MINUATIAE EXTRACTION BASED MATCHING BETWEEN NORMAL AND ALTERED FINGERPRINT

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ABSTRACT

In this paper, we define the matching score between normal and altered fingerprint and also find the percentage of matching. This paper based on experimental, and create live human fingerprint database and find out the matching score same person, between same finger based on minutiae extraction i.e., calculate minutiae of normal finger and altered same finger, find the matching percentage. The result based on experiment shown 18% average finger matched which is comparison same finger means normal and altered. and highest matching 45% and lowest 10%.

INTRODUCTION

Biometrics system is the science and technology to help identify the individual through physical measurement or behavior. Physical biometrics is involving the measurement of face, fingerprint, iris-scans and hand geometry etc. This is the detection the similarity index between normal and altered finger same person and finger. Fingerprint identification system famous due to accuracy and result is good. Henry Fauld, in 1880, was the first to scientist suggest the fingerprints matching based on observation. In 1888, introduced the minutiae extraction for fingerprint recognition. The fingerprint was made in 1889 by Edward Henry, who established Henery system of fingerprint classification.

The objective of this paper is find out the average matching score normal and altered finger same person and same finger. The whole Analysis based on minutiae Extraction. After using the MATLAB coding find the matching Score two finger (Fig. 1).

PROPOSED ALGORITHM FOR MINUTIAE BASED MATCHING

Altered Type fingerprints other type of fake pattern that is like a silicon or sand. And cut of blade, burn by gas, affected by acid, press by door. In this type of finger minutiae are disturb and pattern of finger will be damage. Its use a security system, border control system, Pattern Recognition between fake and original pattern (Woong-silk, 2013; Subhan and Mankame, 2014; Revathi and Naveena, 2014; Renu, 2014).

Above flow chart define the input data i.e., read image from location. After that histogram of sample finger. Histogram is the process to transform the any images to produce the any change of fundamental of images. Enhancement the next process in this minutiae extraction algorithm Enhance the ridge and valley of the fingerprint any image can change any dimension like one dimension two or three and position of images. Smoothness process defines leaving the any noise of the images. Finally get minutiae and calculate get the image. This is the automatic Matching Score between to finger.

FINGERPRINT AND TERMINOLOGY

Finger print is the feature pattern of the one. Of the

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ridges and furrow an any portion of the images but feature called minutiae (Fig. 2).

Above (Fig. 2). show the Sample of the fingerprint. In this sample have number of minutiae and bifurcation, hole research based on minutiae. Fraction skin that covers the inside surface of the hands fingers bottom of the feet and toes. Friction ridges are elevated strips of skin that be gain in to rows forming ridges. Friction ridges regain to form on the human fetus during the third and fourth months fetal life. Minutiae major feature or characteristics of fingerprint. Three important processes of minutiae extraction i.e., image enhancement, image segmentation and final images extraction. These are important steps of find out the minutiae extraction any type of fingerprint (Nazera and Rostom, 2013; Nilsson and Clasesson, 2013; Parvathi and Saravanan, 2013; Petrovici and Lazar, 2012; Ritu and Matish, 2014; Supriya and Chaitali, 2013).

MINUTIAE ALIGMENT

The two images minutia can find out the given formula, and also define the how many percentage are matched between two fingerprint any human. Two images have minutiae I_1, I_2.

$$I_1 = \{m_1, m_2 ... m_M\} \, where \, m_i = (x_i, y_i, \theta_i)$$
$$I_2 = \{m'_1, m'_2 .... m'_N\} \, where \, m'_i = (x'_i, y'_i, \theta'_i)$$

So this is the important phenomena correlation between ridge and the minutia of fingerprint sample. Assume each of minutiae are expressed as a (x_1, x_2, x_3)
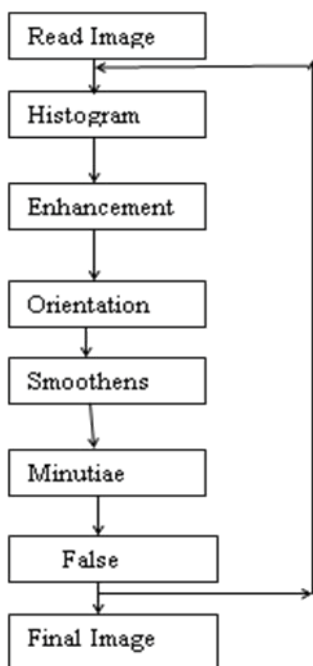

Fig. 1 Algorithm for minutiae based matching.

Fig. 2 Sample of fingerprint.

for x- coordinate. And second one ridge point indicated 1. Where minutiae MM.

$$MM(m_i, m_j) = \begin{cases} 1, sd(m_i, m_j) \leq r_0 \, and \, dd(m_i, m_j) \leq \theta_0 \\ 0, otherwise \end{cases}$$

So, Similarity Index = $\dfrac{num(matched \, minutiae)}{max(num \, of \, minutiae \, in \, I_1, I_2)}$

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

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

The new function is created of based on minutia M and also the direction x gets transformed sets of minutiae I'_1 and I'_2.

RESULTS AND DISCUSSION

Two type of finger taken and find out the matching score with first one normal and second one altered. Matching score based on minutiae of each fingers was create two type of data base Normal and altered after that Find out the Matching Score (Fig. 3 and 4).

Above (Fig. 3 and 4) shown same finger one person with minutiae 101_4 means fourth finger before find the minutiae and after altered we find the minutes. In the normal finger had 45 Minutiae and altered 36.so total Matching percentage 9. Same thing I was 100 sample analyses and reach the result approx. 18%. Finger matched. Some result shown in Table 1.

Above table shows the average matching of every finger normal and altered. According to Table 1 max matching 45% and minimum matching 1% and total matching average 18%. We can say that any type of normal and altered finger matched each other 18%, that are take any type of altered like a burn, Acid affected and other type of any cases (Fig. 5 and 6) (Tom and Arul, 2013; Manisha and Deepa, 2014; Gomathi and Veena, 2013; Zhov, *et al*., 2013; Rahul and Santosh, 2013).

Above both (Fig. 5 and 6) shown the number of minutiae of each finger. Each finger has different minutiae that is 101_2 Normal has 61 and 101_2Altered 52 maximum minutiae and Matching
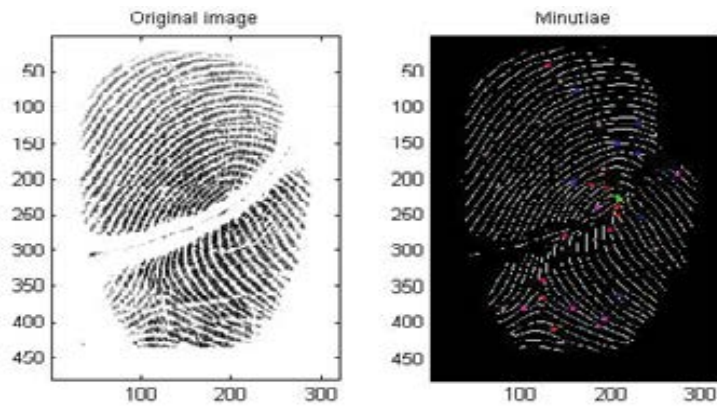

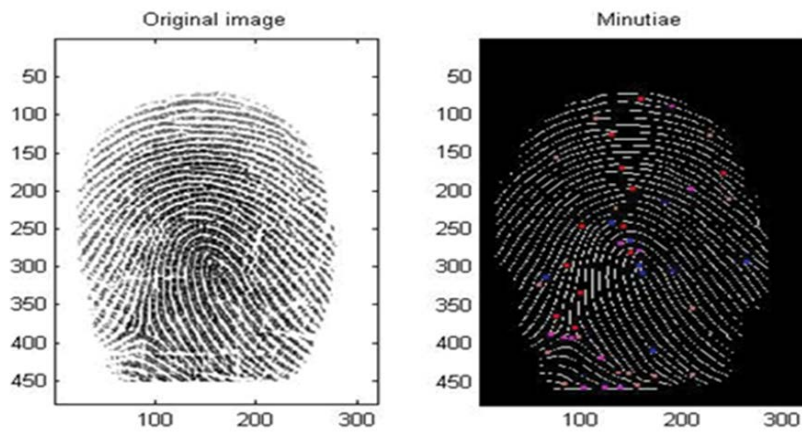**Fig. 3** 101_4 altered fingerprint with minutiae.
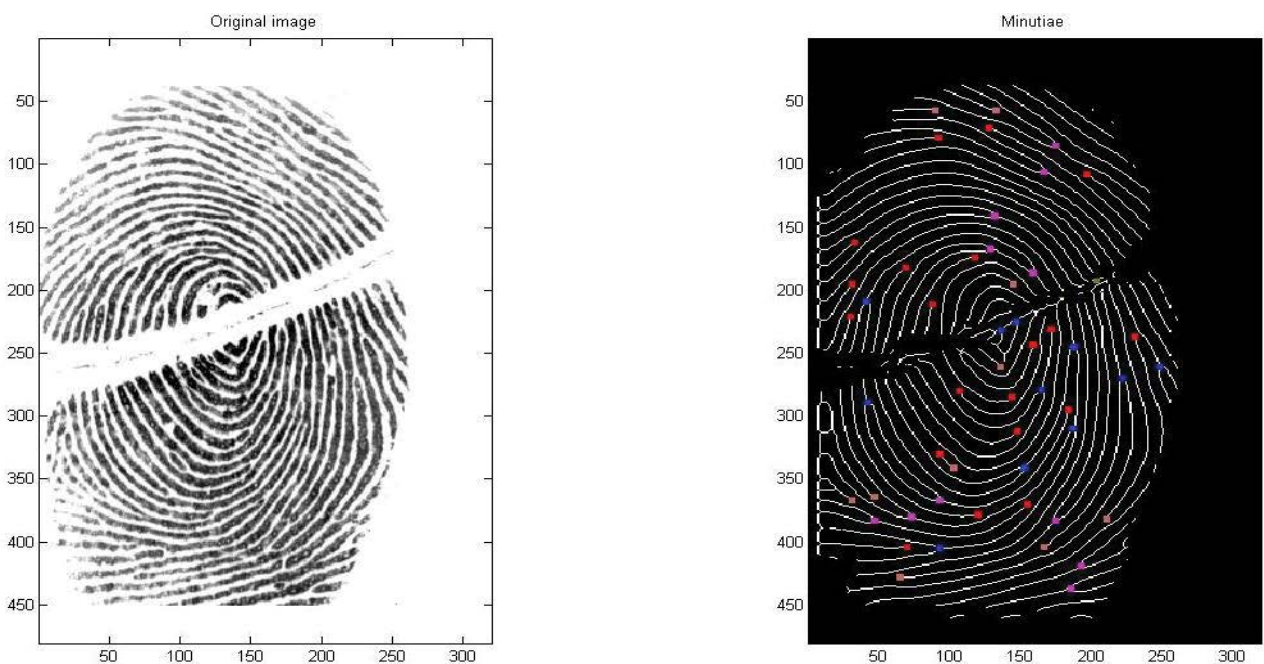

Fig. 4 101_4 normal fingerprint with minutiae.

Fig. 5 Sample of altered fingerprint 101_2A with 52 minutiae.

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Table 1. Percentage of matching normal fingerprint imagi & altered fingerprint images

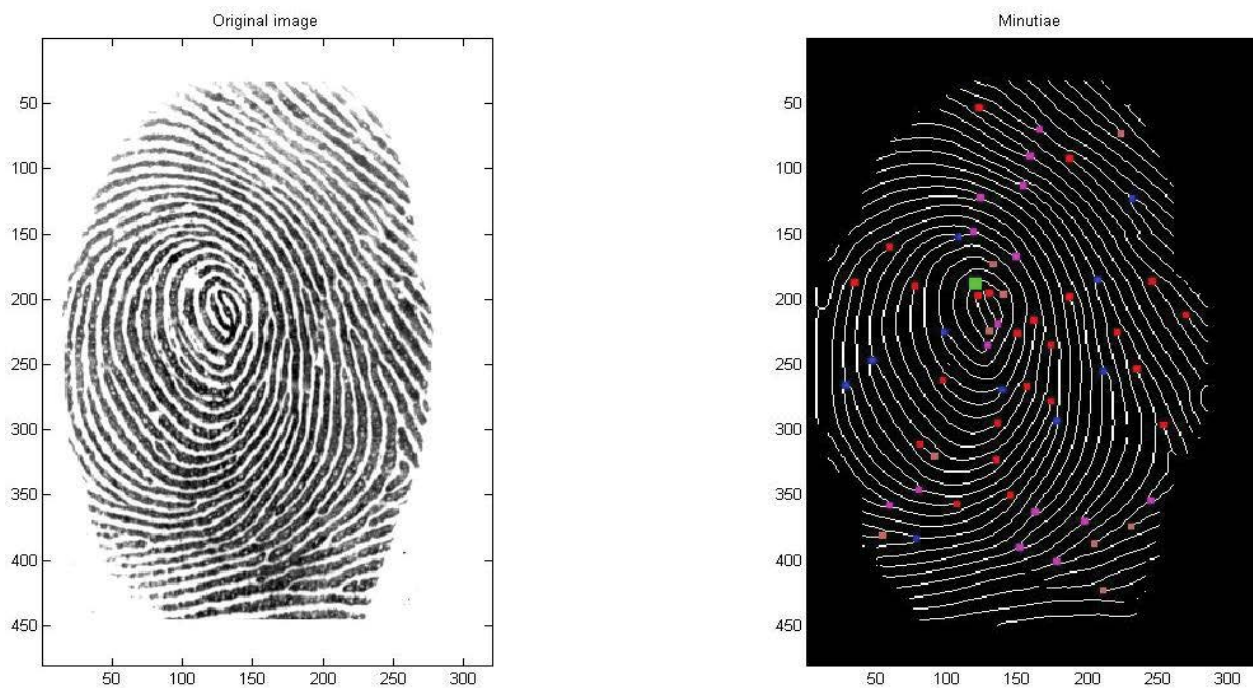| Nomal Manuate	Altered Manuatie	Matched	Matching %	NM	AM	M	%	NM	AM	M	%	NM	AM	M	%	NM	AM	M	%	NM	AM	M	%
X	Y	Z	P	X	Y	Z	P	X	Y	Z	P	X	Y	Z	P	X	Y	Z	P	X	Y	Z	P
53	29	24	45	61	85	24	28	85	75	10	11	75	59	16	21	79	74	5	5	54	56	2	3
54	38	16	29	42	69	27	39	64	78	14	17	41	60	19	31	51	56	5	8	61	52	9	14
40	28	12	22	44	24	20	45	52	88	6	6	54	50	4	7	78	66	12	15	80	77	3	3
45	36	9	20	53	64	11	17	80	81	1	1	57	62	5	8	66	82	16	19	52	37	15	28
115	100	15	13	48	70	22	31	57	62	5	8	54	46	8	14	41	59	18	20	49	56	7	12
41	54	13	24	50	75	25	33	73	63	10	13	66	68	6	8	56	75	19	25	67	54	13	19
42	23	19	45	52	56	4	7	64	53	9	14	57	61	4	6	47	57	10	17	80	89	9	10
47	32	15	31	50	85	35	41	63	56	7	11	48	59	11	18	59	52	7	11	72	69	3	4
43	45	2	4	59	79	20	25	73	77	4	5	48	66	18	27	54	59	5	8	63	75	12	16
38	51	13	25	40	69	29	42	51	65	14	21	58	61	3	5	45	62	17	27	51	59	8	3
AVG.	--	--	25.8	--	--	--	31	--	--	--	11	--	--	--	15	--	--	--	16	--	--	--	12

Fig. 6 Sample of altered fingerprint 101_2N with 61 minutiae.

Percentage of both is 14. And matched Minutiae are 9 (Feng, *et al.*, 2010; Maltoni, *et al.*, 2009).

CONCLUSION

The important conclusion of this research paper is normal and altered fingerprint if same finger average matching score is 18%. That is any finger which is altered from any type and normal finger matched and find the similarity index this used in order security system, military, defense also used this biometrics system.

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