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**ABSTRACT**

A biometric authentication system acquires biometric sample such as fingerprint. The fingerprint signifies physiological features of an individual. This is a system which maintains the attendance records of students automatically. In this designing of an efficient module that comprises of a fingerprint sensor to manage the attendance records of students. This module enrolls the student's as well as staff's fingerprints. This enrolling is a onetime process and their fingerprints will be stored in the fingerprint sensor. During enrolling of fingerprints alone requires a system since it is a onetime process. After enrolling process gets completed disconnect the module from the system and insert a battery into the module. This will provide power when the module is not connected with the system. The presence of each students will be updated in a database.

**KEYWORDS:** Fingerprint, Enrolment, Authentication, Raspberry pi.

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**INTRODUCTION**

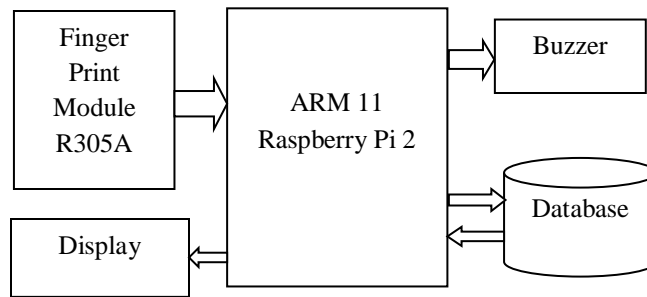
Biometric system plays important role in the security system. Authentication of the user with the use of the fingerprint recognition system. The fingerprint module have the important with the thumb scanning with comparison with the database. If finger match then the system gives the full access if not permission denied. If match then it shows the output on the LCD screen, if not matched then siren the buzzer. The processing of the Thumb scanner with the ARM 11 Raspberry pi Quad Core Processor with 1GHZ speed & 1GB of RAM with the use of python scripting. Biometrics add an additional factor of authentication and are therefore a significant improvement in computer security. The most common biometric security systems use fingerprints, but these systems can also use iris and retinal scans, hand geometry, and facial recognition technology. Biometrics refers to metrics related to human characteristics. Biometrics authentication (or realistic authentication is used in computer science as a form of identification and access control. It is also used to identify individuals in groups that are under surveillance. Biometric identifiers are the distinctive, measurable characteristics used to label and describe individuals. Biometric identifiers are often categorized as physiological versus behavioural characteristics. Physiological characteristics are related to the shape of the body. Examples include, but are not limited to fingerprint, palm veins, face recognition, DNA, palm print, hand geometry, iris recognition, retina. Behavioural characteristics are related to the pattern of behavior of a person, including but not limited to typing rhythm, gait, and voice.

More traditional means of access control include token-based identification systems, such as a driver's license or passport, and knowledge-based identification systems, such as a password or personal identification number. Since biometric identifiers are unique to individuals, they are more reliable in verifying identity than token and knowledge-based methods. This paper discusses on the standardized authentication model which is capable of extracting the fingerprints of individual and store that in database. Then use the final fingerprint to match with others in fingerprints present in the database. Accuracy and reliability are the two most important parameters when it comes to biometric applications and that too with advanced embedded computers. Fingerprint verification is one of the oldest known biometric techniques known but still is the most widely used because of its simplicity and good levels of accuracy.

## IMPLEMENTATION

The aim behind to design the system for fingerprint based student attendance system. Fingerprint scan & match with the existing database of finger, Fingerprint matches then mark the attendance of the student as present. The system design using ARM 11 Raspberry Pi with the use of the fingerprint scanner module. Fig.1 consist of different peripheral are connected with the system like fingerprint module, LCD, buzzer.

Figure:



*Fig.1 Block Diagram of fingerprint authentication system.*

Fingerprint R305A, this module is used to take the live fingers & store into the memory of it. It has its own DSP processor which are capable to perform the finger scanning & comparison with the database available in the memory section. Database is noting but the stored location of the fingerprint of the user. It is used as reference image for comparison between the Live Image & database Image. Buzzer is used to siren if the finger not match. ARM 11 Raspberry Pi is used to take the output from the Fingerprint module & perform the matching with the database of the Fingerprint module. If fingerprint matches it display as the finger match, if not it siren the buzzer or display the message fingerprint not found.

## SYSTEM DESIGN

### Hardware Requirement

#### Raspberry Pi 2:



*Fig.2 Raspberry Pi 2 Development Board*

The Raspberry Pi 2 Model B is the second generation Raspberry Pi. It replaced the original Raspberry Pi 1 Model B+ Compared to the Raspberry Pi 1 it has: A 900MHz quad-core ARM Cortex-A7 CPU, 1GB RAM. Like the Pi 1 Model B+, it also has: 4 USB ports, 40 GPIO pins, Full HDMI port, Ethernet port, Combined 3.5mm audio jack and composite video, Camera interface (CSI), Display interface (DSI), Micro SD card slot, Video Core IV 3D graphics core.

***Fingerprint Module:***



***Fig.3 Fingerprint Module R305A***

Fingerprint scanner widely used in the today's market for taking the attendance of the Employees, bank security systems. Security lockers & many application in day today life. Storage capacity: 350, Security level-5, False Acceptance Rate (FAR) < 0.001% , False Rejection Rate (FRR)< 0.1% .

**Software Requirement:**

Python Scripting: python scripting language is opencv. Python scripting used for fingerprint reader access, fingerprint authentication & recognition.

Ubuntu Mate -15.04: An Operating System.

Putty: Putty is used to access data from rpi board.

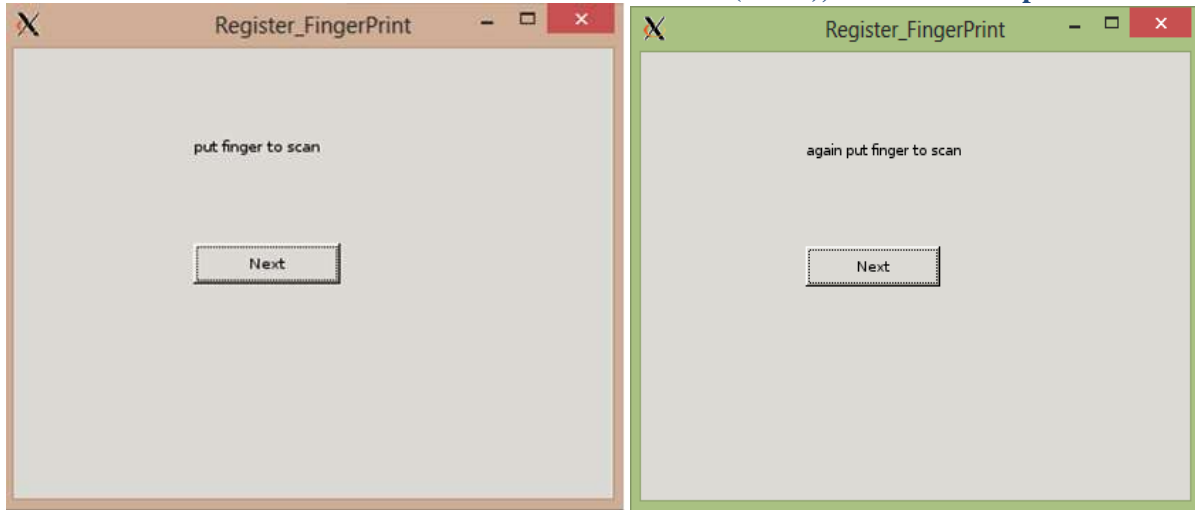
Xming Xserver: It Supports putty, server has portable version of putty.

Postgresql: Used for database creation and management.

Qt Designer tool: Used for GUI creation.

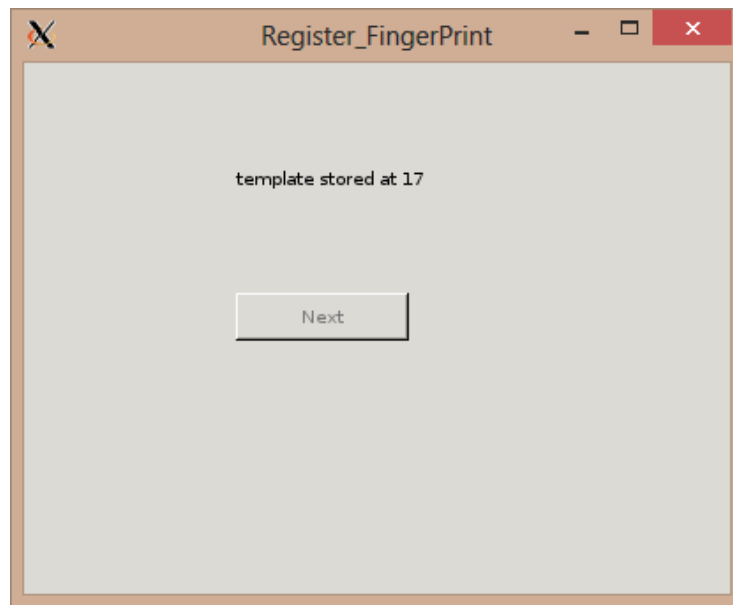
**RESULTS AND DISCUSSION**

In Fingerprint authentication system there are two stages first is fingerprint registration and second is fingerprint verification. The Registration of fingerprint is done by two steps to store proper image of fingerprint into data base as shown in fig .4 (a)(b). The fig.4(c) shows that the fingerprint template stored successfully. Then the second stage is verification in this the comparison has been carried out with the help of open cv programming tool with python script. The below fig.5 (a),(b) shows the image of Verified fingerprint. Matched fingers, which is identified by the python script by comparing each of the fingerprint template stored in the database. In this way the fingerprint authentication process is carried out.



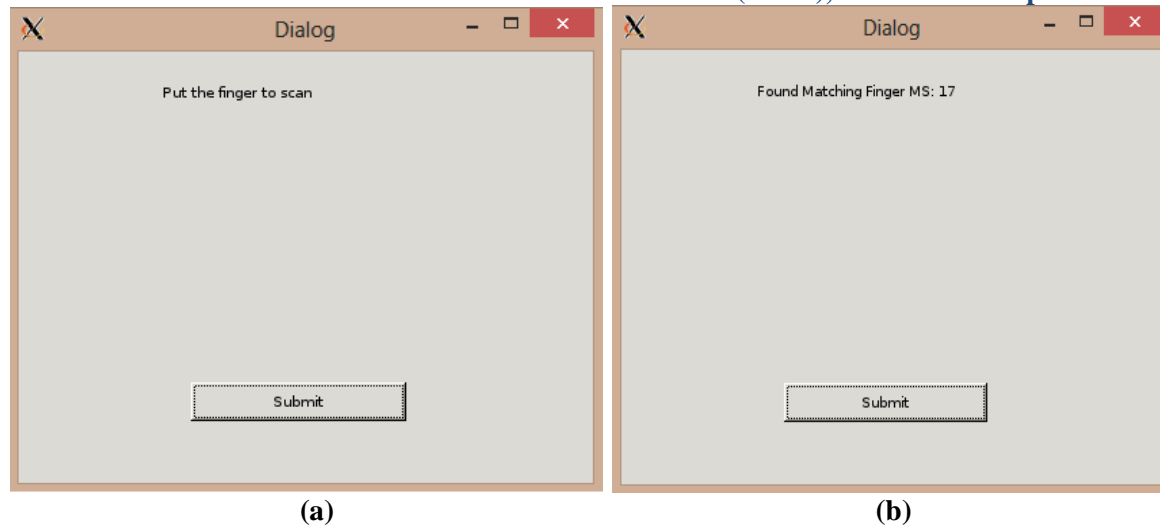
(a)

(b)



(c)

*fig.4 Registration of fingerprint (a),(b),(c).*



*fig.5 Verification of fingerprint (a),(b).*

## CONCLUSION

Thumb scanning & the matching with the database needs the processors high speed. Then only possible to perform the live thumb scanning & comparison with the stored database. Also it needs to interface the Buzzer like module so it need some pins of processor as GPIO pin modules. By observing this scenario ARM 11 Raspberry pi 2 fulfill all the requirement of the system. The Raspberry pi having the CPU & GPU Core with the processor having GPIO port pins. So Raspberry pi 2 it fulfill all the requirements of the system. recognizing fingerprints in Linux based embedded computers (raspberry pi) are still a very complex problem. This entire work is done on the Linux based embedded computer called raspberrypi, in which database creation and management using postgresql.

## ACKNOWLEDGEMENTS

This paper has been realized due to the guidance and support of many individuals, without whom, I would not have succeeded in implementing my ideas. I would like to take this opportunity to express my gratitude to them. I would like to thank Prof. Mrs. S.O. Rajankar mam for the invaluable support and guidance that she has imparted. I am grateful to her for constant encouragement in fulfilment of paper. This work is result of combined efforts put in by my guide and me. I would also like to thank her for providing me with all necessary infrastructure and facilities to complete the review paper. I extend my special thanks to HOD of Electronics & Telecommunication Dr. M. B. Mali and all staff members.

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