International Journal of Research and Review
www.gkpublication.in E-ISSN: 2349-9788; P-ISSN: 2454-2237

Original Research Article

Biometric Finger Print: Its Authentication and Effectiveness on Health Care Professionals

Sidhart Timsinha[1*], Saurabh Narayan[2**], Suvarna Manjarikar[3*]

[1]Assistant Professor, [2]Assistant Manager, [3]Professor & HOD,
[*]Department of Forensic Medicine, [**]Human Resource Department,
Manipal College of Medical Sciences, Pokhara, Nepal.

Corresponding Author: Sidhart Timsinha

Received: 31/01/2016 *Revised: 06/02/2016* *Accepted: 08/02/2016*

ABSTRACT

Introduction: Biometric identification is accepted as more accurate and less time consuming by various agencies. This has resulted in application of biometric identification in diverse fields, from preparation of nationwide databases to daily attendance taking of employees of governmental and Private sectors. Fingerprint recognition is affected by various physiological factors like age, wear and tear of skin, and technological factors like sensor technologies. The present study is based on employee database registering attendance through biometric means and its effectiveness.
Objective: Biometric identification is not infallible and is prone to non-correctable errors. Wearing down of fingerprint pattern is found to be a major source of errors in registering biometric fingerprint attendance.
Materials and Methods: This is a cross-sectional study undertaken on the employees comprising of teaching, non-teaching staffs and medical officers of a Teaching Hospital of Pokhara, Nepal undergoing biometric verification for purpose of attendance. A total of 805 employees constituted the subjects of this research.
Results: Out of total number of 805 subjects, 11 (1.36%) people had problems registering their attendance through biometric means. Out of these 11 people, 3 (27%) belonged to elderly staff or senior by age category (> 60 years). About 8 (72.7%) were manual workers belonging to various departments like plumbing, sanitation, engineering etc. The occupational wearing down of fingerprint pattern (72.7%) and age related (27.27%) were the most probable cause for non-registering of the attendance by biometric machines.
Conclusion: An important conclusion of the study is that biometric identification is not infallible and is prone to non-correctable errors. Wearing down of fingerprint pattern was found to be a major source of errors in registering biometric fingerprint attendance.

Keywords: Biometrics, Databases, Fingerprint recognition.

INTRODUCTION

The term "biometrics" is derived from the Greek words: "bio" (life) and metrics (to measure). Several techniques and features were used over time to recognize human beings several years before the Birth of Christ. Today this research field has become very much active in many applications such as security applications, multimedia applications, and banking applications. Also, many methods have been developed to strengthened the biometric accuracy and reduce the imposture errors by using several features such as face, speech, iris, finger vein etc. [1]

"Biometric technologies" are automated methods of verifying or recognizing the identity of a living person based on a physiological or behavioral characteristic. [2,3]

Fingerprint recognition is among the most widely used biometric systems. [4] In practice, we often abbreviate the term "biometric authentication" as "biometrics", although the latter term has been historically used to mean the branch of biology that deals with its data statistically and by quantitative analysis. [5]

Determining "true" identity is beyond the scope of any biometric technology. Rather, biometric technology can only link a person to a biometric pattern and any identity data (common name) and personal attributes (age, gender, profession, residence, nationality) presented at the time of enrollment in the system. Biometric systems inherently require no identity data, thus allowing anonymous recognition. [6]

Biometric identifiers include digital fingerprints, retinal scans, hand geometry, facial characteristics, and vocal patterns. Compared to a visual comparison of signatures or photo ID's, biometric identification is less fallible and potentially much faster. This has prompted the use of biometrics for noncriminal governmental and commercial applications. Since the body changes over time, the statistical algorithm must be supple enough to match a stored image with a later live scan from the same person, without normally matching two similar individuals. This creates limitations on the uniqueness of the images, which are overcome by using multiple images from one person, or a biometric image plus other information. [7]

MATERIALS AND METHODS

This is a cross-sectional study undertaken on the employees comprising of teaching, non- teaching staffs and medical officers of Manipal Teaching Hospital, Pokhara undergoing biometric verification for the purpose of attendance. Undergraduate students were exempted from the study of biometric verification as attendance for them was not mandatory. A total of 805 employees of this hospital taking biometric identification for daily attendances were analyzed for this study. One hundred and forty-six people belonged to teaching staff (18.11%), 648 were from non-teaching category (80.49%) and 11(1.36%) were medical officers. Out of 805 subjects 11 (1.36%) had problems registering their attendance. These 11 subjects were divided into two categories namely Elderly>60 years age; and Manual labourers. Careful examination of fingerprints was done using high power magnifying glass as an aid for fingerprint pattern identification. The biometric capture device model U300-C is an innovative biometric fingerprint reader image capture solid state charge coupled device with piezoelectric ultrasonic transducer mechanism for live scan capture. (Fig.1, 2)

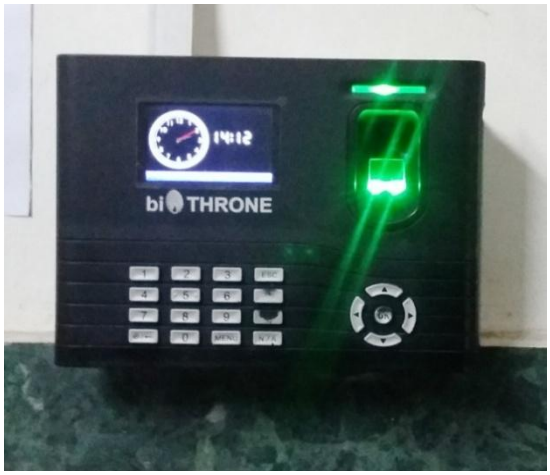

Fig.1: Biometric Fingerprint Capture Device

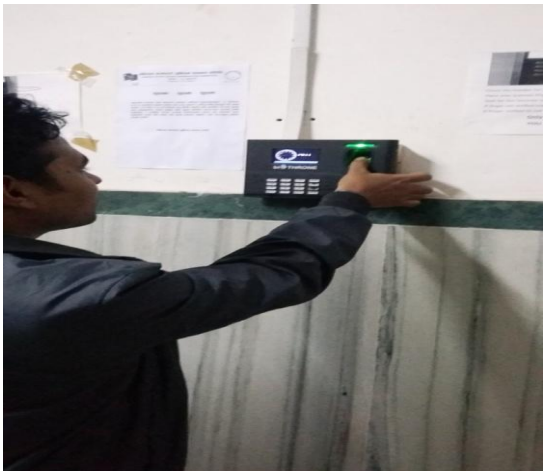

Fig.2: Biometric attendance in Hospital

RESULT

A total number of 805 employees constituted the staff strength of our hospital Table no 1.

Table No 1. Total Sample Size of the study

Teaching staff	Non-teaching staff	Medical officers	Total
146	648	11	805

Table no. 2 shows the group sample size of the study population, out of the total number of 805 employees, 18.11%were teaching staff whereas non-teaching staff and Medical officer comprised of 80.49% and 1.36% respectively.

Table No 2: Grouped Sample Size

S.N	Category	Number	(%)
1	Teaching staff	146	18.11
2	Non- teaching staff	648	80.49
3	Medical officers	11	1.36
	Total	805	100

In our study maximum staff belonged to age group between 31-40 years i.e. 37.76% followed by age group between 20-30 years i.e. 33.29% Table no 3.

Table No 3: Age wise Distribution of Categories giving Biometric attendance

Age wise Distribution of Categories giving Biometric attendance								
	Categories							
	Teaching		Non-Teaching		Medical officer			
Age Group	Male	Female	Male	Female	Male	Female	Total	Percentage
20-30	3	21	50	185	4	5	268	33.29
31-40	45	29	100	128	1	1	304	37.76
41-50	7	3	70	68	0	0	148	18.38
51-60	2	0	32	15	0	0	49	6.08
>60	28	8	0	0	0	0	36	4.47
Total	85	61	252	396	5	6	805	100

Table No 4: Categories having problems with Biometric attendance

S.N	Category	Male	Female	No	Percentage
1	Occupational Wear and Tear	7	1	8	72.27
2	Age	2	1	3	27.27
3	Physical injuries to fingers	0	0	0	0
4	Total	9	2	11	100

Table 5: Main Reasons for non-registering biometric attendance

S.N	Category	Male	Female	No	Percentage
1	Elderly staff > 60 years	2	1	3	27.2
2	Manual labourers	6	2	8	72.7
	Total	**8**	**3**	**11**	**100**

From Table no 4 it is evident that 11(1.36%) people had problems registering their attendance through biometric means. Out of these 11 people, 3(27%) belonged to elderly staff category i.e. >60 years. 8(72.7%) were manual workers belonging to various departments like plumbing, sanitation, engineering etc.

In the majority of the cases, the most common cause or non-registering of the attendance by biometric machines was due to loss of fingerprint pattern by occupational wear and tear 72.7% followed by age-related non-registering biometric attendance which constituted 27.27% Table no 5& Fig 3.

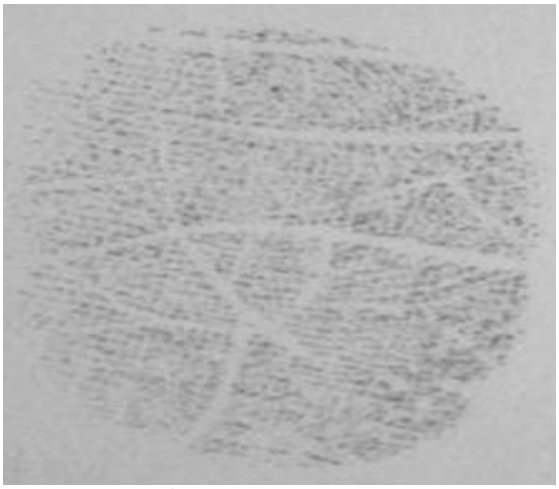

Fig 3: Damaged finger prints due to age related events unsuitable for biometric identification

There were no cases of non-registering of attendance by biometric means due to physical injuries.

DISCUSSION

It is evident that excessive occupational use of digits of the hand over prolonged time intervals results in wearing down of finger print pattern. Age also plays a role due to loss of elasticity of the skin. Physical injuries damaging deeper dermis also cause an error in biometric readings. Decreased skin firmness directly affects the quality of fingerprints acquired by sensors. The body shows numerous age-related changes as age advances, therefore, a statistical algorithm must be developed that should have enough pliability to match a stored image with a later live scan from the same person, without normally matching two similar individuals. [8,9] Government's trials are said to have suggested that worn away fingerprints along with problems with face and iris scans could identify one in 1,000 people as someone else. [10]

The UIDAI's (Unique Identification Authority of India) Biometric Standards Committee published a report in December 2009 and urged the UIDAI to consider the use of iris in addition to fingerprints in order to improve inclusiveness and accuracy of the biometric system. The committee recommended this as a biometric system based only on fingerprint might present challenges in a country like India and in other countries highly involved in manual labor. [11]

In January 2012, UIDAI published another report on the biometric technology of the UID project for the purposes of UID enrollment. This report also concluded with the finding that those involved in physical labour having more wear and tear on their fingerprints take more capture time than other groups e.g. agricultural labourers took about one third longer to register their enrollment compared with public/private sector employees and other white collar workers.

Similarly, one of the conclusions that the Parliament's Standing Committee on Finance (SCoF), which examined the National Identification Authority of India Bill, 2010 came to was that the full or near full coverage of marginalized sections for issuing Aadhaar numbers could not be achieved as the estimated failure of biometrics is expected to be as high as 15% due to a large chunk of population being dependent on manual labour. [11]

Each one of the Technologies used in our days brings us a manner to restrict the access to a system, allowing the entrance only to those persons who know a specific code, own a card or have determined physic marks. The more complex is the system, the most difficult is to be attacked, although it will be more expensive and will require more software and hardware resources. When a new authentication system is implanted, it is essential a judgment between simplicity, price and efficiency, as well as social acceptability.

CONCLUSION

The performance of a biometric authentication system and its suitability for any particular task will depend on the interaction of individuals with the automated mechanism. Determining the true identity of an individual is beyond the scope of any biometric technology. Biometric technology can only link a person to a biometric pattern and any identity data (common name) and personal attributes (age, gender, profession) presented at the time of enrollment in the system. Biometric identification is not infallible and is prone to non- correctable errors. Hence, it would be sensible to have other alternative biometric systems in organization's or institutions like face and iris scan or retinal scan to support finger print biometric system.

REFERENCES

1. Sayoud H. Biometrics: An Overview on New Technologies and Ethic Problems. International Journal of Techno ethics (IJT).2011; 2(1) pp19-34.
2. Miller B. Everything you need to know about biometric identification. Personal Identification News 1988 Biometric Industry Directory. Washington DC: Warfel & Miller. Inc., Washington DC. 1988 Jan.

3. Wayman JL. National Biometric Test Center: Collected Works 1997-2000. National biometric test center, 2000 Aug.
4. IBG BM. Industry Report. 2007. IBG: NY.224.
5. Guralnik DB. Webster's new world dictionary of the American language. World publishing; 1966.
6. Levin G. Real world, most demanding biometric system usage. Biometric Consortium.2001.
7. Wayman JL. Biometric Identification and the Financial Services Industry. Congressional testimony of May 20, 1998. National Biometric Test Center: Collected Works: 263-6.
8. Sickler NC, Elliott SJ. An evaluation of fingerprint image quality across an elderly population vis-a-vis an 18-25 year old population. In Security Technology, 2005. CCST'05.39th Annual 2005 International Carnahan Conference on 2005 Oct 11(pp.68-73).IEEE.
9. Modi SK, Elliott SJ. Impact of image quality on performance: comparison of young andelderly fingerprints. In Proceedings of the 6th International Conference on Recent Advances in Soft Computing (RASC 2006), K. Sirlantzis (Ed.) 2006 Jul 10 (pp. 449-45).
10. Bhavan Y, Marg S. Biometrics Design Standards For UID Applications. Unique Identification Authority of India, Planning Commission, New Delhi.2009 Dec.
11. Rashid AF, Lateef M, Kaur B, Aggarwal OP, Hamid S, Gupta N. Biometric Finger Print Identification Is It a Reliable Tool or Not?.Indian Academy of Forensic Medicine (IAFM). 2013; 35(2):109.

How to cite this article: Timsinha S, Narayan S, Manjarikar S. Biometric finger print: its authentication and effectiveness on health care professionals. Int J Res Rev. 2016; 3(2):28-32.

****