White Paper:

Footprint Aging Validity

CertaScan Technologies

Items Included

Overview

Support Material

Proof of Concept – In Hospital Sampling

U.S. Government & Business References

Overview

CertaScan's Infant Safety System utilizes an FBI certified LiveScan scanner that captures the unique ridge detail of newborn baby footprints. The CertaScan system has been approved by the National Institute of Standards (NIST) to place infant footprints into any ANSI/NIST AFIS system for 1: N (many) matching as a Type 19 record (plantar print).

CertaScan utilizes proprietary algorithms to provide enhanced quality capture for the healthcare industry. The system and software is simple to use by nursing staff and provides a positive experience for the patient. The Infant Safety System also captures a full face photo of the newborn and mother's fingerprints, in order to have a complete biometric record at the time of birth.

CertaScan has worked in close cooperation with the National Center for Missing & Exploited Children to ensure that our process meets their stringent standards on infant safety in hospitals. Additionally, we work with organizations such as NIST, AWHONN, FBI CJIS, DHS OBIM, USS FSD and CITeR to ensure our process meets their guidelines and ever improving standards as we deploy throughout the U.S. and beyond.

Support Materials

- **Infant to Adult Footprint Identification: Journal of Forensic Identification, Volume 57, Issue 4, July 2007**

"Results indicated that sufficient agreement was found between the infant and adult footprints to allow the U.S. State Department to accept the individual's identification as a U.S. citizen and approve the application of a U.S. passport."

https://www.ncjrs.gov/App/Publications/abstract.aspx?ID=241258

- **Infant Footprints for Personal Identification: The FBI Law Enforcement Bulletin, November 1, 1994**

"The FBI continues to advocate and encourage footprinting infants at birth, believing that this process represents a reliable, expeditious, and cost-efficient method for establishing probable personal identity. This article offers justification for continuing this important practice and provides information for law enforcement professionals desiring to train hospital personnel in proper printing techniques.

Print experts agree that every individual's prints contain friction ridge minutiae, i.e., ridge detail, that are unique to that person. Even the footprints and fingerprints of identical twins are different. Furthermore, friction ridge minutiae remain naturally unchanged throughout a person's life. Because of this consistency, FBI print experts have identified the adult victims of such disasters as fires and airplane crashes by using the footprints of the individuals taken in infancy."

http://www.thefreelibrary.com/Best+foot+forward%3A+infant+footprints+for+personal+identification.-a016473798

- **METHODS USED TO IDENTIFY INFANTS ABDUCTED FROM HOSPITALS – UPON RECOVERY – 1983 to present (12/19/14 NCMEC Memorandum attached)**

SINGLE METHOD OF IDENTIFICATION USED: 67

Visual I.D.(includes by mother, parents, hospital staff)	24
Footprints	17
Blood Tests	7
Hospital I.D. Bracelet	6
Confession from Abductor	4
Abductor I.D. By Witnesses	2
DNA	5
Birthmark	1
Photographs	1

- **Adult to infant footprint: National Crime Museum**
  "An actual footprint can be checked and matched to an existing print on record, such as one from a birth certificate."

  www.crimemuseum.org/crime-library/footprints

- **NIST Standard for Footprint 1:N matching (AFIS)**

5.3.19 Type-19 records

Type-19 image records shall contain and be used to exchange variable-resolution plantar print image data together with fixed and user-defined textual information fields pertinent to the digitized image. The **Type-19** record may be used for the exchange of 19.69 ppmm (500 ppi) images. It should be noted that as the resolution is increased, more detailed ridge and structure information becomes available in the image. However, in all cases the scanning resolution used to capture a plantar image shall be at least as great as the minimum scanning resolution of 19.69 ppmm (500 ppi). The variable-resolution plantar image data contained in the **Type-19** record may be in a compressed form.

http://biometrics.nist.gov/cs_links/standard/ansi_2012/Update-Final_Approved_Version.pdf

Ridge Detail versus Plantar Creases

Infant footprints provide unique challenges for many biometric systems. Plantar creases are highly prominent in near and full term newborns, but are short-lived for purposes of matching using AFIS or similar type systems when 1 record is being matched to many. These creases are only useful for orientation in latent examinations when a child is less than 30 days old.

When capturing the ridge details of a newborn's foot with a LiveScan device using a resolution of at least 500ppi is critical. Additionally, the use of moisturizer helps to enhance the ridge details during a capture session.

The CertaScan Infant Safety System is specifically designed to capture and store the necessary ridge detail to work with 1:1 and 1: N many matching systems.

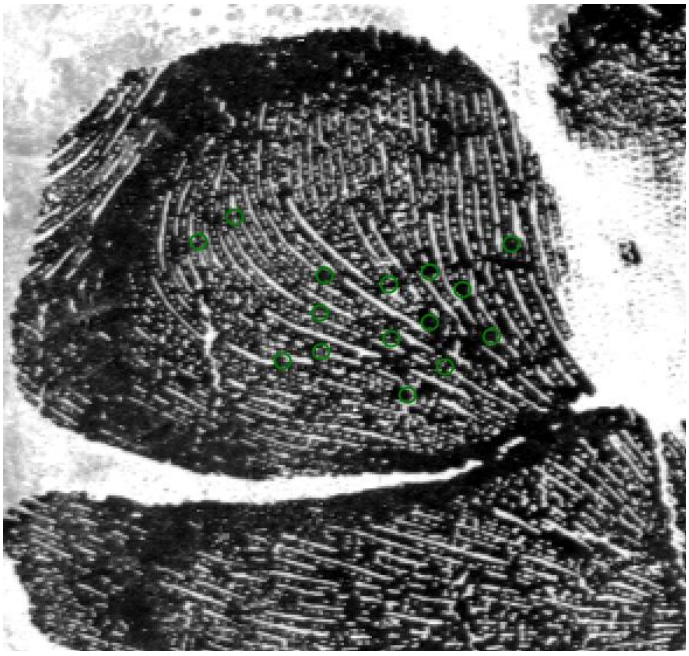
Additionally, CertaScan's matching algorithm's use Ridge Specific Marker (RSM) technology developed with the FBI laboratory (Project Graff).

Example matches below have all been captured during in-hospital Proof of Concept testing, using the CertaScan Infant Safety System, and highlights the difference between plantar creases and ridge detail captured by the CertaScan system.

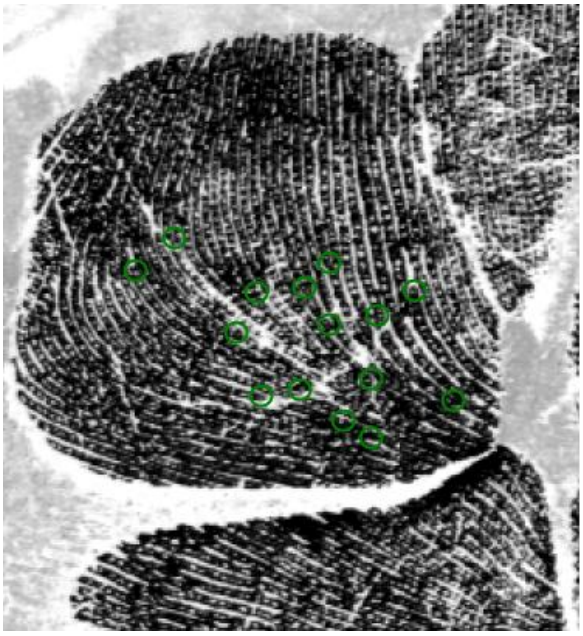
Plantar Creases are shown in RED and ridge flow and minutiae are shown in ORANGE and GREEN, respectively. As stated below, Plantar Creases are NOT used for identification.

LeftFootPrint11.BMP* exemplar is a positive match to previously recorded RightFootPrint6.BMP using a combination of creases for orientation, ridge flow structure in the 1st metatarsal phalangeal joint (sub hallux), Tibial and Fibular Sesamoid region, and other notable ridge flow structure in the medial and lateral Calcaneal-Cuboid joint (mid-plantar) regions, Chopart's joint (proximal to mid-plantar), support positive identification.

Ridge flow structure with defined minutiae (combination of 15 bifurcations and ending ridges) in the Tibial and Fibular Sesamoid region are seen with 150% magnification of LeftFootPrint11.BMP*



Ridge flow structure with defined minutiae (combination of 15 bifurcations and ending ridges) in the Tibial and Fibular Sesamoid region are seen with 150% magnification of RightFootPrint06.BMP.



*NOTE: BMP stands for Bitmap file.

LeftFootPrint06.BMP exemplar is a positive match to previously recorded RightFootPrint11.BMP* using creases for orientation only, and ridge flow structure in the metatarsal sub hallux and metatarsal superior lateral plantar, and notable ridge flow structure in the medial plantar regions, support positive identification.

Government & Business References

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