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Information technology — Biometric performance testing and reporting —

Part 1: Principles and framework

*Technologies de l'information — Essais et rapports de performance
biométriques —*

Partie 1: Principes et canevas

Without
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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 19795-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 37, *Biometrics*.

ISO/IEC 19795 consists of the following parts, under the general title *Information technology — Biometric performance testing and reporting*:

- *Part 1: Principles and framework*
- *Part 2: Testing methodologies for technology and scenario evaluation*

The following parts are under preparation:

- *Part 3: Modality-specific testing [Technical Report]*
- *Part 4: Performance and interoperability testing of data interchange formats*
- *Part 5: Performance of biometric access control systems*

Introduction

This part of ISO/IEC 19795 is concerned solely with the scientific “technical performance testing” of biometric systems and devices. Technical performance testing seeks to determine error and throughput rates, with the goal of understanding and predicting the real-world error and throughput performance of biometric systems. The error rates include both false positive and false negative decisions, as well as failure-to-enrol and failure-to-acquire rates across the test population. Throughput rates refer to the number of users processed per unit time based both on computational speed and human-machine interaction. These measures are generally applicable to all biometric systems and devices. Technical performance tests that are device-specific — for example, fingerprint scanner image quality — are not considered in this part of ISO/IEC 19795.

It is acknowledged that technical performance testing is only one form of biometric testing. Other types of testing not considered in this part of ISO/IEC 19795 include

- reliability, availability and maintainability;
- security, including vulnerability;
- conformance;
- safety;
- human factors, including user acceptance;
- cost/benefit;
- privacy regulation compliance.

Methods and philosophies for these other types of test are currently being considered internationally by a broad range of groups.

The purpose of this part of ISO/IEC 19795 is to present the requirements and best scientific practices for conducting technical performance testing. This is necessary because even a short review of the technical literature on biometric device testing over the last two decades or more reveals a wide variety of conflicting and contradictory testing protocols [1-11]. Even single organizations have produced multiple tests, each using a different test method. Test protocols have varied not only because test goals and available data are different from one test to the next, but also because no standard has existed for protocol creation.

Biometric technical performance testing can be of three types: technology, scenario or operational evaluation. Each type of test requires a different protocol and produces different types of results. Even for tests of a single type, the wide variety of biometric devices, sensors, vendor instructions, data acquisition methods, target applications and populations makes it impossible to present precise uniform testing protocols. Other parts of ISO/IEC 19795 will provide specific advice and requirements for the development and use of such different test protocols. This part of ISO/IEC 19795 addresses specific philosophies and principles that can be applied over a broad range of test conditions.

This part of ISO/IEC 19795 has been developed from the UK Biometrics Working Group’s Best Practices in Testing and Reporting Performance of Biometric Devices [12] which itself drew from two primary source documents developed by the US National Institute of Standards and Technology (NIST) [13, 14], a variety of evaluation reports [7-10], and comments from the Biometrics Consortium Working Group on Interoperability, Performance and Assurance.

Information technology — Biometric performance testing and reporting —

Part 1: Principles and framework

1 Scope

This part of ISO/IEC 19795

- establishes general principles for testing the performance of biometric systems in terms of error rates and throughput rates for purposes including prediction of performance, comparison of performance, and verifying compliance with specified performance requirements;
- specifies performance metrics for biometric systems;
- specifies requirements on test methods, recording of data and reporting of results; and
- provides a framework for developing and describing test protocols, to help avoid bias due to inappropriate data collection or analytic procedures, to help achieve the best estimate of field performance for the expended effort, and to improve understanding of the limits of applicability of the test results.

This part of ISO/IEC 19795 is applicable to empirical performance testing of biometric systems and algorithms through analysis of the matching scores and decisions output by the system, without detailed knowledge of the system's algorithms or of the underlying distribution of biometric characteristics in the population of interest.

Not within the scope of this part of ISO/IEC 19795 is the measurement of error and throughput rates for people deliberately trying to circumvent correct recognition by the biometric system (i.e. active impostors).

2 Conformance

To conform to this part of ISO/IEC 19795, a biometric performance test shall be planned, executed and reported in accordance with the mandatory requirements contained herein.

3 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*