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Information technology — 3D printing and scanning — Data standard operating procedure (SOP)

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Foreword

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Introduction

This document was developed in response to the quality management needs of 3D printing and scanning technology, with the aim of taking full advantage of information and communication technology (ICT) in this context.

However, there is currently no standardized evaluation procedure for the process of turning scanned data into consistent and accurate 3D printed objects, making continuous quality assessment and improvement activities impossible. Issues with precision evaluation and inaccurate modelling from 3D scanned data exist, but no agreed standard specifies practically acceptable measurement accuracy or an evaluation process.

Artificial intelligence/machine learning (AI/ML) technology can be used for generating and optimizing 3D models from 3D scanned data, particularly for enhancing design accuracy and efficiency. For the training data of an ML-based model, the collection of as much data as possible (big data) is considered to improve the performance of the model. However, it is not practical to use big data as test data. Therefore, minimal requirements are necessary for achieving rigorous and comprehensive evaluation.

In this context, this document describes the standard operating procedure (SOP) and necessary requirements for curation and quality control of test data for evaluation of modelling from 3D scanned data.

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Information technology — 3D printing and scanning — Data standard operating procedure (SOP)

1 Scope

This document describes a standard operating procedure (SOP) for the curation and quality control of test data, consisting of 3D scanned data and its corresponding label data, for the evaluation of modelling from 3D scanned data.

This document classifies the main task phases and defines the required tasks in each phase of the 3D scanned and labelled data SOP.

This document defines essential requirements for test data for evaluating modelling from 3D scanned data and describes how to verify conformance to these requirements.

2 Normative references

There are no normative references in this document.

3 Terms, definitions and abbreviated terms

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 Terms and definitions

3.1.1
measure
variable to which a value is assigned as the result of measurement

Note 1 to entry: The plural form “measures” is used to refer collectively to base measures, derived measures, and indicators.

[SOURCE: ISO/IEC/IEEE 15939:2017, 3.15]

3.1.2
measure
make a measurement

[SOURCE: ISO/IEC/IEEE 15939:2017, 3.16]

3.1.3
measurement
set of operations having the object of determining a value of a measure

[SOURCE: ISO/IEC/IEEE 15939:2017, 3.17, modified — Note 1 to entry has been removed.]

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3.1.4
process
system of activities, which uses resources to transform inputs into outputs

[SOURCE: ISO/IEC 25000:2014, 4.22]

3.1.5
annotation
process of adding additional information to a data object to improve its interpretation, organization or use

3.1.6
oversampling
method of increasing the number of observations in a dataset by adding additional data points

3.1.7
standard operating procedure
SOP
authorized, documented procedure, or set of procedures, work instructions and test instructions

[SOURCE: ISO 15378:2017, 3.7.10]

3.2 Abbreviated terms

AI	artificial intelligence
CNN	convolutional neural network
CT	computed tomography
DICOM	digital imaging and communications in medicine
EHR	electronic health records
GAN	generative adversarial network
MAE	mean absolute error
ML	machine learning
MSE	mean squared error
PACS	picture archiving and communication system
SOP	standard operating procedure

4 3D scanned and labelled data standard operating procedure (SOP)

4.1 General requirements

4.1.1 Entity

An entity may act as a data provider, data management institution, or software developer, and represents a legal or organizational body as commonly defined in ISO data-related standards. An entity implementing the SOP specified in this document shall document the test data quality assurance procedures and maintain its effectiveness in accordance with the requirements of the SOP. The entity shall establish, implement and maintain any requirement, procedure, activity or arrangement required to be documented by this SOP.

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