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Condition monitoring and diagnostics of machine systems — Data processing, communication and presentation —

Part 4: **Presentation**

Surveillance et diagnostic d'état des machines — Traitement, échange et présentation des données —

Partie 4: Présentation

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Foreword

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 108, *Mechanical vibration, shock and condition monitoring*, Subcommittee SC 5, *Condition monitoring and diagnostics of machine systems*.

ISO 13374 consists of the following parts, under the general title *Condition monitoring and diagnostics of machine systems — Data processing, communication and presentation*:

— *Part 1: General guidelines*

— *Part 2: Data processing*

— *Part 3: Communication*

— *Part 4: Presentation*

Introduction

The various computer software systems written for condition monitoring and diagnostics (CM&D) of machines that are currently in use cannot easily exchange data or operate in a plug-and-play fashion without an extensive communication infrastructure. The lack of an all-purpose communication system makes it difficult to integrate various CM&D sub-systems and provide a unified view of the condition of machinery to users. The intent of ISO 13374 is to provide the basic requirements for open CM&D software architecture in order to allow CM&D information to be processed, communicated, and displayed by various software packages independent of platform-specific or hardware-specific protocols.

ISO 13374-1 gives a general overview of data processing, communication, and presentation. ISO 13374-2 provides greater details into data processing methodology and requirements that should be present in today's software-enhanced systems. ISO 13374-3 provides the requirements of the data communication architecture for open CM&D systems. This part of ISO 13374 provides the requirements for the presentation of CM&D information for diagnostic analysis and decision support.

Condition monitoring and diagnostics of machine systems — Data processing, communication and presentation —

Part 4: Presentation

1 Scope

This part of ISO 13374 details the requirements for presentation of information for technical analysis and decision support in an open architecture for condition monitoring and diagnostics. Software design professionals need to present diagnostic/prognostic data, health information, advisories, and recommendations on computer displays and in written report formats to end-users. This part of ISO 13374 provides standards for the display of this information in CM&D 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.

ISO 13372, *Condition monitoring and diagnostics of machines — Vocabulary*

ISO 13374-1, *Condition monitoring and diagnostics of machines — Data processing, communication and presentation — Part 1: General guidelines*

ISO 13374-2, *Condition monitoring and diagnostics of machines — Data processing, communication and presentation — Part 2: Data processing*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 13372 apply.

4 Open CM&D information architecture presentation requirements

4.1 Overview

An information architecture describes all the data objects and their properties (or attributes), data types, data object relationships, reference data, and data documents for a given system or application. As specified in ISO 13374-2, an open CM&D information architecture describes the content for each of the five layers shown in Figure 1.

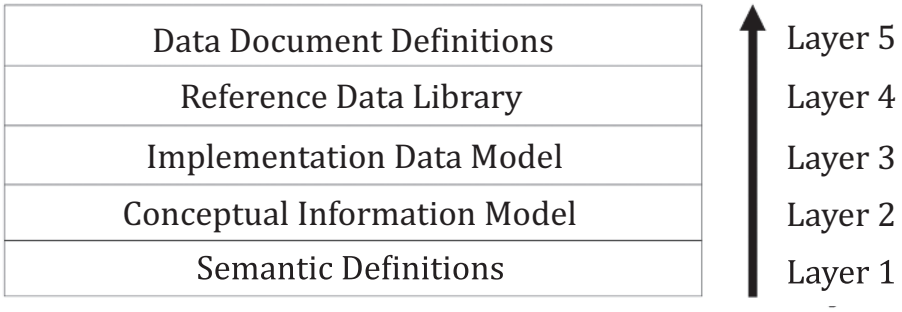

Figure 1 — CM&D information architecture layers (from ISO 13374-2:2007)

4.2 Basic requirements

To support the continuous improvement of end-user interfaces, including graphical user interfaces (GUIs), displays, and reports, an open CM&D information architecture shall separate presentation and display functionality from the information content and logic. Presentation interface functionality is often described using templates which specify the method of formatting end-user displays and reports and allow customization. The presentation interfaces in an open CM&D information architecture shall communicate with a layer 5 data document definition and comply with a defined layer 4 reference data library. Implementations will vary according to application requirements.

4.3 Authentication and authorization requirements

In computing, authentication is the mechanism by which a software system may securely identify who is using the system. Authorization, by contrast, is the mechanism by which a system determines what level of access and functionality a particular authenticated user should have to secure resources controlled by the system. An open CM&D information architecture shall support user authentication and should support user authorization. The architecture shall also specify the supported methods utilized for authentication and authorization, if authorization is supported.

4.4 Internationalization and localization requirements

In computing, internationalization and localization are the mechanisms by which a software system can readily adapt to different languages, time zones, regional differences, and technical requirements of an end-user population. Internationalization is the process of designing a software application so that it can be adapted to various languages and regions without engineering changes. Localization is the process of adapting internationalized software for a specific region or language by adding locale-specific components and translating text. An open CM&D information architecture shall specify the supported methods for end-user internationalization and localization.

4.5 User tracking requirements

The tracking of user interactions with a software system is often necessary to meet regulatory requirements. An open CM&D information architecture should specify the supported user tracking methodology and the methods of reporting on this information.

4.6 User configuration requirements

Software systems often permit users to configure a system to meet their specific needs. This configuration information should then be captured and utilized during each subsequent user session. An open CM&D information architecture should specify the supported user configuration options.

5 Open CM&D processing architecture presentation requirements

5.1 Overview

A processing architecture describes the interactions or transactions between modules internal to the software system itself, external from end-user interactions, or external from other software system interactions. As specified in ISO 13374-1, an open CM&D processing architecture specification shall utilize the processing architecture shown in Figure 2.

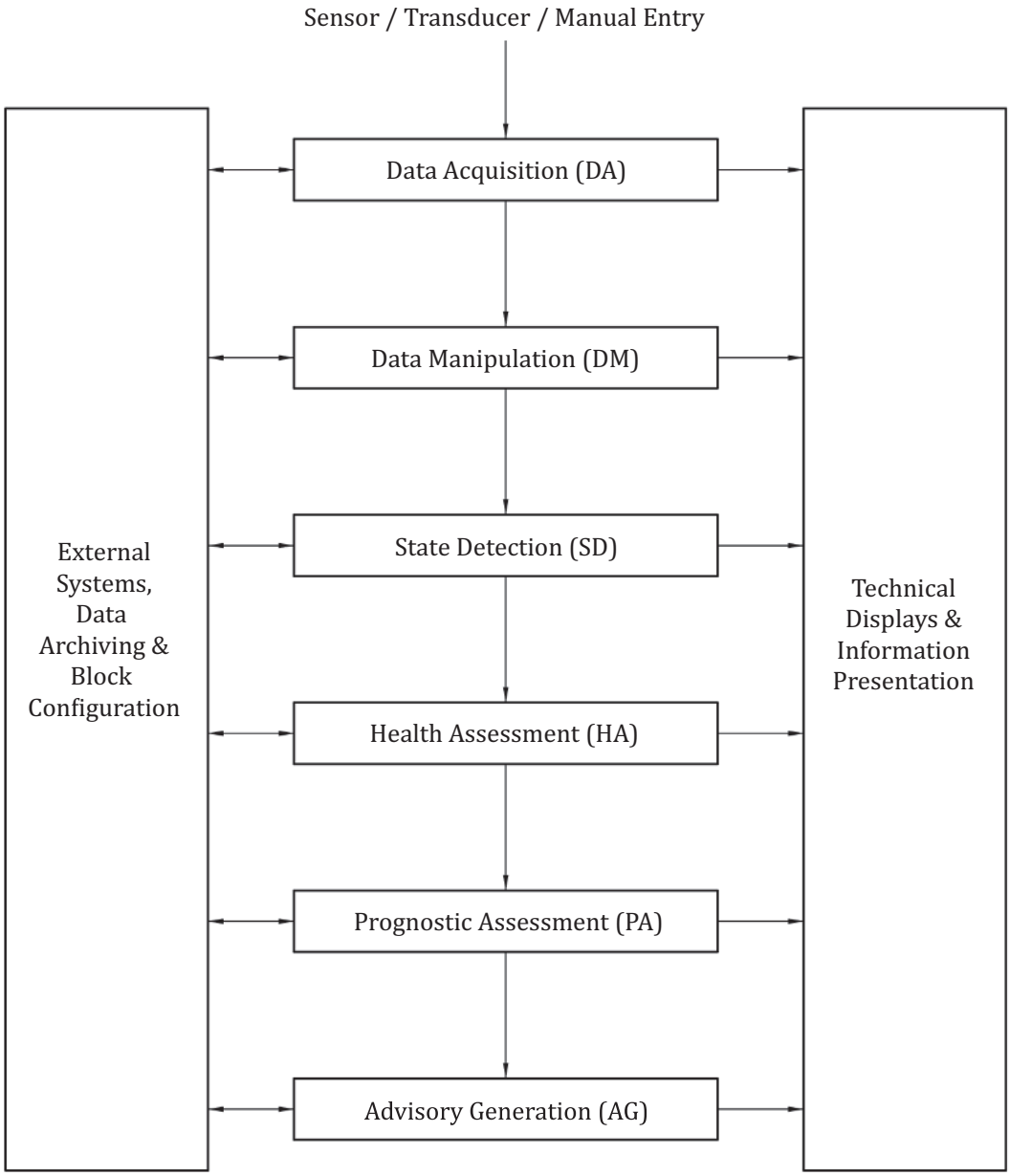

Figure 2 — Data processing block diagram (from ISO 13374-1:2003)

This architecture is defined as blocks of data processing functionality. After each block in the system has been properly configured, the basic data are converted into digital form in data acquisition (DA) and are processed in various ways as they are transformed into actionable information, resulting in advisory generation (AG). As the processing progresses from DA to AG, data from preceding blocks need to be transferred to subsequent blocks and additional information acquired from or sent to external systems. Similarly, as the data evolve into information, both standard technical displays and graphical presentation formats are required. This part of ISO 13374 defines the technical displays (TD)

and information presentation (IP) requirements for any open CM&D processing architecture. With such an approach, the data processing blocks from various suppliers can be integrated into a complete, functional system.

Systems often start with data acquisition in embedded environments with real time constraints. Information is then processed and refined in subsequent system blocks and made available for health assessment, prognostics, and advisory generation. These requirements currently lead to disparate technology choices. The presentation software displaying outputs from the "information-oriented" presentation blocks (HA, PA, and AG) are often different than those used in the "data-oriented" presentation blocks (DA, DM, and SD).

5.2 Technical display (TD) module requirements

The TD modules in an open CM&D processing architecture provide the diagnostic displays and reports required for an end-user to analyse the data coming from the monitoring technologies the system is required to support. Each TD module shall document and optionally display their refresh method(s), normal refresh rates, and time of last update. Modules should also include rate of change information, e.g. graphically through the use of trend plotting.

5.3 Information presentation (IP) module requirements

The IP modules in an open CM&D processing architecture provide an end-user with intelligent, actionable information about the current and future health of a machine with recommended advisories for subsequent actions. Both human and automated agents may be utilized and each agent's output may differ from analysing equivalent inputs. To provide unambiguous context, each IP module shall have a mechanism to identify the source intelligent agent "analyst", the source condition monitoring technologies utilized for the analysis, and the time of analysis. Each IP module shall document and optionally display their refresh method(s), normal refresh rates, and time of last update.

In presentations of the overall health status of a machine to a non-technical audience, an open CM&D processing architecture should utilize the following standard terminology:

Undetermined – Condition indicators have not been reviewed.

Good – All condition indicators monitored are within normal limits.

Fair – Certain condition indicators are abnormal and warrant continued monitoring, but do not appear to significantly increase the likelihood of operational failure.

Serious but stable – Certain condition indicators are abnormal with an increased likelihood of operational failure. These abnormal indicators, however, are currently stable.

Serious – Certain condition indicators are abnormal and worsening with an increased likelihood of operational failure.

Critical but stable – Certain condition indicators are abnormal with a significantly increased likelihood of operational failure. These abnormal indicators, however, are currently stable.

Critical – Certain condition indicators are abnormal and worsening with a significantly increased likelihood of operational failure.

Bibliography

[1] ISO 8601, *Data elements and interchange formats — Information interchange — Representation of dates and times*

[2] ISO/IEC 19501, *Information technology — Open Distributed Processing — Unified Modeling Language (UML) Version 1.4.2*

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