IJCSE International Journal of Computer Sciences and Engineering Open Access
Research Paper Vol.-7, Issue-9, Sept 2019 E-ISSN: 2347-2693

Fingerprint usage as a Text and Its Performance on Database

Nashwan Yahya Ali[1]

School of Computational sciences, S.R.T.M University, Nanded, INDIA

**Corresponding Author: Nashwan.almahbashi@gmail.com*

DOI: https://doi.org/10.26438/ijcse/v7i9.148151 | Available online at: www.ijcseonline.org

Accepted: 11/Sept/2019, Published: 30/Sept/2019

Abstract— Database is considered as an essential element in any organization. Many Databases contains columns, dedicated to hold information about fingerprint. Fingerprint can be stored in two ways. We can either store the path of the fingerprint image inside the database or store the fingerprint template itself as binary stream. Sometimes, database is overloaded with many requests on fingerprint column and this degrades the overall performance of the Database. To solve this problem, we take the advantage of Fingerprint conversion to text which relieves the battleneck problem and offers better performance. SQL Server is used to show the difference of Database throughput in both situation, fingerprint as image and fingerprint as text.

Keywords— fingerprint conversion, fingerprint presentation, minutiae point, Database performance.

I. INTRODUCTION

The usage of biometric technologies within physical access control systems is broadly commercialized. Fingerprint is an import feature to identify or distinguish people. Here, we have to main processes that are Identification and verification. Verification process is used to make one to one matching and verifies the input fingerprint image is identical to the one stored in the database. But identification is using one to many matching and identifies to whom the input fingerprint image belongs. Identification process can search among big amount of data so, this affects the system performance especially when there are so many and frequent search processes.

A good fingerprint representation should contain distinctive information about the fingerprint and can be easily extracted. Fingerprint image has salient features that are needed to be extracted to discriminate between identities especially those remain invariant and not changing with the time.

Many fingerprint Systems depends on minutiae point distribution for fingerprint representation and matching processes.

A. Fingerprint Matching:

The most critical step in authentication and identification processes is fingerprint matching. Automatic matching has been implemented on computers and has the most important algorthems:

Correlation Based Matching: the correlation of two fingerprint images betwwen crresponding pixels is coputed for different alignments.

Minutiae based Matching: minutiae points are extracted from the two targeted fingerprint images and finding the alignment between minutieae sets that results in the maximum number of minutiae pairs.

Ridge Feature Based Matching: Fingerprint redge patern like local orientation and frequency, ridge shape, texture information are extracted. Sometimes minutiae points are difficult to be extracted due to low quality of fingerprint image so, in this case, ridge feature matching is more reliable.

B. Fingerprint Classification:

DBMS collects a large number of fingerprint templates and stores them in database. Fingerprint input for identification process, the system has to compare the input of fingerprint template with the large number of templates stored in the database. This process May affects negatively the performance of the system and takes long processing time. To reduce the search time as well as computational complexity, the large number of fingerprint should be classified to several classes.

Henry classification system and its variants has classified fingerprint into six basic classes (Arch, Tented, Arch, Left loop, Right loop, and Whorl) [5].

Loop fingerprint: has one or more ridges that enter from one side, turn back, and go out the same side they came from as shown in figure [1.A, B].

Whorl fingerprint: has some of the ridges make a turn through at least one circuit. Any fingerprint pattern which contains 2 or more deltas will be a whorl pattern as shown in figure [1.C].

Arch fingerprint: ridges flow in one side and flow out the opposite side as shown in figure [1.D].

Tented fingerprint: in tented fingerprint, arch pattern but horizontal ridges rising up high in the middle, creating a tent-like pattern as shown in figure [1.E].

II. RELATED WORK

A new scheme is proposed to eliminate duplicate data before users' encryption operation that can reduce computation overheads [1]. This scheme is a secure de-duplication by Haonan Su, Dong Zheng, and Hinghui Zhang. It realizes variable-size block-level de-duplication based on the technique of Rabin fingerprinting. It blocks file by using the Rabin fingerprinting that supports various changes.

Wahid Zafar, Tasweer Ahmad, and Muhammad Hassan [2] developed a combination of different techniques for an automatic fingerprint system. The development includes MATLAB GUI to check the performance of a practical system. The precision in marking minutia during the process of minutia marking is the core point in this system. This algorithm can be improved by including robust search algorithm and by using high quality scanner.

In this paper [3], some steps are taken to overcome the finger print database challenges. First, to standardize the process of capturing fingerprints by adhering to international standards such ones developed by ISO/IEC JTC 1/ SC 37 Biometrics. Second, to Convert multiple fingerprint databases into feature database to speed up data transfer and processing time of fingerprint recognition. Third, to replicate the PDRM-BIOFIS fingerprint database across the nation by having a copy in multiple cities.

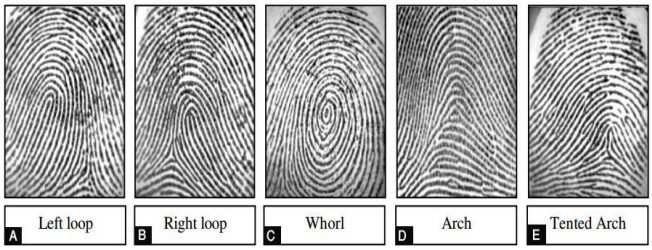

Fig. 1

A new presentation of an improved and enhanced fingerprint image is introduced by Ankita Mehta, and Sandeep Dhariwal [4]. Factors are taken into consideration like image quality, separation, image improvement, and feature detection. MATLAB is used to implement the proposed algorithm. There is a number of factors are detrimental to the correct location of minutia. Poor quality of image is the most serious one. So, many methods are combined to build a minutia extractor and a minutia matcher.

III. THE PROCESS OF FINGERPRINT CONVERSION TO TEXT

Figure [2] fingerprint after processing.

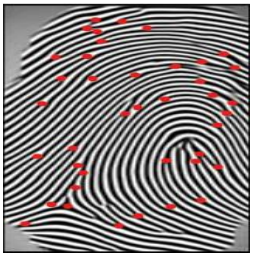

Figure 3 fingerprint image after locating minutiae points

In minutiae extraction, we have two main kinds of points that are ridge endings and bifurcations. An additional kind of minutiae point that is called island or short ridge, but it is not that much efficient. Extracting the points goes through processes that are segmentation, normalization, orientation estimation, ridge frequency estimation, Gabor filtering, binarization, and thinning as shown in figure [2].

The last step is locating the minutiae on the fingerprint image. Fingerprint conversion to text is the same as the one of minutiae point extraction with the addition of one step. After locating the minutiae points on the fingerprint image, we write two kinds of minutiae points, ridge endings and bifurcations. After that we write the position of that minutiae point in the form of (X, Y) pixel coordinates as in figure [3].

An example of this process is the picture in figure 3 is converted to text {
R((93,30)(62,35)(55,65)(86,87)(59,92)(136,112)(105,116)(26,122)(87,127)(124,192)(22,186)(149,197)(47,224)(32,245)(108,247))
B((61,21)(55,30)(78,23)(64,47)(143,62)(35,66)(129,71)(112,77)(150,79)(38,91)(128,95)(148,121)(145,134)(139,148)(79,135)(46,176)(127,184)(140,199)(106,191)(52,206)(42,247)(128,240)(87,259)(15,269)(76,271)) }.

IV. RESULTS AND DISCUSSION

A small program has been built to make a simulation to show the difference of performance between Image fingerprint and text. Visual basic. Net is used along with SQL SERVER

2008. More than 500 fingerprint template involved in the simulation. The task of the program is to insert the fingerprint as template to SQL server and also as a text of some fingerprint. During the insertion of fingerprint templates we checked the performance of the SQL server as shown in figure [4].

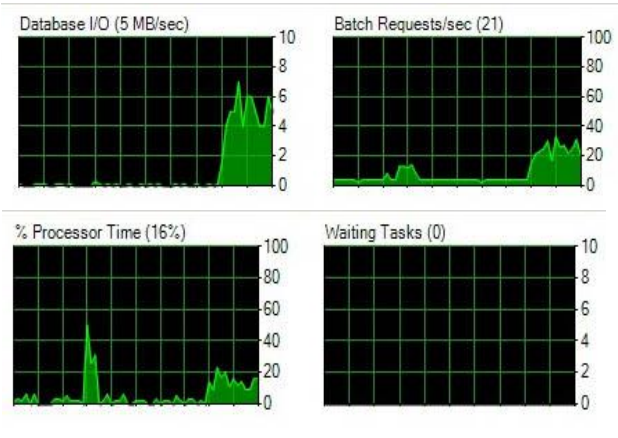

Figure [4] The Performance of Fingerprint Insertion Process as Image.

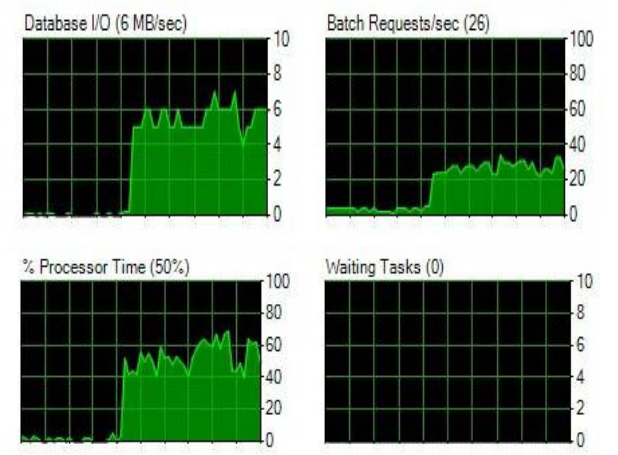

Figure [5] The performance of Fingerprint Reading process as Image.

After fingerprint template insertion we run the program to fetch rows of the inserted ones to check the performance of database in case of fingerprint image reading process and checked SQL server performance as in figure [5]. In case of reading fingerprint as image, we got 50% of processor time, zero of waiting tasks, 6MB/S of database I/O and 26 of batch request/S.

The previous process is replaced with fingerprint as text that means instead of dealing with fingerprint as image, we deal with it as text. Then, the performance of SQL server is monitored and we got this throughput as shown in figure [6] and also reading the fingerprint process as shown in figure [7].

V. CONCLUSION

In this Paper, we tried to focus on the use of fingerprint as a text and its effects on the performance of Database system. Converting fingerprint from template to text has been discussed in previous paper[1] but here we attempt to get the maximum advantage of that conversion. As we have seen the big difference when using a fingerprint as template and a fingerprint as text and how much is better to use it as text. using fingerprint allows us to get advantage in many terms. first, the process of fetching and searching data is much better when using the fingerprint as text including number of bytes read and write, data compression and encryption.

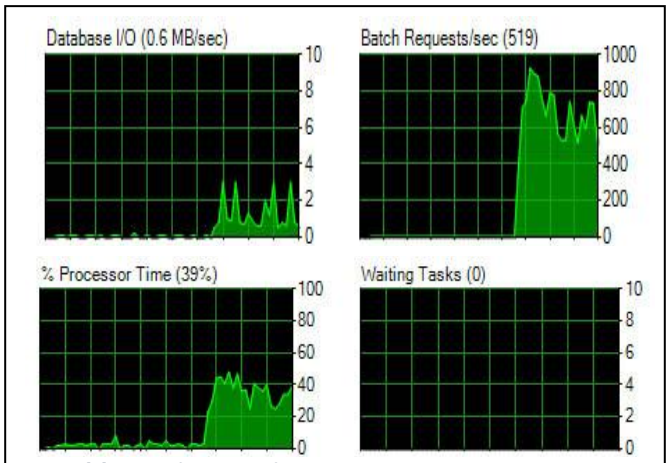

Figure [6] The performance of Fingerprint Insertion as Text.

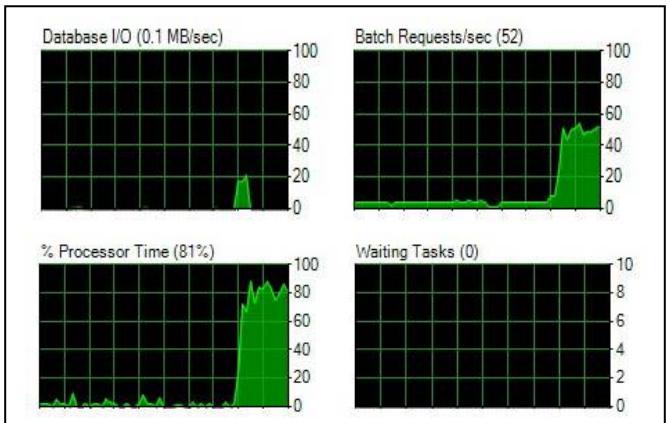

Figure [7] The performance of Fingerprint Reading process as Text.

REFERENCES

[1] Haonan Su, Dong Zheng, and Hinghui Zhang. "An Efficient and Secure Deduplication Scheme Based on Rabin Fingerprinting in Cloud Storage". IEEE international Conference on Computational Science and Engineering (CSE) and IEEE International Conference on Embedded and Ubiquitous Computing (EUC). 2017.

[2] Wahid Zafar, Tasweer Ahmad, and Muhammad Hassan. "Minutiae Based Fingerprint Matching Techniques". 2014.

[3] Chiung Ching Ho, and C.Eswaran. "Consolidation of Fingerprint Databases: Challenges and Solutions in the Malaysian Context". International Journal of Computer Information Systems and Industrial Management Applications. Vol 5 . pp. 373-382 , 2013.

[4] Ankita Mehta, and Sandeep Dhariwal. "Design & Implementation of Features based Fingerprint Image Matching System". Vol .2, International Journal of Multidisciplinary and Current Research. 2014.

[5] D Maltoni, D Maio, and S Parbhakar. "Handbook of Fingerprint Recognition". Springer publisher, New York. pp174, 2003, ISBN no 0-387-95431-7

[6] J Kilian, "Advanced in Cryptology - Crypto", Springer publisher, USA, pp447, 2001, ISBN no 0302-9743.

[7] Nashwan Yahya Ali1, Dr. V M Thakare "MECHANISM OF FINGERPRINT CONVERSION TO TEXT". IJCSE, 2017.

Authors Profile

N Y Ali. Ph.D. Computer Sciences in School of Computational sciences, S.R.T.M unviersity, Nanded, Maharashtra, INDIA. .Master degree in Information System, Osmania University, Hyderabad, India.

