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Digital validation by effective use of simulation

Validation numérique par utilisation efficace de la simulation

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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This document was prepared by Technical Committee ISO/TC 184, *Automation systems and integration*, Subcommittee SC 4, *Industrial data*.

Any feedback or questions on this document should be directed to the user's national standard body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Precision and high-performance electrical products can be defined as products that integrate mechanical, electrical/electronic, and software technologies. These digitally integrated products are expected to simultaneously achieve high functionality and low cost. In order to meet these needs, computer technology, which enables designing of highly functional products in a limited period of time, is necessary. Effective measures to realise such design can include active use of computer simulations from the functional design stage upstream of a design process, evaluating aspects of the feasibility of the expected function, and narrowing the appropriate design solutions at an early stage.

This document examines the business requirements for using simulation in the functional design process and identifies the key technical capabilities needed to satisfy those requirements. Based on a comparison with the capabilities of current technologies validated through research and experimental examples, this document identifies a number of digital validation technologies which need to be developed in order to meet future business needs, and the associated standardization requirements.

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Digital validation by effective use of simulation

1 Scope

This document examines the standardization requirements for the necessary digital validation technology for improving design efficiency by effectively utilizing simulation data at the functional design stage of digitally integrated products.

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
digitally integrated product
precision and high-performance product that integrates mechanical, electrical/electronic, and software technologies

3.1.2
model-based development
MBD
mathematical and visual method of addressing problems associated with designing complex control-, signal-processing and communication systems

3.1.3
functional mock-up interface
FMI
standardized interface used in computer simulations to develop complex cyber-physical systems

Note 1 to entry: See FMI version in Reference [3].

3.1.4
functional mock-up unit
FMU
component that implements the *functional mock-up interface* (3.1.3)

3.1.5
co-simulation
two or more simulation functions interacting to simulate different aspects of a digitally integrated product

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3.1.6
simulation time interval
Δt
simulation time step size in a dynamic simulation

3.1.7
supplier
manufacturer that supplies parts to *original equipment manufacturers* (3.1.8)

3.1.8
original equipment manufacturer
OEM
company that manufactures finished or semi-finished products to be sold by another manufacturer

3.1.9
machine-readable data
data in a format that can be automatically read and processed by a computer

Note 1 to entry: Machine-readable data shall be structured data.

3.1.10
human-readable data
encoding of data or information that can be naturally read by humans

Note 1 to entry: In computing, human-readable data is often encoded as ASCII or Unicode text, rather than as binary data.

3.1.11
reduced order model
ROM
mathematical model with reduced complexity for use in digital simulations

3.1.12
finite element analysis
method for solving problems of engineering and mathematical models

3.1.13
1D CAE
multi-domain systems simulation combined with controls

3.2 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply:

CAD computer aided design

CAE computer aided engineering

3.3 Trademarks

For the purposes of this document, the following trademarks are used. The reason that these trademarks have been used in this document is given in the footnotes.

Modelica®[1)]: An object-oriented, declarative, multi-domain modelling language for component-oriented modelling of complex systems, e.g. systems containing mechanical, electrical, electronic, hydraulic, thermal, control, electric power or process-oriented subcomponents.

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