JOURNAL OF CRITICAL REVIEWS

ISSN- 2394-5125 VOL 7, ISSUE 08, 2020

Review Article

A REVIEW ON FINGERPRINT RECOGNITION USING HARRIS CORNER DETECTOR IN PYTHON

KANNADASAN.R[1]*, PRABAKARAN.N[2]

[1,2] **School of Computer Science and Engineering, Vellore Institute of Technology, Vellore-632014, India,**

***Email: [1]desurkannadasanr@gmail.com, [2]dhoni.praba@gmail.com,**

Received: Revised and Accepted:

ABSTRACT

Fingerprint acknowledgment is the innovation that checks the character of an individual dependent on the way that everybody has different fingerprints. It is one of the exceptionally critical and effectively examined biometric frameworks and is getting immense acknowledgment as fingerprints don't change normally over a lifetime and gives considerably more unwavering quality and security when contrasted with the iris, voice, and face acknowledgment strategy. It can help computerized measurable specialists in completing criminal examinations, biometric advances, for example, non-combatant and gadgets utilized for exchanging for individual ID. A unique fingerprint contains ridges (darkly shaded areas) which are basically the sweat glands which are projecting out of fingertip surface. The uniqueness of a unique mark is solely dictated by the neighborhood ridge attributes. The ridges are the dim territory of the unique finger impression and the valleys are the white zone that exists between the ridges. There are a few techniques and advances that are utilized from numerous points of view for coordinating fingerprints like particulars, connection, ridge designs. These kinds of approaches can be extensively sorted as details based or surface based.

Keywords: Fingerprint recognition, Otsu's threshold, Skeletonization, Harris Corner detector, Hamming distance

DOI: http://dx.doi.org/10.22159/jcr.07.01.01

INTRODUCTION

Biometrics is a technology that can identify a person based on his physical characteristics. Identification and fingerprint recognition are a biometric method that is widely used in different types of applications because of its accuracy and reliability. The main aim of our project is to develop a system that will be able to recognize whether two prints come from the same person or not. For this purpose, the images are first collected from a public data set. Then digital imaging techniques are applied to the corresponding images in order to improve their quality. Once the image is reprocessed, the so-called image is searched. Critical points that are later compared according to their Hamming distance.

TECHNICAL AND FUNCTIONING

A. Data set

The dataset used is called FVC2002 [1] and is published by the University of Bologna. The site has four different datasets, but for this project, I used the DB1 datasets[1].

B. Binarization

Image inclination enables us to clear the picture from pointless commotion and causes us to differentiate between the "wrinkled" surface of the print and different lines.Image Binarization helps in getting us a black and white form of the image, one which can help us to obtain a high contrast and hence give us a differential feature, which at first was invisible to the human eye[2]. When it comes to images of fingerprint, there exist two main features, which are ridges and valleys are needed to be processed in a high differential order. This is where the black white binarization helps us by painting the ridges black and valleys white. In later processes, we can issue the fingerprint ridge characteristics like core, ending ridge, fork etc[3].

C.Otsu's Door Step

Otsu's threshold will by itself select the image which is generic and has better to get massive difference between front end and backend information[5]. For the fact that the image contains a distribution of duality of values of pixe[6]l. With that picture, roughly the value can be taken out between the mid of the highest of histogram. For images which are non-modal the binary is not correct. Otsu give us the permission to not use values which are fixed, thereby the system is made general for the recording devices. The result of the threshold can be seen in Figures (a) and (b).

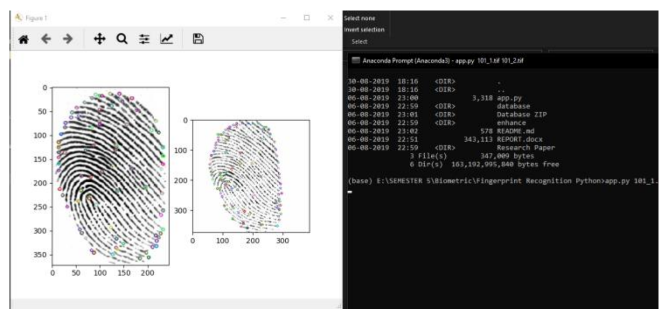

Fig .1: Otsu Threshold (a) Finger Print NOT match; (b) Recording Devices Program

D. Image Skeletonization

So as to improve the way to scanning for basic focuses on the printout, it is prudent to portray the image itself[7]. This makes interesting and more grounded basic focuses. The Skeletonization is based on Zhang-Suen's algorithm.[2] Image skeletonization helps us in giving us the shape features based on the region featurette. When it comes to fingerprint recognition utilizing Harrison's algorithm, image skeletonization produces a rough spine bone like structure of the fingerprint, giving us the prominent [8] features of it like branches or forks [9]. This is the main feature that helps us in differentiating between two different fingerprints. For this we require to do some basic operations, like minutiae extraction. This acts as an autonomous recognition system that recognize normally ridge forks and stoppages.

E. *Requesting Minutiae Points*

Once we have the image which is skeleton of original image, the adjacent step will be to take the points which are crossing on the reefs

ISSN- 2394-5125 VOL 7, ISSUE 08, 2020

of print, they are said to be points which are minutiae. With the use of detector of critical points, which requires a great deal of local contrast change. This is detector of Harris Corner. It is fit for identifying sharp edges, this is for issue of unique mark acknowledgment, the edges and essentials of the edges and of the bifurcations, are gathered. The critical points found can be seen in the Figures 3[10]

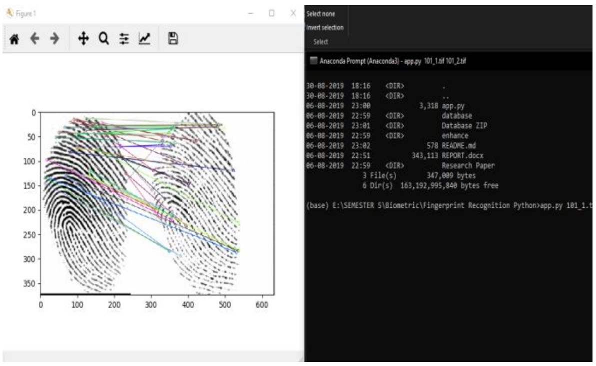

Fig.2: Otsu Threshold (a) Finger Print match; (b) Recording Devices Program Verified

F. ***Definition of Formal Descriptors***

Once the list of critical points is obtained, a descriptor of the region found locally just near that point should be created[12] so that it can be uniquely identified among the other critical points. Since the orientation of the printout may vary (it is not fixed), we need a descriptor that is vigorous enough to identify such small differences.Keeping that in mind, one of the most commonly used descriptors for this purpose is the Oriented FAST and Rotated BRIEF (ORB). With this method, we can obtain a descriptor for each critical point and form a matrix of such descriptors that identify the printout[13].

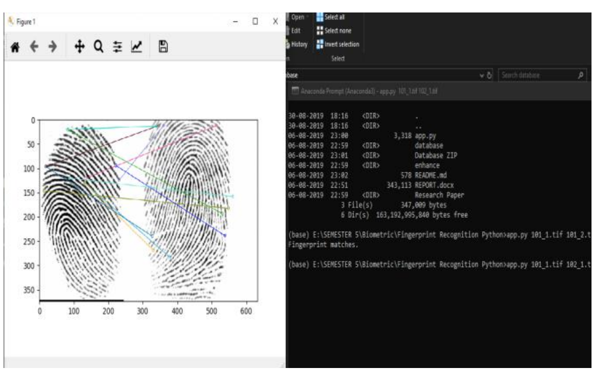

Fig.3: Otsu Threshold (a) Finger Print Not match; (b) Recording Devices OutPut

G.***Comparisons of Print***

Once the two-fingerprint descriptor matrices are obtained, an algorithm for their comparison is needed. The most straightforward path is to look with alleged coarse power along the Hamming distance between descriptors at two distinct focuses. This way, we get a rating that indicates how similar those two prints are [14] Setting a threshold can determine whether or not the prints are the same. Another way is to compare the original fingerprint with all the fingerprints found in our fingerprint database and to select the one that has the best score of all - in order to identify the input fingerprint [15-19]. The final output can be seen in the Figures 3.

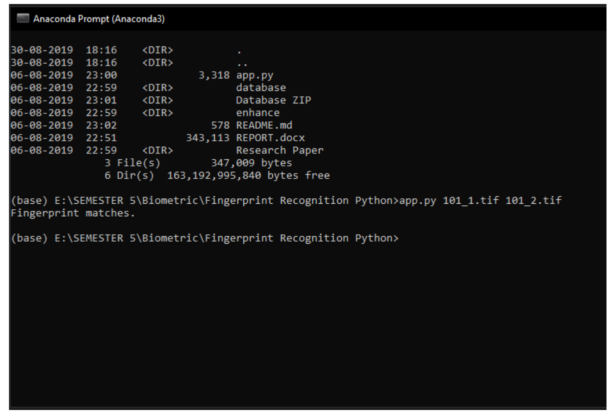

Fig. 4: Otsu Threshold Output Match

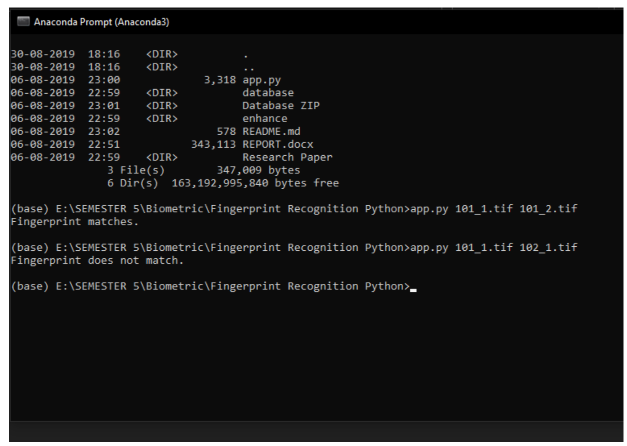

Fig.5: Otsu Threshold Final Output

FUTURE WORK

This algorithm can be later extended into other fields of biometrics which are similar to fingerprint authentication like IRIS authentication etcetera. Currently, it is working on a small database of fingerprints, and this could be expanded using cloud storage which can contain millions of fingerprints. The fingerprint authentication algorithm can be improved and made more efficient by adapting it to any latest pattern-matching algorithm in the current research trend.

We can adapt this algorithm to small biometric electronic devices with limited CPU power by encoding it into embedded C programming and attaching a tiny compiler for the same.

CONCLUSION

This paper built up a unique fingerprint acknowledgment framework dependent on the strategy for discovering basic focuses/points. These focuses/points are then used to discover formal descriptors of the area around them and in this manner structure a matrix that distinguishes the impression itself. We tried the framework on the FCV2002 DB1 dataset to decide whether it effectively perceived the prints. We used Binarization method, Otsu's doorstep, which provides a more precise image detecting the unnecessary noise as well as created a contrast between the foreground and background information and also contrast between the wrinkled surface and other lines. We did Image Skeletonization based on Zhang-Suen's Algorithm, and hence, we take the Harris Corner detection approach in order to figure out the sharp angles and edges in the print. We used the formal descriptor to uniquely identified among the other critical points and then after

ISSN- 2394-5125 VOL 7, ISSUE 08, 2020

forming the two fingerprint descriptor matrices, and we used an algorithm for the comparison of prints. This method can be put to use for authentication in various security applications. It provides hope to society in reliable, authentic biometric systems. Its uniqueness and distinctness prove it to be better as compared to the traditional system.

REFERENCES

1. Jea, T. Y., & Govindaraju, V. (2005). A minutia-based partial fingerprint recognition system. Pattern recognition, 38(10), 1672-1684.
2. Bjorn, V. C., & Belongie, S. J. (2000). U.S. Patent No. 6,125,192. Washington, DC: U.S. Patent and Trademark Office.
3. Baldi, P., & Chauvin, Y. (1993). Neural networks for fingerprint recognition. neural computation, 5(3), 402-418.
4. Prabakaran, N., & Kannan, R. J. (2017). Sustainable life-span of WSN nodes using participatory devices in pervasive environment. Microsystem Technologies, 23(3), 651-657.
5. Babiceanu, R. F., & Chen, F. F. (2005, December). Performance evaluation of agent-based material handling systems using simulation techniques. In Proceedings of the Winter Simulation Conference, 2005. (pp. 7-pp). IEEE.
6. Kannadasan, R., Prabakaran, N., Boominathan, P., Krishnamoorthy, A., Naresh, K., & Sivashanmugam, G. (2018). High performance parallel computing with cloud technologies. Procedia computer science, 132, 518-524.
7. Prabakaran, N., & Kannadasan, R. (2018). Contexts enabled Decision Making using sensors to perceive pervasive environment. Procedia computer science, 132, 477-485.
8. Pankanti, S., & Yeung, M. M. (1999, April). Verification watermarks on fingerprint recognition and retrieval. In Security and Watermarking of Multimedia Contents (Vol. 3657, pp. 66-78). International Society for Optics and Photonics.
9. Marasco, E., & Ross, A. (2014). A survey on antispoofing schemes for fingerprint recognition systems. ACM Computing Surveys (CSUR), 47(2), 1-36.
10. Kannadasan, R., Saleembasha, M. S., & Emerson, I. A. (2016). A Frame Work for Learning Drug Designing through Molecular Modelling Software Techniques and Biological Databases for Protein-Ligand Interactions. In International Journal of Engineering Research in Africa (Vol. 27, pp. 111-118). Trans Tech Publications.
11. Kannadasan, R., Prabakaran, R., Galla, N., Vamsi, K., Balakrishna, K., Kumar, S. C. A., & Kumar, T. (2018, April). IOT Based Live Environmental Monitoring Using Embedded Sensors. In 2018 Second International Conference on Inventive Communication and Computational Technologies (ICICCT) (pp. 1484-1488). IEEE.
12. Prabakaran, N., & Kannadasan, R. (2018, April). Prediction of Cardiac Disease Based on Patient's Symptoms. In 2018 Second International Conference on Inventive Communication and Computational Technologies (ICICCT) (pp. 794-799). IEEE.
13. Amornraksa, T., & Tachaphetpiboon, S. (2006). Fingerprint recognition using DCT features. Electronics Letters, 42(9), 522-523.
14. Yoon, S., & Jain, A. K. (2015). Longitudinal study of fingerprint recognition. Proceedings of the National Academy of Sciences, 112(28), 8555-8560.
15. S. Velliangiri, P. Karthikeyan & V. Vinoth Kumar (2020) Detection of distributed denial of service attack in cloud computing using the optimization-based deep networks, Journal of Experimental & Theoretical Artificial Intelligence, DOI: 10.1080/0952813X.2020.1744196
16. Praveen Sundar, P.V., Ranjith, D., Vinoth Kumar, V. et al. Low power area efficient adaptive FIR filter for hearing aids using distributed arithmetic architecture. Int J Speech Technol (2020). https://doi.org/10.1007/s10772-020-09686-y,
17. Vinoth Kumar V, Karthikeyan T, Praveen Sundar P V, Magesh G, Balajee J.M. (2020). A Quantum Approach in LiFi Security using Quantum Key Distribution. International Journal of Advanced Science and Technology, 29(6s), 2345-2354.
18. Umamaheswaran, S., Lakshmanan, R., Vinothkumar, V. et al. New and robust composite micro structure descriptor (CMSD) for CBIR. International Journal of Speech Technology (2019), Vol. 23, Issue 2, pp. 243-249.
19. Karthikeyan, T., Sekaran, K., Ranjith, D., Vinoth kumar, V., Balajee, J.M. (2019) "Personalized Content Extraction and Text Classification Using Effective Web Scraping Techniques", International Journal of Web Portals (IJWP), 11(2), pp.41-52