VeriFinger/MegaMatcher Case Study

SecureMantra's AFPIS Helps Solve Criminal Cases in India

The Criminal AFPIS Enterprise Solution is based on VeriFinger & MegaMatcher technology

SecureMantra Technologies (P) Ltd is a biometrics firm that, for the past 10 years, has been involved in research and development of fingerprint identification technology. Using the VeriFinger SDK fingerprint identification engine from Neurotechnology, SecureMantra's Criminal AFPIS solution has enrolled more than 1,000,000 new criminal records (1,000,000 x 10 prints) across seven states in India that are currently using the system. To date, more than 10,000 criminals have been identified and over 500 crimes have been solved with the aid of the solution. SecureMantra's latest version, Criminal AFPIS Enterprise Solution version 5.2, has added palmprint technology based on Neurotechnology's MegaMatcher multi-biometric identification engine.

Background

- **The customer:** Police departments in seven Indian states are currently using SecureMantra's Criminal AFPIS solution as is the National Institute of Criminology and Forensic Science (NICFS) in New Delhi.
- **The issue:** A tool was needed to aid police in the investigation of criminal activity through the quick and accurate identification of latent fingerprints collected at crime scenes.
- **The Integrator:** SecureMantra Technologies (P) Ltd, based in Lucknow, Uttar Pradesh, India, is a biometrics firm that has been involved in research & development of fingerprint technologies for the past 10 years.
- **The solution:** The Criminal AFPIS Enterprise Solution, Version 5.2, from SecureMantra was developed using the VeriFinger fingerprint recognition SDK from Neurotechnology.

Recognizing a need to quickly and accurately match and identify fingerprints taken at crime scenes to the larger, amassed collection in police files, SecureMantra worked to develop a system that would include existing print records – especially the difficult-to-read and partial latent prints – as well as newly collected records. Criminal investigators in seven Indian states are currently using SecureMantra's Criminal AFPIS solution and it is also being used for police training at the National Institute of Criminology and Forensic Science (NICFS) in New Delhi. With a Central AFPIS installed at each state's capital and Remote Query Terminals (RQTs) installed in the districts, matching and verification of records can be done in real-time at crime scenes and police stations, connecting to the district RQTs. Additional matching can be done against the state and national databases with SecureMantra Mobile AFIS.

The latest version of the system, Criminal AFPIS Enterprise Solution 5.2 has been used to establish a 234,000 record database (234,000 x 10 prints) of criminal legacy prints for the police in the state of Kerala, India. In the first six months after installation there have already been fifteen latent print matches, leading directly to the solving of fifteen criminal cases.

"We chose Neurotechnology for their record of excellence in the field but also because of their stellar customer support," said Dr Vivek Dixit, Executive Director for SecureMantra Technologies. *"We were able to rely on them throughout the development of our system."*

The Criminal AFPIS Enterprise Solution is administered by each State's Police Department under the jurisdiction of the National Crime Records Bureau (NCRB), Ministry of Home Affairs and has been benchmarked and certified by the NCRB.

The Criminal AFPIS Enterprise Solution

Established in Lucknow, Uttar Pradesh, India, SecureMantra Technologies began using Neurotechnology's VeriFinger SDK in early 2002 to develop their AFIS solution. Working in-house, with the ongoing support of Neurotechnology, the first system prototype was shown to the local Uttar Pradesh Police Department in May 2002. In December of that year, SecureMantra participated in NCRB benchmarking, securing the best fingerprint matching results among a strong field of competitors.

The system was first deployed in 2005 at NICFS and in the states of Orissa and Chhattisgarh. Since that time the states of Rajasthan, Mizoram, Tripura, Arunachal Pradesh and Kerala have deployed the solution. Additional Indian states plan to deploy the Criminal AFPIS Enterprise Solution over the coming months.

The system, which is currently at Version 5.2, has continued to evolve and improve, including adding palm print capability. The matching and verification servers for the Criminal AFPIS Enterprise Solutions are installed on standard dual processor servers at each State Capital and connected to the Remote Query Terminals by broadband.

The matching databases are developed from existing, legacy fingerprint records and the enrollment of newly collected prints. With the use of additional Neurotechnology platforms and support, SecureMantra is working on expanding their system to include other biometric modalities such as face and iris recognition.

While each state is benefitting from the installation of the SecureMantra AFPIS, use of the solution for training personnel in biometric criminal investigation at the NICFS is an enhancement to the overall system of law enforcement.

System highlights:

- 10,000 criminals identified across seven Indian states
- 500 crimes solved from identifications with current and existing (latent) prints
- In the state of Kerala, the first six months after installation yielded fifteen latent print matches, leading directly to the solving of fifteen criminal cases
- To date, the SecureMantra Criminal AFPIS Enterprise Solution has been used to enroll over 1,000,000 new records of arrested or convicted individuals

"Neurotechnology's SDKs allowed us the flexibility and ease of integration we needed to fully develop our system," said Dr Vivek Dixit. *"They have the best performing algorithm in the field and we therefore have the best performing AFIS in the Indian Market."*

How the system works

Each state in India has a State Crime Records Bureau (SCRB). In the states currently using SecureMantra's Criminal AFPIS solution, it is at the SCRB that the Central AFPIS is established. Each state is divided into several districts, each district having a District Crime Records Bureau (DCRB). At these facilities criminal data is collected and sent, via the Remote Query Terminal (RQT), to state's Central AFPIS.

The Criminal AFPIS has the ability to check against established data in real time using portable scanners while at crime scenes and linking to the RQTs. The district level RQTs can perform two different types of queries: the 20 digit record query (10 plain, 10 rolled fingerprints) or the latent print query. Each query may be search-only or enroll-and-search (usually 1:N). If the query is a search-only, then it is first performed against the local district database. Further querying may be done at the state level as well as at the national level. If the query is of the enroll-and-search type, then it follows a similar path, updating and searching at each of the three database levels.

When a fingerprint is found at a crime scene it is transmitted via a mobile fingerprint station, usually a forensic van that is outfitted with the appropriate scanners, AFPIS and cellular internet connection, to the local district database (RQT). The results are transmitted back to the onsite fingerprint expert where the match is verified. This process is real-time, the resulting matching being very nearly instantaneous. If it is required, additional matching may be done at the state or national level, though the system is not yet real-time in these cases. The databases are updated at the local (RQT), state (SCRB) and national levels (NCRB in New Delhi) with the records obtained and/or matched.

Matching and verification is done on clustered servers, the AFPIS running on Windows 7. The system uses Neurotechnology's VeriFinger 6.0 for feature extraction, enrollment and matching.

About Neurotechnology Biometric Technologies

VeriFinger SDK is a fingerprint identification technology designed for the development of of PC- and Web-based fingerprint identification applications on Microsoft Windows, Linux and Mac OS platforms. The VeriFinger algorithm assures fast, reliable fingerprint matching in both 1-to1 and 1-to-many modes. First released by Neurotechnology in 1998, the VeriFinger algorithm has won acclaim in major biometric competitions and more than 1,500 end-user product brands in over 100 countries have used the VeriFinger algorithm. The latest VeriFinger 6.5 version is NIST MINEX-compliant, making it suitable for use in personal identity verification (PIV) program applications.

The VeriFinger algorithm follows the commonly accepted fingerprint identification scheme, which uses a set of specific fingerprint points (minutiae) along with a number of proprietary algorithmic solutions that enhance system performance and reliability. It provides fast matching of both rolled and flat fingerprints and is tolerant to fingerprint translation, rotation and

deformation. VeriFinger supports multiple scanners and programming languages and the compact fingerprint template and unlimited database size make VeriFinger suitable for use in a wide range of applications.

MegaMatcher SDK is designed for the development of large-scale automated fingerprint identification systems (AFIS) and multi-biometric identification systems using any combination of fingerprint, facial, iris or palmprint biometrics. The identification algorithms in MegaMatcher were designed from the ground up to work alone or in combination to provide very fast 1:N (1 to many) matching with even higher reliability than AFIS or any other single biometric.

MegaMatcher 4.3 matching algorithm can match up to 2,100,000 faces per second, 280,000 fingerprints per second or 2,200,000 irises per second on a single processor (based on Intel Core i7-2600 processor running at 3.4 GHz). With Neurotechnology's fault-tolerant, scalable MegaMatcher Cluster Server cluster software, these numbers can be multiplied across multiple PCs.

For very large applications **MegaMatcher Accelerator** or an Accelerator cluster can be used. Each single MegaMatcher Accelerator Extended system can store 40 million fingerprints or 50 million irises and matches 100 million fingerprints or 200 million irises per second. MegaMatcher's latent fingerprint template editing capabilities also allow it to be used in forensic AFIS applications.

MegaMatcher supports most biometric industry standards. The iris engine in MegaMatcher is NIST IREX-proven, and because the MegaMatcher fingerprint recognition algorithm is NIST MINEX-compliant, it is suitable for use in US Government Personal Identity Verification program fingerprint recognition applications.

For More Information:

SecureMantra Technologies (P) Ltd

Established in 2001 in Lucknow, Uttar Pradesh, India, SecureMantra Technologies (P) Ltd is a biometrics firm that has been involved in research & development of fingerprint technologies for the past 10 years. Working with large multi-national companies, SecureMantra provides integrated biometric solutions: AFIS, Facial Recognition and Palm Print Recognition Systems as well as Biometric Passports (e-passports according to ICAO standards).

For more information about SecureMantra Technologies go to: http://www.securemantra.org

Neurotechnology

For more information about VeriFinger pricing, product capabilities and specifications as well as other products from Neurotechnology, go to: http://www.neurotechnology.com

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