I J C T A, 9(41) 2016, pp.1302-1310 ISSN: 0974-5572

ANALYSIS AND DETECTION OF FINGERPRINTS

Sharad Pratap Singh*, Shahanaz Ayub, J.P. Saini*****

Abstract- Biometric identification of a person is fast, easy to use precise, trustworthy biometric system. Fingerprint identification system has border control, government and civil application, employment and security system. a fingerprint recognition system based on Minutiae based matching quite frequently used in various fingerprint algorithms and techniques. The approach mainly involves extraction of minutiae points from the sample fingerprint images and altered fingerprint images(to burn case, to cut by blade, to press by door) then performing fingerprint matching based on the number of minutiae pairings among two fingerprints in question. The implementation mainly incorporates image enhancement, image segmentation, orientation histogram ete, feature (minutiae) extraction and minutiae matching. It finally generates a matching score which tells whether two fingerprints match or not and how may matching above to threshold level .MATLAB coding using for find out the matching score.

Keywords—*Biometric fingerprint recognition image processing, MATLAB Tool.*

1. INTRODCTION

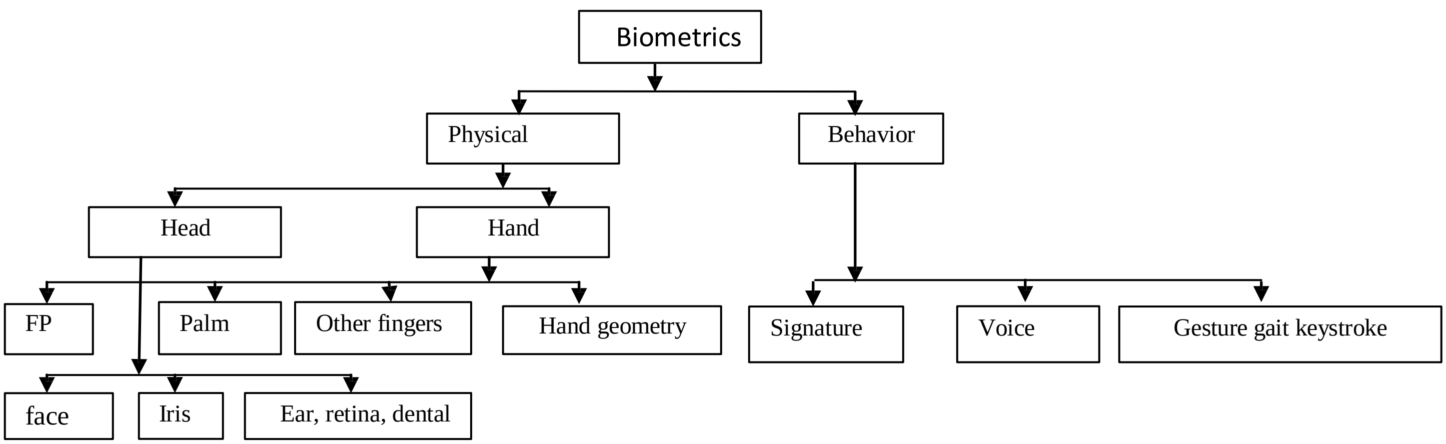


Figure 1. Above diagram shown Different type of Biometric System

Biometric in general and fingerprint in particular have increasingly importance element in the context of public security used historically for forensic proposes some time also identification in absence of any other mean to establish a unique link to a specific person modern electronics data processing to allows for the possibility of campaign fingerprint rapidly without the involvement of human fingerprint experts .thus the rate of majority of existing security scenarios in with the identification of person play key role can be potentially enhancement through the usage of finger .Biometrics is the science & technology to the identify an individual through physiological measure or behavioral traits. Physical biometric are involves some form of physical measurement and include such as trace, fingerprint, iris –scans and hand geometry etc. Behavioral biometrics are usually temporal in nature and involved measuring path in which a user performs certain task such as speech signature, gait, keystroke dynamics etc.[1]

2. HISTORY

The Practice of using fingerprint as a way and techniques of identifying individuals has been is use since late 19th century when Sir Franc is Galton defined some of the points or Characteristics from ,which fingerprint can be identified. The “Galton Point” are the foundation for Science of fingerprint identification which has expanded and transitional over the past century. Fingerprint identification began its transition to automation the late 1960 along with emergence of the computing technology. The “Galton Point” referred to minutiae has been utilized to develop automated fingerprint Technology. In 1969 there was a major push form the federal Bureau of Investigation (FBI) to develop a system to automate its fingerprint identification process, the FBI contracted the National Bureau of standards (NBST), now the National Institute of Standards and Technology (NIST) to study the process of automating fingerprint classification searching and matching. NIST has two most important changing-

1. Scanning Fingerprint card & Extracting minutiae for each fingerprint.
2. Searching against large repositories of the fingerprint.

In 1975 the FBI funded the development of fingerprint scanner for automated classifiers and minutiae extraction technology. This leads to the development of a prototype reader. This reader used capacitive techniques to collect the fingerprint minutiae. The work of NIST lead to the development of the M40 algorithm, the first operation matching algorithm used the FBI, the result produced to trained and specialized human Techniques. In 1914 Competed the Integrated Automated fingerprint System (IAFS). The Completion are three major changes-

1. Digital fingerprint Acquisition
2. Local ridge characteristics
3. Ridge characteristics matter matching [2]

III. PROPOSED ALGORITHM FOR FINGERPRINT MATCHING

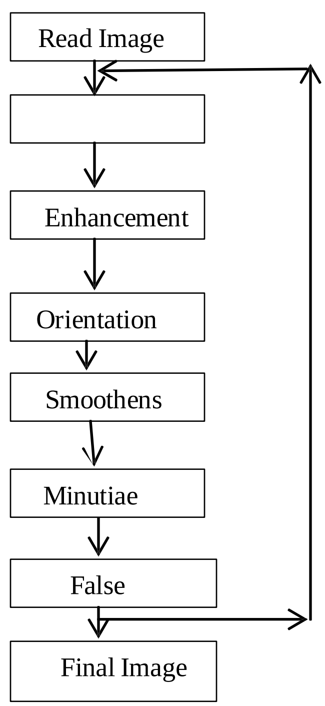


Figure 2. Flow chard of proposed algorithm

2.1 Analysis of orientation field-

Orientation field4 describes the ridge flow of fingerprints and is defined as θ(the local ridge orientation in the range 0 to 360 in degree. Good quality fingerprints have a smooth orientation field except near the singular points (e.g., core and delta). Based on this fact, many orientation field models have been developed by combining the global orientation field model for the continuous flow field of the fingerprint with the local orientation field model around the singular points [14-16]. The global orientation field model represents either arch- type fingerprints, which do not have any singularity, or the overall ridge orientation field except singularity in fingerprints. If the global orientation field model alone is used for orientation field approximation, the difference between the observed orientation field and the model will ideally be nonzero only around the singular points. On the other hand, for obfuscated fingerprints, the model fitting error is observed in the altered region as well. Thus, we use the difference between the observed orientation field extracted from the fingerprint image and the orientation field approximated by the model as a feature vector for classifying a fingerprint as natural fingerprint or altered. Orientation field approximation. The orientation field θ (x,y) is approximated by a polynomial model to obtain θ(x,y) Feature extraction. The error map, is com E(x,y) putted as the absolute difference between θ(x,y) and $\hat{\theta}$(x,y) and used to construct the feature vector, the global orientation field, a set of polynomial functions is used, which is not only computationally efficient, but also provides a good approximation in orientation field modeling. Let $\hat{\theta}$ (x, y) denote the orientation field. Then, the cosine and sine components of the doubled orientation at $\hat{\theta}$(x, y) can be represented by polynomials of order n:

g_c^n (x, y) $\triangleq$ cos 2 θ (x,y)= $\sum_{i=0}^{n} \sum_{j=0}^{i} a_{i,j}\, x^j\, y^{i-j}$

For i=0, j=0-i , = 0-0=0, $a_{0,0}\, y^{0-0} = a_{0,0}$ 1.1 = $a_{0,0}$ 0(1)

For i=1, j=0, 1 = $a_{1,0}\ x^0 . y^{1-0} + a_{1,1}\, x^1 . y^{1-1} = a_{1,0}$ 1. y + $a_{1,1}$x. 1 = $a_{1,0}$ y +$a_{1,1}$. x

For i=2, j=0, 1.2 ,=$a_{2,0}\, x^0 . y^{2-0} + a_{2,1}\ x^1 . y^{2-1} + a_{2,2}\, x^2 . y^{2-2}$,= $a_{2,0}$ 1. y^2 +$a_{2,1}$ x.y +$a_{2,2} x^2 y^0$,=$a_{2,0}\, y^2$ +$a_{2,1}$ xy +$a_{2,2}\, x^2$

For i=n, j= 0…………n

=$a_{n,0}\, y^n$ +$a_{n,1}\, x^{n-1}\, y^{n-1}$ …………..$x_{n,n}\, x^n$

Similarly g_s^n (x,y)= $\sum_{i=0}^{n} \sum_{j=0}^{i} b_{i,j}\, x^j\, y^{i-j}$

For i=0, j=0 = $b_{0,0}\ x^0 . y^{0-0} = b_{0,0}$

For i=1, j= 0, 1

=$b_{1,0}\ x^0 . y^{1-0} + b_{1,1}\, x^1 . y^{1-1} = b_{1,0}$ .y + $b_{1,1}$. x

For i=2, j=0, 1, 2

=$b_{2,0}\, x^0 . y^{2-0} + b_{2,1}\, x^1 . y^{2-1} + b_{2,2}\, x^2 . y^{2-2} = b_{2,0} \cdot y^2 + b_{2,1}$ x y+ $b_{2,2}\ x^2$

Similarly for i=n, j=0 …….n

=$b_{n,0} \cdot y^n + b_{n,n-1}\ x^{n-1} . y^{n-1}$ ………… $b_{n,n}\, x^n$.

Now this coefficient can be expressed as matrix

$g_c^n(x, y) = x^T . a$ & $g_s^n(x, y) = x^T .b$

Where a & b n×n matrix, these $a_{i,j}$ Coefficient Matrix
J= 0………………………………..i(n) J=0……………………………..…i(n)

$$\begin{matrix} i=0 \\ i=1 \\ i=2 \\ \vdots \\ i= \end{matrix} \begin{bmatrix} b_{0,0} & 0 & 0 & 0 & \cdots & 0 \\ b_{1,0} & b_{1,1} & 0 & 0 & \cdots & 0 \\ b_{2,0} & b_{2,1} & b_{2,2} & 0 & \cdots & 0 \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ b_{n,0} & b_{n,1} & .. & .. & .. & b_{n,n} \end{bmatrix} \quad \begin{matrix} i=0 \\ i=1 \\ i=2 \\ \vdots \\ i=n \end{matrix} \begin{bmatrix} a_{0,0} & 0 & 0 & 0 & \cdots & 0 \\ a_{1,0} & a_{1,1} & 0 & 0 & \cdots & 0 \\ a_{2,0} & a_{2,1} & a_{2,2} & 0 & \cdots & 0 \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ a_{n,0} & a_{n,1} & .. & .. & .. & a_{n,n} \end{bmatrix}$$

Same for b_{ij} coefficient

g_c^n (x,y) = Cos 2 θ (x,y)…………..(1)

∵ g_c^n (x,y) = Sin 2 θ (x,y)……………(2)

Dividing both the Equation –

$\frac{\ddot{g}_{s(x,y)}}{\hat{g}_{c(x,y)}} = \tan 2\theta(x, y)$ $2\theta(x, y) = \tan^{-1} \frac{\ddot{g}_{s(x,y)}}{\hat{g}_{c(x,y)}}$

$\theta(x, y) = \frac{1}{2} \tan^{-1} \frac{\ddot{g}_{s(x,y)}}{\hat{g}_{c(x,y)}}$ ………….(3) Where $\hat{g}_c(x,y) = x^T \hat{a}$ and $\hat{g}_s(x,y) = x^T \hat{b}$

Finally above given orientation field approximated by the pronominal model.[17]

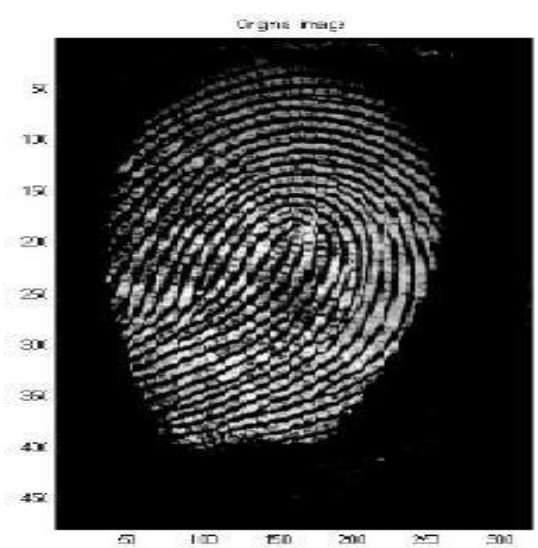


Figure 3. Original images

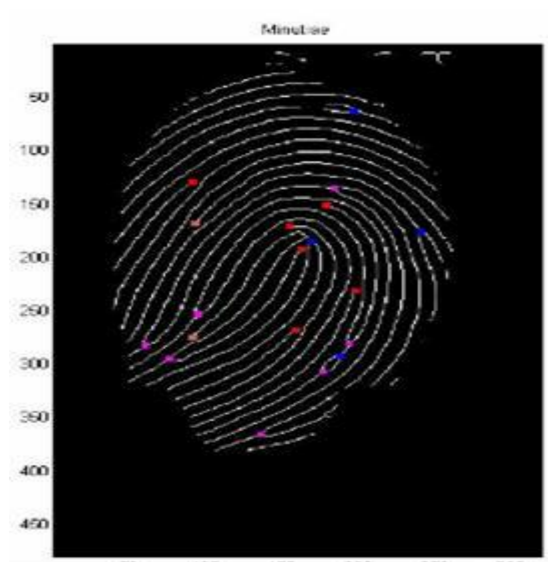


Figure 4. Original images with minutiae

IV. MINUTIAE ALIGMENT

The set of minutia points of 2two fingerprint images to be tested, we perform Minutiae Matching to check whether they belong to the same person or not and also define the how many percentage are matched between two fingerprint any human. Two images have minutiae I_1 ,I_2.

$I_1 = (m_1,m_2,m_3 \ldots\ldots m_M)$ where $m_i=(x_i,y_i,\Theta_i)$

$I_2 = (m'_1,m'_2,m'_3 \ldots\ldots m'_M)$ where $m'_i=(x'_i,y'_i,\Theta'_i)$

Now we choose one minutia from each set to find the ridge correlation factor between them. The ridge associated with each minutia is represented as a series of x-coordinates (x_1, $x_2 \ldots x_n$) of the points on the ridge Let mm(.) be an indicator function that returns 1 in the case where the minutiae m_i and m_j match according to above equations.

$$mm(m_i,m_j)=\begin{cases}1, & sd(m_i,m_j) \le r_0 \text{ and } dd(m_i,m_j) \le \theta_0 \\ 0, & otherwise\end{cases}$$

Now the total number of matched minutiae pair given by, num (matched minutiae) $= \sum mm(m_i,m_j)$ and final match score is given by,

$$\text{Match Score} = \frac{num\ (matched\ minutiae)}{\max(num\ of\ minutiae\ in\ I_1,I_2)}$$

$$S=\sqrt{\frac{\sum_{i=0}^{m} x_i X_i}{\sum_{i=0}^{m} x_i^2 X_i^2}}$$

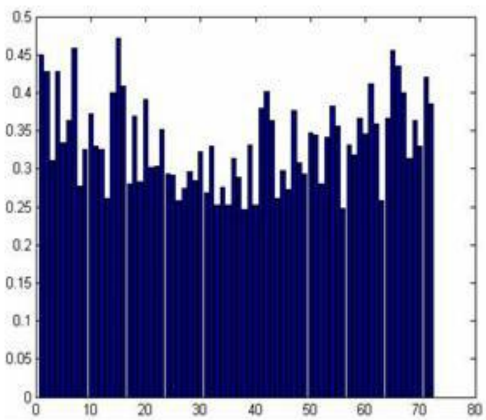
$$\begin{pmatrix} xi\_new \\ yi\_new \\ \theta i\_new \end{pmatrix} = \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} xi - x \\ yi - y \\ \theta i - \theta \end{bmatrix}$$

Where ($x_i.x_n$) and ($X_i..X_n$) are the set of x-coordinates for each of the 2 minutia chosen. And m is minimal one of the x, y, θ n and N value Let M (x, y, θ) be reference minutia found from step 1(say from I_1). For each fingerprint, $xi\ yi\ \theta i$ translate and rotate all other minutiae (x_i, y_i, θ) with respect to the M according to the following formula: The new coordinate system is originated at reference minutia M and the new x-axis is coincident with the direction of minutia
M. so get transformed sets of minutiae I_1’ & I_2’.

III. EXPERIMENT AND RESULT DISCUSSION

Two type of data base taken, fist one directly published database FVC2002 (Fingerprint Verification Competition 2002[19]. And second one I create data base with the help of fingerprint scanner (fig 6). I was taken all fingerprint of person i.e. the Fingerprint sample of each person, and compared with published data base FCV2002. And find out the Marching score between create data base and published data base, also define the threshold level 0.48 this level may be change or not. Using the proposed algorithms with MATLAB Tool directly fiend out matched Score.in the table -1 shown matching scores between published data and database taken by the scanner. Name of the images like a 101_1 for first 101_2 images of second fingerprint goes to101_10. Same as second person have 102_2 images of second person fist fingerprint.

In the table-2, find out the matching score published data FCV2002 in this case the compare the fingerprint to all 72 images i.e. I have select 101_1 images and its compare the all 72 images and find the minutiae and matching score. Same as the 101_2 compare to all 72 images and find the matching score .one thing important when 101_1 already in the data base than compare also means matching score will be 100%. Otherwise according to above threshold level 0.48 will matched images. In this graph shown the matching finger of finger101_10. Min. matching scores .02462 and max. Matching finger is 0.4715.



No. of fingerprint sample →

Figure 5. Shown the matching graph of finger 101_10

Figure 6. Sample taken by fingerprint scanner

REFERNCES

[1]Woong-silk Kim, "A multistage fingerprint recognition method for payment verification system."*International journal of security and its applications* vol.no.2, pp.335-365, 2013.

[2] Ru Zhov, Dexing Z hong & Han, "fingerprint Identification Using SIFT based Minutia Descriptions And Improved All Descriptor –pair matching*''www.mdpi.com/journal/sensors*,ISSN 1424-8220, Sensors2013.

[3] J. Zhou and J. Gu, "A Model-Based Method for the Computation of Fingerprints' Orientation Field," *IEEE Trans. Image Processing ,vol*. 13, no. 6, pp. 821-835, 2004.

[4] S. Huckemann, T. Hotz, and A. Munk, "Global Models for the Orientation Field of Fingerprints: An Approach Based on Quadratic Differentials," *IEEE Trans. Pattern Analysis and Machine Intelligence*, vol. 30, no. 9, pp. 1507-1519, Sept. 2008.

[5] Y. Wang and J. Hu, "Global Ridge Orientation Modeling for Partial Fingerprint Identification," *IEEE Trans. Pattern Analysis and Machine Intelligenc*e, vol. 33, no. 1, pp. 72-87, Jan. 2010.

[6] R. Cappelli, D. Maio, and D. Maltoni, "Multi space KL for Pattern Representation and Classification," *IEEE Trans. Pattern Analysis and Machine Intelligence*, vol. 23, no. 9, pp. 977-996, Sept. 2001.

[7] J. Li and Y. Yau, "Prediction of Fingerprint Orientation," *Proc. Int'lConf. Pattern Recognition*, vol. 4, pp. 436- 439, Aug. 2004.

[8] B. Sherlock, D. Monro, and K. Millard, "Fingerprint Enhancement by Directional Fourier Filtering," *Proc. IEE Vision, Image, and Signal Processing*, vol. 141, no. 2, pp. 87-94, Apr. 1994.

[9] P. Vizcaya and L. Gerhardt, “A Nonlinear Orientation Model for Global Description of Fingerprints, *“Pattern Recognition*, vol. 29, no. 7, pp. 1221-1231, 1996.

[10] S. Dass, “Markov Random Field Models for Directional Field and Singularity Extraction in Fingerprint Images,” *IEEE Trans. Image Processing*, vol. 13, no. 10, pp. 1358-1367, 2004.

[11] J. Zhou and J. Gu, “A Model-Based Method for the Computation of Fingerprints Orientation Field,” *IEEE Trans. Image Processing*, vol. 13, no. 6, pp. 821-835, June 2004.

[12] A. Rao and R. Jain, “Computerized Flow Field Analysis: Oriented Texture Fields,” *IEEE Trans. Pattern Analysis and Machine Intelligence*, vol. 14, no. 7, pp. 693-709, July 1992.

[13] R. Ford and R. Strickland, “Nonlinear Phase Portrait Models for Oriented Textures,” Proc. IEEE Conf. Computer Vision and Pattern Recognition, pp. 644-645, Jun. 1993.

[14] W. Yau, J. Li, and H. Wang, “Nonlinear Phase Portrait Modeling of Fingerprint Orientation,” *Proc. IEE Control, Automation, Robotics and Vision Conf.*, vol. 2, pp. 1262-1267, Dec. 2004.

[15] R. Gonzalez and R. Woods, Digital Image Processing. Prentice Hall, 2001.

[16] W. Press, S. Teukolsky, W. Vetterling, and B. Flannery, Numerical Recipes in C: The Art of Scientific Computing. Cambridge Univ. Press, 1992.

[17] W. Menke, Geophysical Data Analysis: Discrete Inverse Theory. Academic Press, Inc., 1984.

[18] M. Deal and G. Nolet, “Nullspace Shuttles,” Geophysical J. Int’l, vol. 124, no. 2, pp. 372-380, 1996.

[19] R. Cappelli, A. Lumini, D. Maio, and D. Maltoni, “Fingerprint Image Reconstruction from Standard Templates*,” IEEE Trans.Pattern Analysis and Machine Intelligence*, vol. 29, no. 9, pp. 1489-1503, Sept. 2007.

Table -1309 Experiment

FINGER PRINT MATCHING SCORE >0.48										
S.N./IMAGE	**101_1**	**101_2**	**101_3**	**101_4**	**101_5**	**101_6**	**101_7**	**101_8**	**101_9**	**101_10**
1	0.314347	0.261116	0.24535	0.284268	0.195646	0.296908	0.252262	0.251478	0.361873	0.449977
2	0.380693	0.316228	0.297133	0.344265	0.23694	0.314627	0.261861	0.304555	0.318728	0.428174
3	0.30443	0.234146	0.26401	0.344124	0.263158	0.319489	0.349005	0.236779	0.283197	0.311272
4	0.353919	0.267261	0.215249	0.327327	0.350438	0.303895	0.258199	0.321745	0.404061	0.427669
5	0.466252	0.322749	0.311925	0.368932	0.290191	0.275241	0.267261	0.279751	0.341565	0.333712
6	0.328551	0.303239	0.274753	0.309492	0.255609	0.290929	0.376659	0.301172	0.372494	0.36393
7	0.299067	0.241523	0.250097	0.253546	0.271448	0.26482	0.228571	0.2243	0.286902	0.458682
8	0.300965	0.25	0.234905	0.238145	0.234146	0.284268	0.345033	0.331061	0.31497	0.276956
9	0.273009	0.220479	0.304408	0.257172	0.212398	0.295468	0.234738	0.227508	0.261905	0.325669
10	0.266632	0.268462	0.324324	0.383598	0.226294	0.286182	0.250097	0.242393	0.27904	0.371761
11	0.28957	0.267261	0.322873	0.363696	0.300376	0.227921	0.33197	0.257396	0.269374	0.328976
12	0.291295	0.256632	0.265742	0.299342	0.247226	0.312653	0.242871	0.238332	0.304851	0.324918
13	0.29794	0.294628	0.332205	0.240563	0.19868	0.201008	0.29277	0.212814	0.222718	0.261116
14	0.253292	0.28691	0.282423	0.312348	0.214972	0.244677	0.29038	0.299345	0.265079	0.400249
15	0.276694	0.255377	0.308516	0.347524	0.239182	0.290382	0.352454	0.276694	0.321745	0.471521
16	0.307438	0.255377	0.308516	0.382276	0.334855	0.254084	0.246718	0.24595	0.28957	0.408651
17	0.2243	0.241523	0.277885	0.253546	0.23267	0.294245	0.228571	0.249222	0.312984	0.280306
18	0.240772	0.208333	0.268462	0.340207	0.234146	0.248734	0.276026	0.240772	0.31497	0.369274
19	0.276694	0.29794	0.239957	0.382276	0.382692	0.290382	0.281963	0.24595	0.28957	0.282913
20	0.29794	0.235702	0.189832	0.336788	0.331133	0.301511	0.243975	0.212814	0.267261	0.391675
21	0.265396	0.244949	0.263038	0.266667	0.229416	0.348155	0.202837	0.265396	0.246885	0.301511
22	0.242272	0.260875	0.210105	0.213003	0.209427	0.254257	0.246885	0.242272	0.253546	0.302765
23	0.238332	0.219971	0.265742	0.269408	0.28843	0.250122	0.27323	0.238332	0.277137	0.351995
24	0.321839	0.297044	0.358854	0.323381	0.222566	0.29554	0.245976	0.286079	0.299392	0.292509
25	0.266485	0.237171	0.233462	0.258199	0.207322	0.247207	0.24004	0.247451	0.258966	0.291937
26	0.232321	0.18762	0.237453	0.262613	0.180743	0.251433	0.221948	0.232321	0.222871	0.257337
27	0.268398	0.257248	0.207184	0.23338	0.192748	0.292509	0.236691	0.20646	0.237675	0.27443
28	0.244505	0.246183	0.223057	0.276385	0.172929	0.262432	0.305788	0.28896	0.302407	0.295455
29	0.252861	0.245049	0.253748	0.285831	0.196722	0.268687	0.20292	0.202289	0.264628	0.284398
30	0.236433	0.218218	0.241656	0.222718	0.183942	0.279145	0.271052	0.275839	0.247436	0.322329
31	0.262472	0.218026	0.195106	0.276916	0.190586	0.26857	0.280844	0.262472	0.256374	0.268371
32	0.322599	0.267971	0.215821	0.267419	0.234246	0.27931	0.246557	0.236573	0.292597	0.32985
33	0.202362	0.2179	0.250706	0.254164	0.209913	0.265466	0.206216	0.224847	0.211779	0.25289
34	0.224847	0.186772	0.200565	0.228748	0.209913	0.212373	0.180439	0.157393	0.23531	0.27588
35	0.179878	0.186772	0.200565	0.177915	0.244899	0.15928	0.180439	0.224847	0.211779	0.25289
36	0.222911	0.270031	0.279616	0.220479	0.173422	0.263181	0.223607	0.222911	0.291606	0.313392
37	0.256664	0.284268	0.286182	0.261116	0.199681	0.333333	0.235396	0.230997	0.268608	0.288675
38	0.270868	0.208333	0.167789	0.204124	0.280976	0.213201	0.20702	0.210675	0.220479	0.246183
39	0.323989	0.241523	0.250097	0.253546	0.193892	0.323669	0.2	0.199378	0.286902	0.331271
40	0.273793	0.265334	0.274753	0.216645	0.213007	0.258603	0.251106	0.219034	0.372494	0.251952
41	0.433566	0.37158	0.322286	0.396746	0.289122	0.292509	0.378705	0.330336	0.345709	0.37998
42	0.371628	0.285831	0.299266	0.396746	0.289122	0.292509	0.331367	0.330336	0.324102	0.40109
43	0.413758	0.272772	0.329531	0.334077	0.275913	0.302407	0.316228	0.315244	0.288675	0.36262
44	0.312127	0.274986	0.316386	0.3849	0.220755	0.234509	0.35783	0.340503	0.326653	0.261116
45	0.242393	0.268462	0.378378	0.328798	0.226294	0.228946	0.361251	0.36359	0.304408	0.297409
46	0.266632	0.234905	0.324324	0.410997	0.26401	0.286182	0.361251	0.315111	0.329775	0.272625
47	0.460531	0.350667	0.333773	0.312348	0.322458	0.326236	0.369575	0.299345	0.38557	0.376705
48	0.410689	0.303239	0.335809	0.464238	0.340811	0.35558	0.376659	0.301172	0.372494	0.307941
49	0.312772	0.252591	0.261557	0.353553	0.283887	0.338502	0.328688	0.260643	0.30005	0.293151
50	0.266632	0.268462	0.324324	0.356198	0.301726	0.3148	0.444616	0.387829	0.329775	0.346977
51	0.269816	0.311286	0.325918	0.279581	0.279885	0.292013	0.25777	0.269816	0.282372	0.34485
52	0.252758	0.204124	0.281827	0.285714	0.229416	0.223814	0.362209	0.252758	0.33065	0.279975
53	0.306503	0.231455	0.248548	0.283473	0.216777	0.263181	0.223607	0.250775	0.291606	0.341882
54	0.249222	0.172516	0.250097	0.422577	0.23267	0.353094	0.314286	0.323989	0.365148	0.382235
55	0.369565	0.210675	0.242393	0.221163	0.202953	0.307996	0.274145	0.23913	0.318511	0.355643
56	0.266632	0.234905	0.27027	0.410997	0.226294	0.257564	0.333462	0.266632	0.304408	0.247841
57	0.324232	0.249377	0.301268	0.325785	0.224221	0.255204	0.247805	0.252181	0.263916	0.331519
58	0.329183	0.253185	0.285477	0.289414	0.227644	0.237508	0.272554	0.274319	0.287085	0.317882
59	0.264292	0.235219	0.273639	0.277413	0.234989	0.289749	0.302991	0.245414	0.237078	0.366743
60	0.278335	0.220193	0.310346	0.26968	0.185606	0.234726	0.205129	0.238573	0.270481	0.345574
61	0.383906	0.318896	0.299641	0.260378	0.298674	0.271956	0.242065	0.28793	0.301329	0.412161
62	0.300501	0.300463	0.279218	0.320812	0.285738	0.236525	0.287085	0.250418	0.279543	0.358464
63	0.270194	0.274315	0.321353	0.285062	0.280276	0.297738	0.309756	0.234168	0.245065	0.257848
64	0.375479	0.272291	0.358854	0.323381	0.222566	0.27443	0.30747	0.286079	0.261968	0.365636
65	0.278639	0.308607	0.372822	0.31497	0.260133	0.394771	0.351382	0.390095	0.379088	0.455842
66	0.283752	0.274986	0.253109	0.288675	0.264906	0.469018	0.3253	0.340503	0.326653	0.435194
67	0.286707	0.288675	0.319681	0.353553	0.243332	0.307729	0.328688	0.3649	0.381881	0.399751
68	0.250775	0.270031	0.279616	0.377964	0.260133	0.230283	0.287494	0.334367	0.349927	0.313392
69	0.328551	0.341144	0.305281	0.309492	0.29821	0.323254	0.345271	0.328551	0.343841	0.36393
70	0.323029	0.372678	0.390195	0.334719	0.251312	0.286039	0.246885	0.323029	0.338062	0.330289
71	0.355931	0.227429	0.305281	0.278543	0.213007	0.290929	0.313882	0.301172	0.315188	0.419919
72	0.29611	0.260875	0.30015	0.334719	0.293198	0.286039	0.308607	0.29611	0.450749	0.385337

FINGER PRINT MATCHING SCORE >0.48

S.N./I	101_1	101_2	101_3	101_4	101_5	101_6	101_7	101_8	102_1	102_2	102_3	102_4	102_5	102_6	102_7	102_18
1	1	0.825723	0.684762	0.88396	0.6742	0.712627	0.5766	0.73983	0.230283	0.2804	0.232621	0.268044	0.192847	0.266371	0.222277	0.266733
2	0.770675	1	0.710819	0.788811	0.653197	0.623302	0.567367	0.632456	0.239046	0.212238	0.281718	0.231869	0.23355	0.241943	0.269191	0.215353
3	0.684762	0.770054	1	0.600751	0.580381	0.553819	0.426562	0.796098	0.247797	0.188579	0.250313	0.206021	0.138343	0.214972	0.239182	0.239182
4	0.88396	0.788811	0.600751	1	0.621059	0.486265	0.66394	0.668153	0.235702	0.215249	0.285714	0.274352	0.197386	0.306719	0.273009	0.227508
5	0.6742	0.653197	0.580381	0.690066	1	0.29361	0.427618	0.516398	0.243975	0.20795	0.276026	0.227185	0.190693	0.246932	0.263752	0.263752
6	0.712627	0.623302	0.553819	0.526787	0.352332	1	0.659153	0.606478	0.343841	0.274753	0.243132	0.300167	0.223957	0.37701	0.348481	0.309761
7	0.5766	0.567367	0.426562	0.66394	0.427618	0.659153	1	0.448543	0.26082	0.222308	0.221313	0.242871	0.203859	0.263982	0.281963	0.211472
8	0.73983	0.68516	0.749269	0.668153	0.516398	0.568574	0.448543	1	0.220479	0.234905	0.222718	0.219971	0.184637	0.318788	0.212814	0.212814
9	0.197386	0.199205	0.212398	0.235702	0.243975	0.257881	0.26082	0.220479	1	0.710285	0.538748	0.665129	0.325669	0.674748	0.546966	0.482617
10	0.24535	0.212238	0.188579	0.251124	0.20795	0.244225	0.222308	0.201347	0.710285	1	0.573997	0.738173	0.446113	0.744569	0.617032	0.685591
11	0.232621	0.281718	0.250313	0.238095	0.20702	0.243132	0.221313	0.222718	0.538748	0.609872	1	0.705476	0.526361	0.511199	0.682524	0.773527
12	0.229752	0.231869	0.164817	0.235159	0.227185	0.266815	0.242871	0.219971	0.720556	0.797227	0.705476	1	0.433224	0.813439	0.749006	0.561754
13	0.246183	0.149071	0.19868	0.188982	0.182574	0.268028	0.19518	0.235702	0.311805	0.427121	0.503953	0.414781	1	0.270501	0.300965	0.541736
14	0.199778	0.201619	0.179144	0.238559	0.296319	0.290007	0.263982	0.255031	0.626552	0.69322	0.477119	0.701241	0.235441	1	0.716419	0.455903
15	0.266733	0.269191	0.239182	0.273009	0.263752	0.348481	0.246718	0.212814	0.546966	0.651312	0.682524	0.749006	0.377217	0.781548	1	0.565217
16	0.222277	0.215353	0.239182	0.227508	0.197814	0.232321	0.211472	0.212814	0.546966	0.685591	0.773527	0.524304	0.565825	0.488467	0.608696	1
17	0.180187	0.261861	0.23267	0.221313	0.267261	0.251106	0.257143	0.20702	0.312984	0.250097	0.184428	0.242871	0.152894	0.263982	0.246718	0.246718
18	0.217597	0.263523	0.280976	0.267261	0.322749	0.303239	0.31053	0.208333	0.409462	0.335578	0.222718	0.366618	0.184637	0.318788	0.29794	0.255377
19	0.266733	0.269191	0.239182	0.318511	0.263752	0.309761	0.211472	0.255377	0.225221	0.205677	0.227508	0.187251	0.188608	0.227951	0.26087	0.217391
20	0.307729	0.298142	0.264906	0.251976	0.273861	0.375239	0.29277	0.235702	0.489979	0.284747	0.251976	0.414781	0.261116	0.270501	0.240772	0.300965
21	0.298481	0.258199	0.229416	0.261861	0.252982	0.371391	0.270449	0.285774	0.216025	0.230159	0.261861	0.251447	0.241209	0.343582	0.333623	0.333623
22	0.194625	0.235702	0.209427	0.278887	0.23094	0.237322	0.277746	0.186339	0.225374	0.210105	0.239046	0.26233	0.220193	0.228106	0.228416	0.190347
23	0.229752	0.231869	0.247226	0.274352	0.283981	0.300167	0.27323	0.219971	0.387992	0.324796	0.195965	0.258065	0.162459	0.280496	0.262152	0.262152
24	0.310253	0.375735	0.278207	0.317554	0.306786	0.270226	0.245976	0.247537	0.224544	0.199363	0.211702	0.261364	0.219382	0.227266	0.252861	0.202289
25	0.247717	0.333333	0.207322	0.225374	0.204124	0.263705	0.24004	0.237171	0.318728	0.233462	0.253546	0.231869	0.194625	0.302429	0.242272	0.242272
26	0.223957	0.271225	0.180743	0.229227	0.249136	0.341362	0.244143	0.214423	0.243132	0.237453	0.200574	0.21225	0.237542	0.287093	0.191655	0.191655
27	0.238833	0.289241	0.192748	0.27501	0.221404	0.260025	0.213021	0.314414	0.280888	0.230205	0.18334	0.226348	0.2111	0.349899	0.233583	0.233583
28	0.25713	0.23355	0.207514	0.296078	0.238366	0.251952	0.203859	0.21541	0.232621	0.322193	0.197386	0.324918	0.181818	0.423793	0.314347	0.220043
29	0.255945	0.309965	0.196722	0.261968	0.21693	0.286618	0.20292	0.210042	0.211702	0.225554	0.224544	0.215614	0.206835	0.214269	0.21456	0.1788
30	0.256411	0.241523	0.275913	0.262445	0.211289	0.27296	0.248465	0.30005	0.226816	0.241656	0.262445	0.192006	0.201456	0.292174	0.222911	0.306503
31	0.202418	0.214498	0.190586	0.207182	0.187647	0.308532	0.240723	0.193801	0.292999	0.214616	0.181284	0.191837	0.178914	0.296551	0.197969	0.197969
32	0.279887	0.33896	0.167319	0.190982	0.276759	0.297951	0.295868	0.178647	0.337612	0.215821	0.190982	0.209585	0.17592	0.296144	0.24332	0.212905
33	0.195077	0.23625	0.209913	0.16639	0.289346	0.198228	0.231993	0.186772	0.400028	0.225635	0.199667	0.246506	0.18392	0.214346	0.222587	0.222587
34	0.195077	0.196875	0.174928	0.199667	0.241121	0.198228	0.231993	0.186772	0.44709	0.225635	0.232945	0.273896	0.18392	0.261979	0.190789	0.222587
35	0.195077	0.196875	0.174928	0.199667	0.289346	0.198228	0.25777	0.186772	0.44709	0.250706	0.232945	0.301285	0.13794	0.261979	0.190789	0.222587
36	0.201456	0.243975	0.260133	0.206197	0.298807	0.245652	0.223607	0.192879	0.349927	0.248548	0.247436	0.271538	0.170941	0.236113	0.236433	0.236433
37	0.296908	0.314627	0.199681	0.303895	0.220193	0.258603	0.235396	0.213201	0.295468	0.3148	0.265908	0.281387	0.314918	0.326236	0.362977	0.326679
38	0.174078	0.210819	0.234146	0.222718	0.322749	0.303239	0.276026	0.208333	0.440959	0.234905	0.222718	0.329956	0.184637	0.28691	0.212814	0.212814
39	0.180187	0.174574	0.193892	0.258199	0.213809	0.219718	0.257143	0.20702	0.286902	0.305674	0.295084	0.27323	0.254824	0.29038	0.281963	0.281963
40	0.316723	0.52741	0.213007	0.283654	0.29361	0.344828	0.219718	0.189525	0.343841	0.274753	0.324176	0.300167	0.279946	0.290007	0.271041	0.232321
41	0.298541	0.289241	0.256997	0.397236	0.309965	0.286028	0.307698	0.228665	0.324102	0.368327	0.305566	0.326947	0.25332	0.371768	0.321176	0.291979
42	0.268687	0.253086	0.256997	0.305566	0.221404	0.286028	0.307698	0.285831	0.345709	0.345307	0.27501	0.301797	0.25332	0.349899	0.291979	0.262781
43	0.284901	0.31053	0.30657	0.262445	0.253546	0.27296	0.29364	0.327327	0.309295	0.263625	0.233285	0.216007	0.161165	0.271305	0.250775	0.222911
44	0.287213	0.298142	0.264906	0.251976	0.243432	0.321634	0.22771	0.235702	0.267261	0.284747	0.251976	0.241955	0.174078	0.300557	0.2809	0.240772
45	0.2804	0.297133	0.26401	0.251124	0.259938	0.274753	0.250097	0.268462	0.355142	0.27027	0.215249	0.265742	0.198273	0.282423	0.239957	0.274236
46	0.31545	0.254686	0.226294	0.286998	0.20795	0.366338	0.250097	0.268462	0.304408	0.27027	0.179374	0.236215	0.198273	0.282423	0.274236	0.274236
47	0.299667	0.282267	0.28663	0.272639	0.296319	0.232006	0.263982	0.255031	0.38557	0.385122	0.272639	0.364645	0.235441	0.390244	0.325645	0.260516
48	0.316723	0.287678	0.255609	0.324176	0.29361	0.275862	0.282494	0.265334	0.372494	0.335809	0.324176	0.333519	0.167968	0.319008	0.348481	0.309761
49	0.301511	0.273861	0.283887	0.308607	0.279508	0.262613	0.239046	0.216506	0.354604	0.348743	0.270031	0.381	0.159901	0.358902	0.442326	0.294884
50	0.31545	0.254686	0.26401	0.322873	0.311925	0.335809	0.305674	0.234905	0.304408	0.324324	0.251124	0.354323	0.198273	0.333773	0.342796	0.274236
51	0.292615	0.275625	0.209913	0.299501	0.241121	0.283183	0.25777	0.2179	0.352966	0.250706	0.232945	0.273896	0.13794	0.285795	0.286183	0.286183
52	0.304572	0.258199	0.229416	0.280566	0.225877	0.318335	0.313914	0.233285	0.39678	0.281827	0.218218	0.282237	0.129219	0.312348	0.297878	0.238302
53	0.322329	0.341565	0.216777	0.288675	0.239046	0.245652	0.223607	0.231455	0.233285	0.248548	0.206197	0.237595	0.170941	0.265627	0.236433	0.236433
54	0.252262	0.261861	0.23267	0.295084	0.213809	0.313882	0.314286	0.241523	0.312984	0.389039	0.258199	0.333947	0.152894	0.395973	0.317208	0.246718
55	0.220043	0.266485	0.202953	0.225221	0.186501	0.246414	0.249222	0.210675	0.250259	0.266632	0.28957	0.264814	0.177822	0.276319	0.307438	0.24595
56	0.2804	0.254686	0.301726	0.286998	0.311925	0.335809	0.305674	0.234905	0.304408	0.351351	0.215249	0.324796	0.148704	0.359447	0.377075	0.308516
57	0.286513	0.283896	0.196193	0.239936	0.2318	0.272236	0.247805	0.174564	0.282767	0.261099	0.319915	0.219423	0.257848	0.343434	0.229267	0.254741
58	0.264443	0.288231	0.2561	0.243599	0.235339	0.299425	0.272554	0.227866	0.287085	0.265085	0.297733	0.334159	0.261785	0.251823	0.25863	0.284493
59	0.245678	0.231413	0.176242	0.22352	0.242933	0.261534	0.238064	0.209083	0.276591	0.25259	0.279399	0.229961	0.270232	0.29994	0.240278	0.293673
60	0.201236	0.278524	0.216541	0.26482	0.213201	0.225352	0.296297	0.192669	0.228869	0.266011	0.26482	0.217962	0.243935	0.27376	0.196813	0.224929
61	0.222051	0.268917	0.268806	0.198867	0.247016	0.26593	0.264071	0.186023	0.220974	0.235432	0.340915	0.303974	0.235521	0.284649	0.298609	0.244316
62	0.241402	0.233882	0.20781	0.2965	0.214834	0.294362	0.287085	0.1849	0.227128	0.223374	0.2965	0.284708	0.238976	0.371347	0.283315	0.259706
63	0.23442	0.220808	0.196193	0.239936	0.193167	0.272236	0.247805	0.199502	0.263916	0.241014	0.213276	0.241365	0.221013	0.305275	0.229267	0.203793
64	0.232689	0.281801	0.222566	0.264628	0.230089	0.247708	0.266474	0.19803	0.28068	0.259172	0.238165	0.304925	0.219382	0.32196	0.252861	0.252861
65	0.241747	0.29277	0.216777	0.247436	0.358569	0.315838	0.255551	0.231455	0.291606	0.248548	0.288675	0.271538	0.284901	0.295141	0.275839	0.236433
66	0.246183	0.298142	0.220755	0.419961	0.243432	0.357371	0.22771	0.235702	0.237566	0.316386	0.20998	0.311086	0.232104	0.360668	0.240772	0.240772
67	0.263822	0.273861	0.202777	0.270031	0.33541	0.328266	0.268926	0.216506	0.272772	0.290619	0.231455	0.28575	0.266501	0.38651	0.258023	0.221163
68	0.282038	0.29277	0.216777	0.206197	0.298807	0.210559	0.223607	0.231455	0.291606	0.279616	0.288675	0.30548	0.227921	0.324655	0.315244	0.315244
69	0.277133	0.287678	0.255609	0.364698	0.234888	0.344828	0.251106	0.265334	0.257881	0.274753	0.243132	0.233463	0.279946	0.435011	0.348481	0.232321
70	0.23355	0.329983	0.251312	0.239046	0.23094	0.271225	0.216025	0.260875	0.253546	0.30015	0.278887	0.360704	0.330289	0.313646	0.342624	0.304555
71	0.277133	0.287678	0.255609	0.364698	0.29361	0.413793	0.313882	0.227429	0.229227	0.274753	0.243132	0.266815	0.223957	0.319008	0.271041	0.271041
72	0.272475	0.282843	0.209427	0.239046	0.34641	0.372935	0.246885	0.260875	0.281718	0.24012	0.278887	0.327913	0.275241	0.370673	0.304555	0.266485