Minutia Deviation Tool:
Software Requirements Specification (SRS)

(Version 1.1)

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OSD AT&L, ASD(R&E)

Prepared by

ManTech International Corporation ®
ManTech Advanced Systems International
1000 Technology Drive, Suite 3310
Fairmont, West Virginia 26554
Telephone: (304) 368-4120
Fax: (304) 366-8096

Dr. Lars Ericson, Director

Steve Shine (Azimuth, Inc.)

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CHANGE HISTORY

Version/ Revision	Revision Date	Description of Change
1.0	06/05/14	Final Draft for Customer Review
1.1	06/12/14	Final Revised Document

1.0 SCOPE

1.1 Identification

Minutia Deviation Tool (MDT), version 1.0 (beta)

1.2 System Overview

The MDT is a prototype Computer Software Configuration Item (CSCI) (i.e., software utility) that shall aid a user in designating equivalent minutia pairs across two fingerprint biometric images and calculating the pair's minutia spatial deviations. MDT shall serve as a tool to support research and analysis of contactless and contact-based fingerprint data.

No prior software development exists for the MDT.

The tool shall be used by biometrics researchers in academia, government, and industry, as designated and distributed by the sponsors, in an independent manner without operations or maintenance support from the developer. The MDT version being developed shall be in a Beta state, not suitable for general release, but possessing suitable stability for use by knowledgeable and experienced researchers.

MDT development is part of the Contactless Fingerprint Research (Phase 2) project. The effort is sponsored by the Director, Defense Biometrics and Forensics in partnership with the National Institute of Justice (NIJ).

The MDT is being developed by ManTech Advanced Systems International, Inc. (and its subcontractor, Azimuth, Inc.) under the National Institute of Justice (NIJ) Sensor, Surveillance, and Biometric Technologies (SSBT) Center of Excellence (CoE) cooperative agreement (Award# 2010-IJ-CX-K024). The NIJ SSBT CoE is a center within the National Law Enforcement and Corrections Technology Center (NLECTC) System. The Center provides scientific and technical support to NIJ's R&D efforts. The Center also provides technology assistance, information, and support to criminal justice agencies. The Center supports the sensor and surveillance portfolio and biometrics portfolio. The CoEs are the authoritative resource within the NLECTC System for both practitioners and developers in their technology area(s) of focus. The primary role of the CoEs is to assist in the transition of law enforcement technology from the laboratory into practice by first adopters.

1.3 Document Overview

The Software Requirements Specification (SRS) document specifies the required functionality, capabilities, computer interfaces, and usability for the MDT.

1.3.1 Thresholds and Objectives

Each requirement shall have a threshold value or an objective value. Requirements labeled [T] indicate Threshold requirements. Requirements labeled [O] indicate Objective requirements.

For requirements, “threshold” shall mean the minimum acceptable value that, in the user's judgment, is necessary to satisfy the need.

The “objective” value is the value desired by the user, and the value the software tries to obtain. The objective value represents an incremental, operationally meaningful, time-critical, and/or cost-effective improvement to the threshold value of software requirements.

2.0 REFERENCED DOCUMENTS

- Department of Defense (DOD), *DI-IPSC-81433A Software Requirements Specification Data Item Description (SRS DID)* (December 15, 1999)

- National Institute of Standards and Technology (NIST), *ANSI/NIST-ITL 1-2011 Data Format for the Interchange of Fingerprint, Facial & Other Biometric Information* (January 2012)

- Federal Bureau of Investigation (FBI), *IAFIS-DOC-01078-9.3 Electronic Biometric Transmission Specification (EBTS) Version 9.3* (December 9, 2011)

- ManTech Advanced Systems International (MASI), *Contactless Fingerprint Research (Phase 2) Program Narrative – Draft V7* (January 15, 2014)

- MASI and Azimuth, Inc.; *Evaluation of Contact versus Contactless Fingerprint Data (Final Report v2)* (January 23, 2014)

3.0 REQUIREMENTS

3.1 Required States and Modes

No states or modes are required. [T]

3.2 CSCI Capability Requirements

3.2.1 Display Fingerprint Image and Minutiae [T]

a. The MDT shall open a pair of Latent Friction Ridge Features Search (LFFS) EBTS files (i.e., *.lffs file format). [T]
b. The MDT shall display the fingerprint image. [T]
c. The MDT shall overlay associated minutiae to fingerprint in a graphical user interface (GUI). [T]
d. The MDT shall allow individual minutia to be selected to display details (e.g., x, y, angle, classification, etc.) and any associated annotations. [T]

3.2.2 Calculate Minutiae Deviations [T]

a. The MDT shall calculate the spatial deviations between a pair of minutiae selected on the two fingerprints. [T]
    i. The MDT shall allow the user to select a baseline minutia using the GUI and mouse pointer. [T]
    ii. The MDT shall allow the user to select a target minutia on the other fingerprint. [T]
    iii. The MDT shall calculate the spatial deviation. [T]
b. The MDT shall present deviation results to the user in the GUI window. [T]

3.2.3 Filter Minutia Deviations [O]

a. The MDT may allow a user to filter minutiae. [O]
    a. The MDT may graphically mark minutia pairs as they are selected for deviation calculations and maintain a running graphical display of selected pairs. [O]
    b. The MDT may keep track of calculated minutia deviations and the associated minutia pairs during the active session. [O]
    c. The MDT may allow a user to filter the minutiae based on the calculated deviations or other minutia features by entering a filter parameter through the GUI interface controls. [O]
b. The MDT may alter the displayed minutiae based on those pairs that satisfy the filter parameter(s). [O]
c. The MDT may write an EBTS file or pair of files with only minutiae that satisfy the entered filter parameter(s). [O]

3.3 CSCI External Interface Requirements

3.3.1 Interface Identification and Diagrams

a. The MDT shall provide a GUI. [T]
b. The MDT shall allow a user to manually open files from the local computer. [T]
c. The MDT shall allow a user to manually save a results file to the local computer. [T]

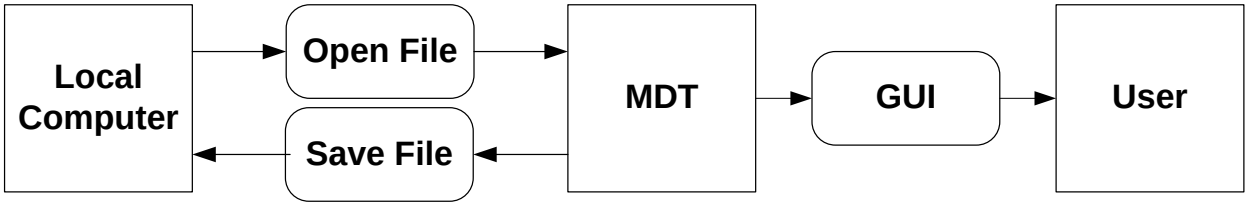

Figure 1: MDT External Interface Diagram

3.3.2 EBTS Files

a. The MDT shall open a pair of LFFS EBTS files (i.e., *.lffs file format) for display within the GUI. [T]
b. The MDT shall open an LFFS file that contains a valid Type-9 and Type-13 record, in accordance to ANSI/NIST-ITL 1-2011. [T]
c. The MDT shall open an LFFS file that contains a valid Type-9 record, in accordance with ANSI/NIST-ITL 1-2011, and allow the user to then import an external image file (.bmp) for display [O].
d. The MDT shall only be required to open LFFS files that contain Type-9 minutia records in one encoding standard; the specific minutia standard is Field Block 9.300-9.399 – Extended Feature Set (EFS) standard Profile 2: Quick Minutia Search. [T]
e. The MDT may allow a user to save an EBTS file that has had minutiae deleted from the originally opened file due to user interactions or deviation filtering. [O]

3.3.3 Deviation Log File

a. The MDT shall allow a user to save a text file containing a log of minutiae pairs with details and the resulting deviation calculations from the current user session. The text file will be in a table structured format suitable for viewing in a common office spreadsheet software program. [T]

3.3.4 Session File

a. The MDT shall allow a user to save a session file containing all data from the LFFS files, Deviation Log file, and any actions taken within the session by the user that resulted in a change state. The specific file data format and structure is to be left to the design. [T]
b. The MDT shall allow a user to open a session file and resume the viewing and/or analysis of fingerprint image and minutia data in accordance to the describe CSCI capabilities. [T]

3.4 CSCI Internal Interface Requirements

No internal interface requirements for the MDT.

3.5 CSCI Internal Data Requirements

No internal data requirements for the MDT.

3.6 Adaptation Requirements

No adaptation requirements for the MDT.

3.7 Safety Requirements

No safety requirements for the MDT.

3.8 Security and Privacy Requirements

a. MDT will not provide per-user security setting. [T]
b. MDT will be able to operate in a standard DoD Information System (IS) Environment. [T]

3.9 CSCI Environment Requirements

a. MDT will operate in an office environment. [T]

3.10 Computer Resource Requirements

3.10.1 Computer Hardware Requirements

a. MDT shall operate on a standard Government desktop computer. [T]

3.10.2 Computer Hardware Resource Utilization Requirements

a. MDT will require a minimum 100 Megabytes (MB) of RAM. [T]
b. MDT will require a minimum 200 MB hard drive. [T]

3.10.3 Computer Software Requirements

a. MDT will run in the Microsoft Windows 7 operating system. [T]
b. MDT will require Microsoft .Net Framework 4. [T]

3.10.4 Computer Communications Requirements

a. MDT shall not provide any network functionality. [T]

3.11 Software Quality Factors

a. Due in part to the prototype/research nature of this effort, the MDT will utilize a Spiral development methodology. This will provide the best methodology to support the development of the current version 1.0 (Beta) development, while still allowing for the capture, planning, and implementation of future revision of the MDT tool. [O]

3.12 Design and Implementation Constraints

3.12.1 Hardware Design Constraints

The hardware/operating system for the MDT shall meet the following minimal system requirements:

a. Microsoft Windows 7 or higher [T]
b. X86 Dual Core Processor [T]
c. 2 Gigabytes (GB) Memory [T]
d. 30 GB Hard drive [T]

3.12.2 Software Constraints

a. MDT will execute on a Windows 7 or higher compatible computer system. [T]
b. MDT will use a Windows Standard user interface. [T]
c. An effort will be made to develop all software for the MDT using C# computer language. If insurmountable problems occur interfacing C#, MDT, and Windows, the C/C++ computer languages will be used as an alternative. [O]

3.13 Personnel-Related Requirements

No personnel-related requirements for the MDT.

3.14 Training-Related Requirements

No training-related requirements for the MDT.

3.15 Logistics-Related Requirements

No logistics-related requirements for the MDT.

3.16 Other Requirements

No other requirements for the MDT.

3.17 Packaging Requirements

a. The MDT will be delivered on 2 compact discs (CDs). One CD will contain the application. The second CD will contain the source code and documentation for MDT

tool delivered on disc one. Upon sponsor written request the delivery can be made electronically as an alternative to the CD delivery. [T]

3.18 Precedence and Criticality of Requirements

All requirements have equal weight.

4.0 QUALIFICATION PROVISIONS

a. The MDT shall be demonstrated to representatives of the government sponsors to verifying the CSCI capabilities. [T]

5.0 REQUIREMENTS TRACEABILITY

Table 1: Listing of Requirements and Sources

ID No.	Section	Requirement	Source / Reference
1	3.2.1	Display Fingerprint Image and Minutiae	Program Narrative
2	3.2.2	Calculate Minutiae Deviations	Program Narrative
3	3.2.3	Filter Minutia Deviations	Program Narrative
4	3.3.2	EBTS Files	ANSI/NIST-ITL 1-2011
5	3.3.3	Deviation Log File	Program Narrative
6	3.3.4	Session File	Program Narrative

6.0 NOTES

Table 2: Acronyms and Abbreviations

ACRONYM	DESCRIPTION
ASD(R&E)	Assistant Secretary of Defense for Research and Engineering
AT&L	Acquisition, Technology, and Logistics
CD	Compact Disc
CoE	Center of Excellence
CSCI	Computer Software Configuration Item
DOD	Department of Defense
DOJ	Department of Justice
EBTS	Electronic Biometrics Specification Transmission
EFS	Extended Feature Set
FBI	Federal Bureau of Investigation
GB	Gigabyte
GUI	Graphical User Interface
IS	Information System
LFFS	Latent Friction Ridge Features Search
MASI	ManTech Advanced Systems International
MB	Megabyte
MDT	Minutia Deviation Tool
NIJ	National Institute of Justice
NIST	National Institute of Standards and Technology
NLECTC	National Law Enforcement and Corrections Technology Center
OSD	Office of the Secretary of Defense
SRS	Software Requirements Specification
SSBT	Sensor, Surveillance, and Biometric Technologies