

## FINGERPRINT BASED LOCKER WITH IMAGE CAPTURE

<sup>1</sup>Hemant Kumar, <sup>2</sup>Pradeep Kumar Gupta, <sup>1</sup>Divyanshu Kapoor,  
<sup>1</sup>Gautam Rana, <sup>1</sup>Govind Varshney  
<sup>1</sup>U.G. Scholars, <sup>2</sup>Assistant Professor,  
Dept. of Electronics & Communication Engg.,  
MIT Moradabad Ram Ganga Vihar, Phase II, Moradabad (244001), India

### ABSTRACT

*As we are moving in a World of advancement, so the security is the major concern in order to keep data isolate from the unauthorised users to access. In today's World, we need high degree security system for the protection of our document, important data, as well as memory and jewellery. This review paper presents a secure fingerprint locker which is feasible. This system is proved successful on all norms of security of lockers. There are other methods of verifying authentication through password, RFID but this method is most efficient and reliable. To provide perfect security to the lockers and to make the work easier, this project is taking help of two different technologies, i.e. Embedded System and Biometrics. Biometrics is basically the measurement and use of unique characteristics of living beings to make them distinguish from one another. And this is more reliable then passwords and tokens which can be lost or stolen by the humans. In this paper we are providing the work done on this technique.*

**KEYWORDS:** *Fingerprint Module, Intrusion Detector, Microcontroller, OTP Pin, DC Motor, Memory Card Reader etc.*

### I. INTRODUCTION

We all know that the security is ours primary job in today world, but most human cannot find the ways to provide security to their confidentially belonging manually. As today fingerprint based system provides high degree of accuracy in terms security. Therefore, we have decided to introduce a system for locking which is based on the Finger print scanning. Our project will provide high degree of security with no manual flaws. Our project basically, is a combination of Embedded Systems & Biometrics.

An Embedded system is a combination of computer hardware and software, i.e. software is implemented on the hardware which has a key characteristic that it is dedicated for the particular task. Design engineers optimized the size and characteristics of the microcontrollers, the cost of the product also decreased which make it commercial. Basically, embedded system is "Real Time Operating System" which provides output without delay. In fingerprint locking system there is huge demand of high speed operating systems which is fulfilled by embedded systems. This paper includes fingerprint identification, in this we are explaining the working of fingerprint module and it's working. Next comes, Literature Review in which we consider nine papers and extract the working principles of different papers. For the comparison of literature review papers we make a comparison table. The conclusion of the papers comes after this table and then we mention the thirteen references.

### II. FINGERPRINT IDENTIFICATION

Fingerprints are made of a series of ridges and furrows on the surface of the finger and have a core around which patterns like swirls, loops, or arches are curved to ensure that each print is unique. An arch is a pattern where the ridges enter from one side of the finger, rise in the centre forming an arc, and then exit the other side of the finger. The loop is a pattern where the ridges enter from one side of

a finger, form a curve, and tend to exit from the same side they enter. In the whorl pattern, ridges form circularly around a central point on the finger. The ridges and furrows are characterized by irregularities known as minutiae, the distinctive feature upon which finger scanning technologies are based. Minutiae points are local ridge characteristics that occur at either a ridge bifurcation or a ridge ending. The ridge ending is the point at which a ridge terminates. Bifurcations are points at which a single ridge splits into two ridges.

The basic principle of this system is based on fingerprint authentication system.

There are mainly two types of scanning methods available for this authentication technique. These are optical scanner or capacitance scanner is used to scan and generate a picture of the user's finger. Though both the methods generate the same type of image but the making is completely different.

### III. LITERATURE REVIEW

**Aditya Shankar et. al** focused in this project on the replacement of conventional techniques of locking system. They replaced the old methods like lock & key system and password authentication system by the biometric system. They basically used fingerprints for the authentication system, the person whose fingerprint saved in the database can easily access the locker. They also provide an alarm system to alerting the neighbours if an unauthorized person or thief tries to access the locker. To prove that person authorized to open the locker door they need to scan their fingerprint images. The scanner is interfaced to 8051 microcontroller; this controller will be controlling the scanning process. They also provided a keypad for password after the fingerprint scanning. This two step verification is for the double security. And a buzzer is provided for alarm in case of unauthorized access of locker. [1]

**Omidiora E.O. et. al** refused the traditional methods of locking system for the bikes, they introduced finger print based locker which is the robust security mechanism in various security domain. In their prototype software module is used for the database storage of valid users and hardware is provided for the interfacing. Programming was done with the help of Visual Basics, Visual C and Visual C++. The programming of this prototype was done in Visual Basic 6.0 Enterprise Edition. The prototype was tested with 20 test images stored in the database. The implementation was successful and the microcontroller was clearly differentiated between authorized and unauthorized users. Logic 1 transferred for authorized user and logic 0 for unauthorized user. [2]

**Karthikeyan. A et. al** told that every person has unique fingerprint. They added a secured keypad for adding and deleting number of users from database which is very good concept. FIM3030 fingerprint module by NITGEN is used in this purpose. For controlling the whole driving unit Microcontroller AT89C52 is used. LCD is also provided for showing the information about the authorized and unauthorized user. Decoder DM742S138 is provided for data routing and for interfacing with fast memory units as the decoder have short propagation delay. Latch 74HC373 is provided which is high-speed Si-gate CMOS devices. A relay is used as an interfacing circuitry between the microcontroller output and the ignition system of the car. [3]

**Pavithra .b.c et. al** mainly focused in this project on security. They used R303A as a scanner. This module has in-built ROM, DSP and RAM. The fingerprint module has a capacity of storage 100 user's fingerprint. This module operates in 2 modes they are Master mode and User mode. Master mode is used to register the fingerprints which will be stored in the ROM present on the scanner with a unique id. They provided a unique identification number for the last step of verification, which provides three wrong attempts.

They provide a digital code lock at every locker's door, which is operated by the password. The password included six mandatory numeric numbers without any character. This locking system is interfaced with microcontroller for the password storage and verification. This lock consists of a LCD screen, keyboard and a microcontroller 8051. This can be implemented at every door locker because it is commercially available. [4]

**Crystalynne D.Cortez et. al** focused on the development of microcontroller-based biometric locker system with short message service. A 9-12Vdc was used to supply power to the system. The microcontroller ATMEGA 644 housed in Arduino board was utilized to interface the input and output hardware devices. Input devices include the fingerprint sensor for biometric recognition, keypad was for the encoding of passcode and real time clock for display of current date and time. The

microcontroller is programmed with the help of Arduino Integrated Development Environment. ATmega644 housed in Arduino board, was the microcontroller unit used in the system. It controlled the functions of the biometric locker system. The ATmega644 is a 40 pins, low-power complementary metal oxide semiconductor (CMOS), 8-bit microcontroller based on the AVR enhanced reduced instruction set computer (RISC) architecture. ATmega644 can achieve throughputs approaching 1 million instructions per second per MHz through the execution of powerful instructions in a single clock cycle. This allowed the optimization of power consumption versus processing speed in system designs. It can store up to 64 KB of program instructions. [5]

**Smita s. Mudholkar et. al** developed this project for the biometrics authentication technique for Intrusion detection systems using Fingerprint recognition. Biometrics makes the use of biological terms that deals with data statistically. It verifies uniqueness by analyzing his physical features or behaviours (e.g. face, fingerprint, voice, signature, keystroke rhythms). The systems record data from the user and compare it each time the user is claimed. A biometric system is a computer system that implements biometric recognition algorithms. A typical biometric system consists of sensing, feature extraction, and matching modules. They classified the biometric techniques into two classes:

Physiological based techniques include facial analysis, fingerprint, hand geometry, retinal analysis, DNA and measure the physiological characteristics of a person. Behaviour based techniques include signature, key stroke, voice, smell, sweat pores analysis and measure behavioural characteristics.

Iris recognition is an automated method of biometric identification which uses mathematical pattern recognition techniques on video images of the irises of an individual's eyes, whose complex random patterns are unique and can be seen from some distance. Iris cameras perform recognition detection of a person's identity by analysis of the random patterns that are visible within the iris of an eye from several distances. [6]

**Ms. ReetuAwasthi et. al.** mainly focused in this project on the crime, fraud and threats being central & all pervading, Security is indispensable. "The secret agent places his palm on the grid panel as a thin red scans his entire hand from left to right. A mechanical female voice chimes "Access granted", "Biometrics is a technology that has been glorified in movies, and comic books as a thing of science fiction and "James Bond" styled security access systems. The origin of the word biometrics comes from the Greek word "bios" which means life and "metros", which means to measure. True to this etymology, biometrics is the identification of an individual based on distinguishing biological traits such as fingerprints, hand geometry, vascular patterns of a person's palm, retina and iris patterns, voice waves as well as DNA. [7]

**Sagar S.Palsodkar et. al** proposed project for Bank lockers security system using biometric and GSM. In our proposed system first the user will enrol his user name password and his mobile number .then the camera of pc will automatically on and capture the face store with face id then the person will put finger on finger print module finger print will be scan and store with finger id . In this way user's enrollment process will be completed then user will perform login operation during login operation user face of person will detect and finger print will be scan. if the id get matches LCD will show mobile number of the user which entered during enrolment .then code will send to person mobile through GSM. And user will punch the code through keypad if the code get match then LED will be blink or lockers will be open. And LCD will show message access granted. In their project, they used R305 finger print module. It is having FAR value is <0.001% .and FRR value is <0.1%. This sensor is having Good image processing capabilities, can successfully capture image up to resolution 500 dpi. ARM is a 16/32-bit ARM7TDMI-S microcontroller in a tiny LQFP64package. It has 8 KB to 40 KB of on-chip static RAM and 32 KB to 512 KB of on-chip. It offers high performance small size low power. It is having two UART pin UART0AND UART1 from UART0 interface through pc using serial cable. In their project they used SIM 300 GSM module. SIM300 is a Tri-band GSM/GPRS engine that works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS1900 MHz by this GSM code will come on user mobile.[8]

**Raghu Ram.Gangi et. al** focused on the four step verification project. In this proposed work, RFID reader reads the ID number from passive tag and sends to the microcontroller, if the id number is valid then only it gives the access to the fingerprint scanner otherwise it stops the process, if the fingerprint is matched then microcontroller sends the password to the authenticated person mobile number then the authenticated person enters the both passwords in the keyboard which was already given by the user and received from the microcontroller. if these two passwords are matched then the locker will be

opened otherwise the microcontroller sends the warning message to the authenticated person mobile number and it will be remain in locked position. RFID is an effective automatic identification technology for variety of objects. The most important functionality of RFID is the ability to track the location of the tagged item. Based on power source, RFID tags can be classified into three major categories: active tags, passive tags, and semi-passive (semi-active) tags. An active tag contains both a radio transceiver and a battery that is used to power the transceiver. Active tags are more powerful than passive tags/semi-passive tags. RFID tags can also be classified into two categories: tags with read/write memory, and tags with read-only memory. The tags with read/write memory are more expensive than the tags with read-only memory. RFID tags operate in three frequency ranges: low frequency (LF, 30–500kHz), high frequency (HF, 10–15MHz), and ultrahigh frequency (UHF, 850–950MHz, 2.4–2.5GHz, 5.8GHz). 20 LF tags are less affected by the presence of fluids or metals when compared to the higher frequency tags. [9]

#### IV. TABLE FOR REVIEW PAPERS

S.NO.	PAPER	TECHNIQUES OR COMPONENTS	ADVANTAGES	DISADVANTAGES
1.	Aditya Shankar etal	Biometrics, 8051 Microcontroller	No false Intrusions	No Alarm system for alerting the peoples.
2.	Omidiora E. O. etal	Biometrics, Visual C, Visual C++, Visual Basic 6.0 Enterprise Edition	Fingerprint module used as an additional security feature in the vehicle. System was efficiently differentiating between the authentic and the fake user.	Option of adding/ deleting user from the memory is not given.
3.	Karthikeyan. A etal	Biometrics, identification number, digital code lock, R303A as a Scanner	Proposed good system to authenticate the user with the fingerprint recognition.	Unsuccessful to implement.
4.	Pavithra.b.c etal	Biometrics	High accuracy in terms of security.	Identification number can guess easily.
5.	CrystalynneD.Cortez etal	Biometrics	Unlock the locker using fingerprint or auto-generated pass code.	No intruder detection technique.
6.	Smita s. Mudholkar etal	Biometrics	All genuine users could enroll their fingerprint and use a fingerprint-based system.	It should have GSM calling system.
7.	Ms.Reetu Awasthi etal	Biometrics, fingerprint ARM, GSM.	Less time delay, Quick response time.	It should have GSM calling system.

#### V. CONCLUSION

We studied eight research papers and learned the different works done on this project. The project took the revolution in the history of lockers, because this system overcome limitation of traditional locking systems like locks & keys, password authentication, RFID Card, etc. Because all the systems had some disadvantages like duplication of keys and RFID Cards or hacking of passwords. But in biometric security system there is zero possibility of duplication of fingerprints and DNA.

#### REFERENCES

- [1]. A. Aditya Shankar, "Finger Print Based Door Locking System", IJECS Volume 4 Issue 3 March, 2015 ISSN:2319-7242.

- [2]. Omidiora E. O.(2011) “A Prototype of a Fingerprint Based Ignition Systems in Vehicles” Published in European Journal of Scientific Research ISSN 1450-216X Vol.62 No.2 (2011), pp. 164-171 © EuroJournals Publishing, Inc. 2011.
- [3]. Karthikeyan.a “Fingerprint Based Ignition System” Published in Karthikeyan.a, Sowndharya.j /International Journal of Computational Engineering Research / ISSN: 2250–3005.
- [4]. Pavithra. b.c., “Fingerprint Based Bank Locker System Using Microcontroller”, Proceedings of IRF International Conference, 05th April-2014, Pondicherry, India, ISBN: 978-93-82702-71-9.
- [5]. Crystallynne D. Cortez, “Development of Microcontroller-Based Biometric Locker System with Short Message Service” Lecture Notes on Software Engineering, Vol. 4, No. 2, May 2016.
- [6]. Smita s. Mudholkaretal, “Biometrics Authentication Technique For Intrusion Detection Systems Using Fingerprint Recognition”, International Journal of Computer Science, Engineering and Information Technology (IJCEIT), Vol.2, No.1, February 2012.
- [7]. Ms. Reetu Awasthi, “A Study Of Biometrics Security System”, International Journal Of Innovative Research & Development Page 737 www.Ijird.Com April, 2013 Vol. 2 Issue 4.
- [8]. Sagar S.Palsodkar, “Bank Lockers Security System using Biometric and GSM Technology”, SSRG International Journal of Electronics and Communication Engineering (SSRG-IJECE) – Volume 2 Issue 4–April 2015.
- [9].Raghu Ram Gangi, “Locker Opening And Closing System Using Rfid, Fingerprint, Password and GSM” International Journal of Emerging Trends & Technology in Computer Science (IJETTCS, Volume 2, Issue 2, March – April 2013 ISSN 2278-6856.
- [10]. Anil k. Jain, Ling Hong, Sharath Pankanti, Ruud Bolle “An Identity-Authentication System using Fingerprints” .IEEE Vol.85 No.9 September1997.
- [11]. Mary Lourde R and Dushyant Khosla, “Fingerprint Identification in Biometric Security Systems”, International Journal of Computer and Electrical Engineering, Vol. 2, No. 5, October,2010.
- [12]. A. O. Oke, A. A. Adigun, A. S. Falohun, and F. O. Alamu, “Development of a programmable electronic digital code lock system,” International Journal of Computer and Information Technology, vol.2, issue 1, pp. 127-131, January 2013.
- [13]. D. Matoni, D. Maio, A. K. Jain, and S. Prabhakar, Handbook of Fingerprint Recognition, 2nd ed., London: Springer Verlay London Limited, 2009, ch. 2, pp. 57-58.

## **AUTHORS**

**Hemant Kumar** is a final year undergraduate scholar, Department Of Electronics and Communication Engineering from Moradabad Institute of Technology, Moradabad (U.P.). Main area of interest is Embedded System.



**Pradeep Kumar Gupta** has 9 years of experience in the field of Academic. He obtained his Bachelor’s degree in Electronics & Communication Engineering from M.I.T.,Moradabad and Master’s degree from NITTTR ,Chandigarh. Now He is pursuing P.hd from AKTU,Lucknow (U.P.). Presently He is working as an Assitant Professor, department of E &C Engineering at MIT Moradabad. His area of interest in Wireless Communication and Medical Image Processing. He has published number of papers in International and National journals, conferences and seminars.



**Divyanshu Kapoor** is a final year undergraduate scholar, Dept. of Electronics & Communication Engineering from Moradabad Institute of Technology, Moradabad (U.P.). Main area of interest is Embedded System.



**Gautam Rana** is a final year undergraduate scholar, Dept. of Electronics & Communication Engineering from Moradabad Institute of Technology, Moradabad (U.P.). Main area of interest is Embedded System.



**Govind Varshney** is a final year undergraduate scholar, Dept. of Electronics & Communication Engineering from Moradabad Institute of Technology, Moradabad (U.P.). Area of interest includes Embedded System & working with Arduino based project.

