SLOVENSKI STANDARD
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Metodologija preskušanja vplivov na okolje med operativno uporabo evropskih sistemov ABC

Environmental influence testing methodology for operational deployments of European ABC systems

Testmethodik für Umwelteinflüsse beim operationellen Einsatz von europäischen ABC-Systemen

Méthodologie de tests de l'influence environnementale pour les déploiements opérationnels des systèmes européens de contrôle de passages aux frontières automatisés

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European foreword

This document (CEN/TS 16920:2016) has been prepared by Technical Committee CEN/TC 224 “Personal identification and related personal devices with secure element, systems, operations and privacy in a multi sectorial environment”, the secretariat of which is held by AFNOR.

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Introduction

This Technical Specification is focused on the application of the testing methodology defined in ISO/IEC 29197 for analysing the influence of environmental conditions on the biometric performance of European automatic border control (ABC) systems according to the features of these systems, the specificities of these systems for the European context and their intended operational environment, i.e. airports and port halls.

ABC systems are automated systems which can verify the identity of travellers crossing the borders at the border crossing points, without the need for human intervention. These systems are used by many European countries for supporting border control officer activities. Their objective is to improve border crossing processes and achieve consistent security levels throughout Europe. As a consequence, it is required that these systems conform to ISO/IEC standards for interoperability (see CEN/TS 16634:2014, Personal identification — Recommendations for using biometrics in European Automated Border Control, Clause 1). Among these standards, the multipart standard ISO/IEC 19795 "Biometric Performance Testing and Reporting" establishes requirements for planning, executing and reporting biometric performance evaluations. However, due to the fact that this set of standards does not cover the analysis of environmental conditions influence on biometric performance, ISO/IEC JTC1 SC37 WG5 began a new project for establishing a testing methodology to quantify those environmental effects. This project is ISO/IEC 29197 "Information technology — Evaluation methodology for environmental influence in biometric system performance".

However, this methodology is generic and its requirements have been specified to cover the analysis of several environmental parameters (e.g. temperature, humidity, atmospheric pressure, illumination, noise, etc.) considering all possible operational environments. Depending on the particular features of the biometric system under test and the expected operational environment, those requirements should be particularized.

European ABC systems have biometric modules which have common and well-defined features.

Firstly, European ABC systems may use one or a combination of three biometric modalities: facial, fingerprint and iris (as it is specified by CEN/TS 16634:2014, Personal identification — Recommendations for using biometrics in European Automated Border Control, 4.1). Therefore, there are certain environmental conditions that affect such modalities to a greater extent according to ISO/IEC/TR 19795-3.

On the other hand, European ABC systems are localized in specific environments such as airports, railway stations and sea ports (as it is mentioned in CEN/TS 16634:2014, Personal identification — Recommendations for using biometrics in European Automated Border Control, 5.1.1). As a result, it is possible to predict which are going to be the surrounding environmental conditions of the ABC systems and to analyse whether the systems work properly or not for the possible values of such conditions. If the biometric performance of European ABC systems is affected by any environmental condition and this problem is not detected in early stages, it may cause negatively effects in future.

In addition, European ABC systems are subjected to privacy and data protection legislation (e.g. Directive 95/46/EC). Therefore, their analysis should comply with the limitations imposed by EU and data protection regulations (see CEN/TS 16634:2014, Personal identification— Recommendations for using biometrics in European Automated Border Control, 5.1.3.6 and 5.1.4).

Consequently and considering the importance to accurately check the correct behaviour of the biometric recognition functionality of European ABC systems in their expected host environment, it is essential to specify the general testing methodology addressed by ISO/IEC 29197 for the characteristics and needs of European ABC systems.

1 Scope

The purpose of this document is to specify the ISO/IEC 29197 testing methodology for European ABC systems. This specification will cover the following aspects:

— environmental conditions which influence biometric modalities used for European ABC systems, i.e. temperature, humidity, illumination and noise;

— different tests that can be defined regarding European ABC systems and the procedures for defining of the evaluation conditions to analyse per each test;

— particular characteristics of European ABC systems in accordance to best practice recommendations and privacy and data protection regulations for this kind of systems in case of European deployments.

As a consequence, the proposed document will include the following aspects:

— specific requirements for planning and executing environmental testing evaluations for European ABC systems based on ISO/IEC 29197 project and the best practices recommendations provided by CEN/TS 16634 Personal identification — Recommendations for using biometrics in European Automated Border Control document;

— recommendations for the selection of the possible tests according to the specific system that is going to be evaluated;

— specific requirements to establish and measure such evaluation conditions as well as to establish the baseline performance;

— a specification of the biometric performance evaluation including requirements for test population, test protocols, data to record and test results consistent with operational deployments of European ABC systems.

2 Normative references

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

CEN/TS 16634:2014, *Personal identification - Recommendations for using biometrics in European Automated Border Control*

ISO/IEC 29197:2015, *Information technology — Evaluation methodology for environmental influence in biometric system performance*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
environmental conditions
all atmospheric parameters and other physical and chemical phenomena that can surround the European ABC system and influence on its performance

Note 1 to entry: The term "environmental conditions" entails more aspects than "ambient conditions". However, the term "ambient conditions" can also refer to conditions that occur naturally in contrast to conditions that have been induced. Therefore, it has been preferred to use the term "environmental conditions".

Note 2 to entry: It is important to distinguish two concepts related to this term:

— operational environment: the environmental conditions under which the European ABC system is expected to operate. This concept does not associate any predefined value;

— extreme conditions: environmental conditions that entail very high or very low values and may be hostile for systems operation or even human life.

3.2
environmental generator
equipment used to establish and maintain the controlled conditions of the test (e.g. an air conditioning system)

3.3
evaluation conditions
each of the evaluations carried out in a different evaluation environment to assess the performance of European ABC systems in one or more specific environmental conditions

3.4
evaluation configuration
physical layout of the environment in which the European ABC is going to be tested including the necessary equipments for performing tests

3.5
evaluation environment
environment in which the biometric system is evaluated considering the environmental conditions and the evaluation configuration

3.6
instrument
calibrated equipment used to measure and/or record environmental parameters (e.g. a thermometer)

3.7
parties involved in the evaluation
entities or organizations which are interested in the evaluation and have responsibilities in the evaluation process

Note 1 to entry: These entities are basically two: the test laboratory which is going to conduct the evaluation and the developer or customer who request to carry out the evaluation. In case the developer is different from the customer (e.g. an end-user requesting to know the performance of a commercial European ABC system), a third entity is added to the number of parties.

Note 2 to entry: Test subjects are not considered a party of the evaluation although they have to take part in it.

3.8
reference evaluation environment
REE
evaluation environment in which the European ABC system is analysed to obtain baseline performance metrics for making comparisons

3.9
target evaluation environment
TEE
evaluation environment in which the European ABC system is analysed to obtain performance metrics for studying the influence of certain environmental conditions, by comparing with the results obtained at the REE

4 Symbols and abbreviations

For the purposes of this document, the following symbols and abbreviations apply.

ABC Automatic Border Control

REE Reference Evaluation Environment

TEE Target Evaluation Environment

5 Overview of evaluating the influence of ambient conditions in European ABC systems

5.1 Introduction to ISO/IEC 29197 evaluations

ISO/IEC 29197 defines a general evaluation methodology for analysing the influence of environmental conditions on biometric systems performance. The model established for this evaluation methodology entails to conduct an “end-to-end” ISO/IEC 19795-1:2006 biometric performance evaluation, i.e. a scenario evaluation or an operational evaluation in one or more predefined environments.

During the biometric performance evaluation in each evaluation environment, test subjects interact with the biometric system many times as it was required and both, the biometric system recognition outcomes and environmental conditions are recorded at the same time. From such results, it is possible to determine the biometric system performance (i.e. error rates and throughput rates) for the specific evaluation conditions.

For scenario evaluations, ISO/IEC 29197 addresses to conduct two (or more) scenario test: one in a Reference Evaluation Environment (REE) and another (or others) in the Target Evaluation Environments (TEEs). The evaluation environments will be identical, including the same test subjects, following the same procedures, except for the environmental conditions. The environmental conditions are specific of each evaluation environment. As a consequence, the comparison between results of the REE and the TEEs allows knowing whether the biometric system is influenced, or not, by any environmental parameter, as well as quantifying this influence. A schema of the evaluation methodology model is shown in Figure 1.

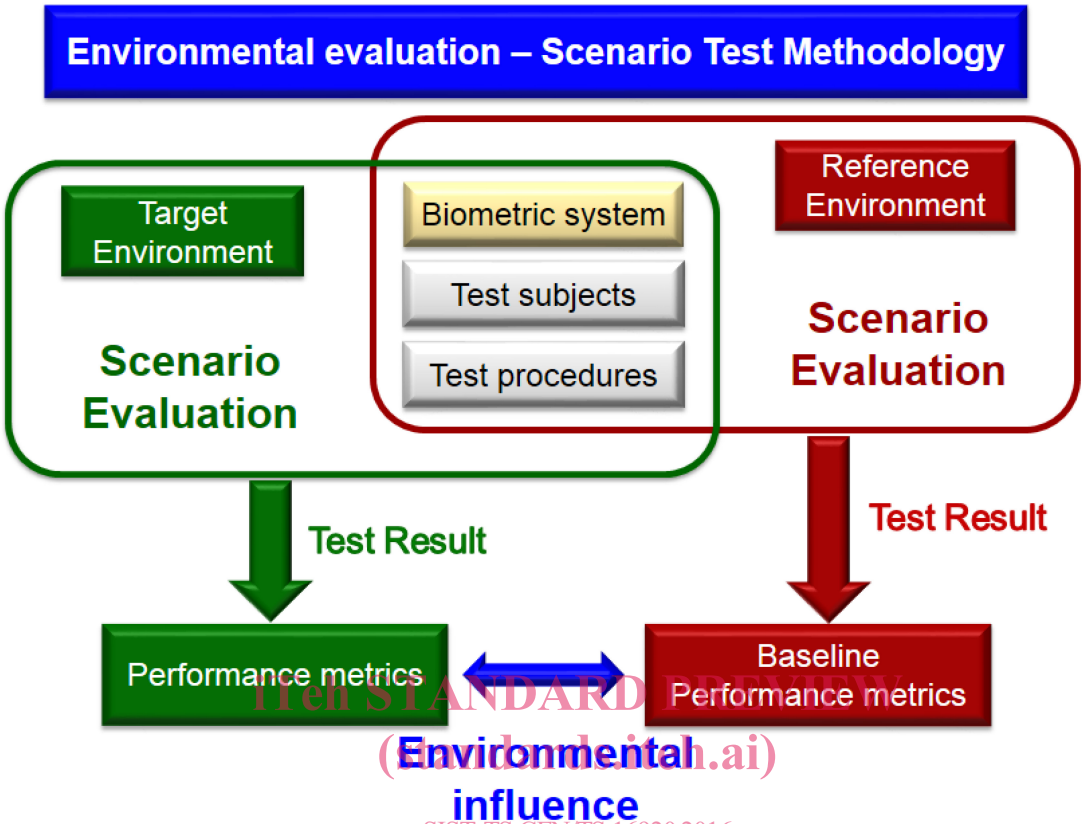

Figure 1 — Evaluation model for scenario evaluations

In case of an operational test, ISO/IEC 29197 addresses to determine a specific environment and select one or more environmental parameters to assess. Then an operational test is to be conducted in this environment. This approach provides insights into the degree to which biometric systems are influenced by the environmental conditions analysed for this particular environment.

5.2 Application of the ISO/IEC 29197 evaluation methodology to European ABC systems

5.2.1 General

The application of the ISO/IEC 29197 evaluation methodology to analyse the influence of the environmental conditions on the biometric performance of European ABC systems shall consider the special characteristics of this kind of systems and their intended operational environment. The following clauses describe these characteristics and relate to the relevant section of ISO/IEC 29197.

5.2.2 Environmental parameters influencing biometric performance of the European ABC systems

The most relevant parameters that influence the biometric performance of European ABC systems are the following:

— temperature and humidity. These parameters can influence to European ABC systems which use fingerprint biometrics;

NOTE 1 CEN/TS 16634:2014, Personal identification — Recommendations for using biometrics in European Automated Border Control addresses in 5.3 that the quality of an acquired image finger depends on the skin condition and also offers recommendations in order to avoid the halo effects in the captured fingerprint images when there is a difference between the finger and the sensor surface temperatures.

— illumination: illuminance and irradiance. This parameter could affect the three biometric modalities that can be used for a European ABC system: face, fingerprint and iris (See CEN/TS 16634 Personal identification- Recommendations for using biometrics in European Automated Border Control addresses in 4.1).

NOTE 2 CEN/TS 16634:2014, Personal identification — Recommendations for using biometrics in European Automated Border Control addresses in 5.2.4 the following: “Sunlight will vary both on a daily and on a seasonal basis. It is recommended to test that the system will perform adequately under different sunlight conditions. It is recommended that direct sunlight is avoided, and environmental illumination is controlled for best capture results”.

As a consequence, the analysis of the influence of environmental conditions in case of European ABC systems shall include a test (or tests) that covers one or more of these environmental parameters. For each test, the evaluation conditions specification addressed by ISO/IEC 29197 evaluation methodology shall be in accordance with the environmental parameter to study in such a test.

5.2.3 Specific characteristics of biometric modules of the European ABC systems

Firstly, regarding the biometric functions, European ABC systems are biometric systems where the verification process is composed of two separate steps: capture and verification sub-processes (See CEN/TS 16634:2014, Personal identification — Recommendations for using biometrics in European Automated Border Control, 5.1.2). Enrolment is usually a process that is carried out in previous steps, with a careful control of the overall process and usually at indoor conditions. Therefore, the application of ISO/IEC 29197 evaluation methodology to this kind of systems should not cover the enrolment process. If this process is necessary for the tests because it has not been done before, it should be conducted considering the standard conditions and only at REE in case of biometric performance scenario evaluations.

Also, there are two general types of European ABC systems in relation to their use of the biometric references, token-based or tokenless. The verification sub-process of a token based ABC system entails a verification (i.e. a 1:1 comparison) whereas the verification sub-process of a tokenless based ABC systems entails an identification (i.e. a 1:N comparison). As a result, the specification of the ISO/IEC 29197 methodology to these systems considers either verification or identification mechanisms.

Secondly, regarding the physical and user interface features, European ABC systems are biometric systems which may have different topologies and should follow certain recommendations for improving the quality of the acquired biometric samples and its usability (See CEN/TS 16634:2014, Personal identification — Recommendations for using biometrics in European Automated Border Control, 5.1 to 5.4). The most relevant are related to the following aspects:

— localization of the capture unit;

— user guidance (i.e. visual and audible instructions and indications, etc); and

— feedback (i.e. displays, LEDs, etc).

Therefore, when applying the ISO/IEC 29197 evaluation methodology to European ABC systems, requirements for the test environment and for the guidance and training of the test crew shall be defined in accordance with these characteristics and recommendations.