be controlled/ authorized by multi users. Such system is useful in Banks locker or safe vault, where the lock need to be operated by a pair of key (User and Bank Manager). In this mode two level of validation from two different users will be required for locking or unlocking the system. This module provide the following features:-
o Individual user can login using the 4 digit registered PIN.
o User can lock or unlock the door with their individual password.
o Individual user can recover the password if forgot the password, using registered email address.

o Individual user can reset the PIN.
o Admin mode to set the user level and authorization.

Assumption: - It is assumed that the end user will operate the lock using Android Smart Phones having Bluetooth features. The mobile App to operate the lock is developed for Android Phones and will not work on other platform. However it can be customized for other platform also. It is also assume that user will operate it within the Bluetooth device accessibility range of 10m to 100m.

IV.SYSTEM IMPLEMENTATION

The system is implemented using following hardware components:

• Arduino Uno Board: - It's actually the control board [Fig 1] which communicates with the Android Apps and triggers the door strike based on the command received from Android Apps.
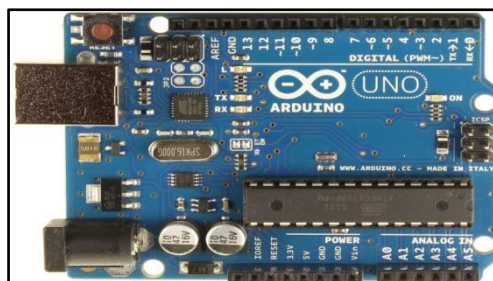

Fig 1: Arduino Uno Board

• Electric door strike: - An electronic lock (or electric lock) is a locking device which operates by means of electric current [Fig 2]. Electric locks are sometimes stand-alone with an electronic control assembly mounted directly to the lock. Electric locks can be connected to an access control system. Electric Door Strike is used in this project as a locking device, which will be controlled by Arduino Uno Board.

Fig 2: Electric Door Strike

• Bluetooth HC-05:- HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. In this project it is used to provide

communication between Arduino Uno Board and the smart phone, which will have Android Apps to control the lock.
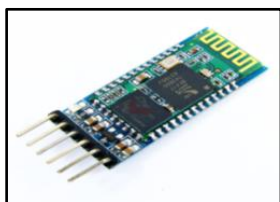

Fig 3: Bluetooth HC-05 Module

- Relay Switch: - Relay switch is an electromagnetic switch operated by a relatively small electric current that can turn on or off a much larger electric current. In this system relay switch is used to switch On/Off Electric Door Strike.
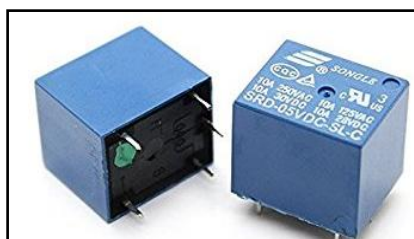

Fig 4: Relay Switch

Table 1 shows the system components and its purposes.

Table-1. System Components

Component Name	Purpose
Arduino uno	Receives the command from Android Apps and process it. Based on the command, it controls the Electric Door Strike.
Bluetooth Module Hc-05	Bluetooth Module is used for communication channel between Arduino Uno and Mobile Phone.
Relay Switch (5V)	Relay switch is used to Switch On/Off the Electric Door Strike. Based on the valid key received by Arduion Board, it controls the Electric Door Strike using Relay Switch.
Android Smartphone	It is used as User interface. User need to install Android Apps which is developed to control the lock and configuring the basic functionalities of the system.

Figure 5 shows the basic circuit connectivity of Arduino uno board with Electric Door Strike and other hardware components. Figure 6 shows the demo model of overall implementation of the system.
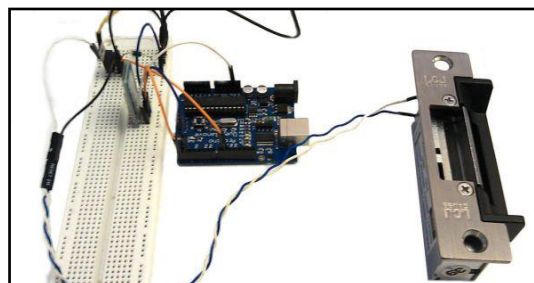

Fig 5: Arduino uno and Electric Door Strike Connectivity

Fig 6: Demo model of overall implementation of the system

V. CONCLUSION

The implemented system is very cost effective. It is very easy to install and configure the system. The system provides different modes of operation (Single User, Multi User, Multi Level), which makes the system more attractive and useful.

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BIOGRAPHIES

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Dr. M Hanumanthappa is currently working as Professor in the Department of Computer Science and Applications, Bangalore University, Bangalore, India. He has over 17 years of teaching (Post Graduate) as well as Industry experience. He is member of Board of Studies /Board of Examiners for various Universities in Karnataka, India. He is actively involved in the funded research project and guiding research scholars in the field of Data Mining and Network Security.

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