Biometrics in India : An Overview

[Mridula Singh, M. Hanmadlu, B K Chauhan]

Abstract*—Biometrics has been used in western countries for almost a century for public safety purpose. Its use as mainstream technology for public and private organizations has increased phenomenally in last decade. In India also, number of projects using biometrics are increasing and becoming voluminous with elapse of time. The initiatives pertaining to the identity of citizens, employee benefit schemes, and growing security concerns are pushing the envelope for Biometrics. Private organizations are also using it for the variety of purposes. This study attempts to find a general view of current scenario of Biometrics in India and various factors contributing to its unprecedented growth and its pervasiveness.

***Keywords— Biometrics, Identity projects, Security projects, Indian perspective*.**

I. Introduction

This Biometrics measures individuals' unique physical or behavioral characteristics, to recognize, and then authenticate their identity [1]-[4]. Common physical biometrics include fingerprints; hand or palm geometry; and retina, iris, or facial characteristics. Behavioral characters include signature, voice, keystroke pattern, and gait [5]-[6] as shown in Fig. 1.

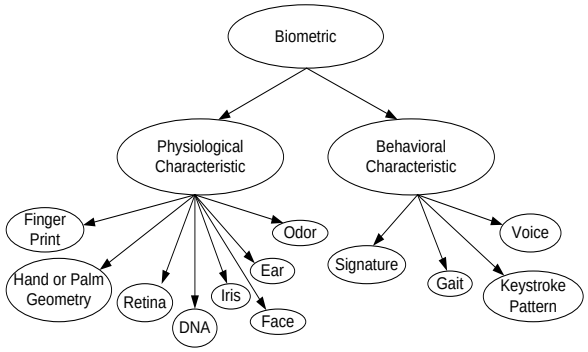

Fig.1 Different types of biometrics methods

Mridula Singh
HAL Korwa
Sulatnpur, India
blessu35@gmail.com

M Hanmadlu
IIT Delhi,
New Delhi, India

B K Chauhan
ABESIT
Ghaziabad, Inida

Most biometric systems in commercial applications operate under the verification mode, as one-to-one matching is the main task facing security concerns. Identification mode is mainly used for database searches, such as in criminal fingerprint matches, or for a small-scale user group searches. All biometric systems operate in two separate stages: the enrollment phase and the testing phase. During enrollment, bio-metric samples from a user are used to produce, generate, or train a pattern or model from the user. This is a key process, as the resultant pattern or model represents the biometric identity card of each enrolled user. Care must be taken to ensure the true identity of the enrollee is established at this stage, otherwise the whole system is compromised. In the testing phase a biometric sample from a person is identified or verified against the enrolled models. In biometrics sample matching the output is a binary decision (accept or reject), that is usually based on comparison of the match score between the test sample and the claimed user's model or pattern to a decision threshold as shown in the process flow of Fig. 2.

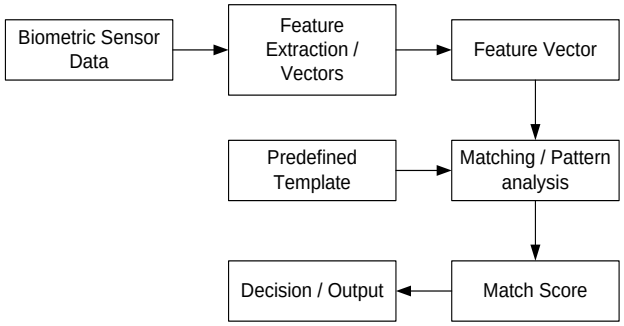

Fig.2. Biometrics sample matching process flow

II. Factors contributing to growth

There are various key factors which are responsible for the growth in the biometrics based devices use and their applications. The factors which are seemingly taking on more weightage in the Indian scenario are as follows;

A. *Identity*

Identity is easy to take for granted. Most of us have multiple legal documents or ID cards that prove we are who we say we are. But for many of the world's poorest citizens, the lack of legal identity is a barrier to participating in commerce and receiving services [7].

B. *Security*

There is an inherent need for enhanced security management in India with its billion plus population. Government and businesses are increasingly adopting biometric technologies to realize safety framework. With the recent spate of terrorist attacks in India, security is a major concern for Indian Government. The impetus on part of the Government in secure identity inflicted a major effect on the corporate commercial and enterprise space. Many solution providers are coming into Biometrics. It is grooming to be a major market for security solution providers.

C. *Schemes Implementation*

India has many federal and state programs to help people living in poverty, but today it's nearly impossible to be sure that funds and benefits are actually being delivered to those who need them. The biometrics based project is an attempt to cut down on fraud and graft by increasing accountability and transparency. It's also meant to provide access to banking and the formal economy that many people lack.

D. *Availability of standardization*

Earlier one of the impediment in the growth of the biometrics was the lack of availability of standards for the Indian users. Now, all the biometrics devices used in government are tested and validated using the testing facilities provided with the help of STQC and the same facility is available to a private enterprises or user [8]. STQC Directorate is an attached office of the Department of Electronics and Information Technology (Deit), Government of India, which provides quality assurance services in the area of biometrics through countrywide network of laboratories and centers. The services include Testing, Calibration, training and Certification to public and private organizations. STQC laboratories are having national/International accreditation and recognitions in the area of testing and calibration. It helps the government in ensuring quality in biometrics projects by conducting testing, training, audit and certifications as per the requirement.

E. *Market Economics*

Due to large scale demand of biometrics related products, many foreign as well as local companies compete with each other, which have lowered the price of the products significantly in the biometrics products market. However, the inferior quality products, which may also be available at lower prices, can easily be dealt with stringent quality checks.

F. *Social Acceptance*

Major part of the Indian population still resides in far off rural areas and is still illiterate. Making them understand say the efficacy of iris scanning and other process requires conviction and persuasion. However, Biometrics methods are now penetrating rural areas for government-related projects in India. But it was not easy to convince people initially about the importance of biometrics, which was a challenge for those persons who spearheaded the biometrics based projects.

III. Use of Biometrics in India

Biometrics based projects in India has lot of variety, not only in terms of its application domain, but also in terms its objectives and volume. These projects are being run both public as well private funding. Hence these projects can broadly be classified into two categories; government projects and private projects.

A. *Public Sector*

Unique Identification Authority of India (UIDAI)

When UIDAI spearheaded by technology titan N. Nilekani entrusted with the task of giving each Indian an unique identity that will transform delivery of services, this new e-governance initiative fell upon an ancient idea, biometrics specifically fingerprints and iris to create uniqueness. Aadhaar provides registrants with a unique 12-digit ID and pairs it up with basic information about them and their biometrical data such as scans of the irises and fingerprints of all ten fingers. This information can then be used to verify their identity digitally, and even online, using a nationwide back-end database [9]. The whole project is run from the Aadhaar Technology Centre in Bangalore, with the database stored in server farms in Bangalore, the IT capital of India, and New Delhi, the actual capital of India. The UIDAI has also begun installing test equipment in the form of biometric scanners and ID authenticators in parts of Karnataka, and will eventually allow its partners to use its database to start verifying the identities of Indian citizens.

Aadhaar also promises to be the panacea for e-governance in India, no duplicates, no frauds and one that an individual need not remember it , like a password. As pilots, using Aadhaar to authenticate people, convert to actual rollout, people will be able to use fingerprints to avail of government subsidies, insurance policies, buy fertilizer or open bank accounts. By using standard specifications, the Indian project has been able to use many existing devices and data interchange formats and avoid having to rely on a single private biometrics equipment vendor or proprietary format. This standard specifies formats on how minutiae points are determined and collected. The templates thus formed are saved into a database, which in case of Aadhaar, is located at the Bangalore technology hub of UIDAI. To use fingerprints for authentication, Aadhaar uses algorithms certified by the US-based National Institute of Standards & Technology (NIST). The greater awareness about Biometrics among the enterprise class has lead to mass distribution and implementation, which in turn, is furthering lower costs of implementation projects. Citizens would be spared the hassle of repeatedly providing supporting identity documents each time they wish to access services such as obtaining a bank account, passport, driving license etc.

National population Register (NPR)

The National population Register (NPR) program's stated objectives are to streamline the delivery of government services [10], such as welfare or subsidies, prevent identity fraud, and facilitate economic development, but some critics contend that the plan has its roots in an agenda focused on national security. Indian journalist Aman Sethi argued in a New York Times Op-Ed that the NPR originated with a 1992 government campaign to deport undocumented Bangladeshi immigrants, and that the creation of a comprehensive identity database [11] was intended exclusively to assist law enforcement. And while UID was originally created to target India's poorest 200 million citizens to facilitate service delivery, it has since been expanded to cover the country's entire population.

Income Tax Department

The government has decided to issue biometric PAN cards to taxpayers across the country [12] to weed out the problem of duplicate and fake ones. The decision was taken recently by the finance ministry and it comes in the wake of a Comptroller and Auditor General (CAG) report that asked the income tax department to ensure that a single tax payer is not issued multiple cards. The proposed new biometric Permanent Account Number (PAN) cards would bear the I-T assessee' fingerprints (two from each hand) and the face.

Government Schools

In a first of its kind initiative in the country, the Jhajjar district administration has decided to introduce biometric system for registering the attendance of all the schoolchildren in government schools of the district [13]. The portable GPS fitted biometric machines would be made available in all the 250 villages of the district which would cover government schools as well as the anangwari centers for attendance of children. This system would help the administration to put a check of the fake enrollment in the government schools and also to provide exact data for implementing various government funded schemes like mid day meal, scholarships and distribution of books etc.

All India Council of Technical Education (AICTE)

AICTE [14] also requires all the approved institutes to submit biometric data of its faculty and support staff so as to ascertain that no bogus data is uploading or feed to council with regard to required manpower to run an institute. In fact many of the approved institute makes use biometric means to monitor its staff time and attendance.

E-Passports

The e-passports have an electronic chip that contains all relevant personal data of the holder and simplify procedures at immigration. It is compatible with international standards and identity cards. It will protect against fraud and security breaches. It is easy to verify the authenticity of e-passports. Central Passport Organization has taken steps to upgrade their resources according to international standards, which make the passport more secure. India is one of the first developing countries to have launched this system [15].

State Government Pensioners/Service records

Due to major scam in pension distribution, the different states governments is now distributing biometric card for the pension holders in their state [16]. The use of biometrics also helping them in dealing with those, in service for their record and passing the financial benefits, if any, which accrue thereof.

Rural Sector

Many financial institutions have brought Biometrics to the rural sector. One of the biggest problems of rural India has been duplication where one individual has more than one ration card. Institutions like State of India (SBI) are looking to bring biometrics into the rural sector [17]. Biometrics in conjunction with smart cards could reduce the discrepancies in the distribution of the funds to the rural people. The recent decision of the government to route all future National Rural Employment Guarantee Programme (NREGP) wage payments will translate into more new bank accounts. This will encourage the banks to go for projects like biometric smart cards.

B. Private Sector

Manufacturing Industry

Biometrics has become popular in the manufacturing sector primarily driven by the requirement in time and attendance. Manufacturing has always been a large manpower-intensive organization in terms of managing access control at a door-level or facility-level. Many biometrics solutions [18] have been implemented at the manufacturing level customized to the industries need.

Banking, Financial Services and Insurance (BFSI)

BFSI sector has also been using biometric to tackle the menace of identity frauds which has been on the rise in past decade [19]. The up gradation of technology in the field of biometrics is helping this sector in minimizing financial irregularities and fraudulent practices. This will encourage the banks to go for projects like biometric smart cards. The gadget fitted with a biometric facility will link all transactions directly

to the branches. The Private and public banks are also thinking of introducing biometric ATMs and some leading banks have already taken initiatives in this regard.

Information Technology Enables Services (BPO)

India has revenues of more than US$10 billion from offshore BPO and more than US$30 billion from IT [20]. As it is also manpower based, the timing and attendance of workers also key role [21]. Hence almost all the companies operating in this sector employ biometric methods for monitoring their human resource.

Smart Safe City

We see huge focus of the private builders as well as government in the recently initiated smart safe city projects [22] that require the deployment of advanced systems and management solutions across different layers of a city's infrastructure in various metropolitan cities of India. Biometric technology is of critical importance in these projects [23]. Leading builders across India are becoming synonymous with such projects in township development, which provide them an edge against their competitors.

IV. Conclusion

Earlier lack of unified standard for biometric readers, inadequate expertise, limited investment, and poor awareness were the major impediment to the much needed growth in biometrics field. Now considering the pressing needs of time, the government is also playing an active role, beside Indian community at large in getting over impediments in the biometrics field. Considering the spectrum of projects, spreads across public as well as private sector, the Indian scenario in the field of Biometrics is certainly promising. This augurs well for the nation considering its security and identity concerns.

References

[1] A.K. Jain, R. Bolle, and S. Pankanti (Eds.), *Biometrics—Personal Identification in Networkwed Society*. Norwell, MA: Kluwer, 1999.

[2]] J. Ortega-Garcia, J. Gonzalez-Rodriguez, D. Simon-Zorita, and S. Cruz-Llanas, "From biometrics technology to applications regarding face, voice, signature and fingerprint recognition systems," in *Biometric Solutions for Authentication in an E-World*, D.D. Zhang, Ed. Norwell, MA: Kluwer, July 2002, pp. 289–337, ch. 12.

[3] W. Shen and R. Khanna (Eds.), "Special issue on automated biometrics," *Proc. IEEE*, vol. 85, no. 9, Sept. 1997.

[4] D.D. Zhang, Ed., Biometrics Solutions for Authentication in an E-World. Norwell, MA: Kluwer, July 2002.

[5]] Karl Ricanek Jr., Dissecting the Human Identity, IEEE Computer Society Magzine, Jan 2011, pp. 97-98.

[6] Lalita Acharya and Tomasz Kasprzycki, "*Industry, Infrastructure and Resources Division*" Revised April 2010.

[7] http://www.channelworld.in/features/biometrics-next-big-growth-market-india

[8] http://www.stqc.gov.in/

[9] http://uidai.gov.in/

[10] http://ditnpr.nic.in/

[11] https://www.eff.org/deeplinks/2012/05/growing-mistrust-india-biometric-id-scheme

[12] http://timesofindia.indiatimes.com/business/india-business/Govt-to-issue-biometric-PAN-cards/articleshow/7945877.cms

[13] http://articles.timesofindia.indiatimes.com/2012-07-14/india/32674492_1_biometric-system-biometric-machines-government-schools

[14] http://www.aicte-india.org/

[15] http://articles.timesofindia.indiatimes.com/2012-07-02/bangalore/32507397_1_rpos-passports-biometrics

[16] http://articles.timesofindia.indiatimes.com/2002-07-01/pune/27303674_1_lakh-state-government-pensioners-family-pension-madhukar-lokur

[17] http://www.financialexpress.com/news/biometric-cards-sbi-to-tie-up-with-hp/327626/0

[18] ManufacteringIndustry-http://www.bspalabs.org/2008/10/18/biometrics-in-the-manufacturing-pharamaceutical-environment/

[19] BFSI-http://www.dnb.co.in/bfsisectorinindia/BankC6.asp

[20] http://en.wikipedia.org/wiki/Business_process_outsourcing

[21] http://info.shine.com/Industry-Information/ITES/3.aspx

[22] http://www.smart-cities.eu

[23] http://www.safecity-project.eu

About Author (s):

Mridula Singh is currently serving as the deputy manager in Quality department, HAL Korwa, Sultanpur, India. Her research interests are biometrics and its allied areas

M.Hanmadlu is currently serving as the Professor in the department of Electrical Engineering, Indian Institute of Technology Delhi. He is also heading the biometrics research laboratory at the institute.

B. K. Chauhan is currently the Professor and Director at ABES Institute of Technology, Ghaziabad, India.