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IEEE Standard Framework for Prognostics and Health Management of Electronic Systems

IEEE Reliability Society

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IEEE Standard Framework for Prognostics and Health Management of Electronic Systems

Sponsor

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IEEE Reliability Society

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Abstract: Information for the implementation of prognostics and health management (PHM) for electronic systems is described in this standard. A normative framework for classifying PHM capability and for planning the development of PHM for an electronic system or product is also described in this standard. Manufacturers and end users can use this standard for planning the appropriate prognostics and health management techniques to implement and the associated life cycle operations for the system of interest.

Keywords: classification of electronics, electronic systems, health management, IEEE 1856™, implementation in electronics, PHM definitions, PHM functional model, PHM Metrics, PHM operational model, prognostics

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Introduction

This introduction is not part of IEEE Std 1856-2017, IEEE Standard Framework for Prognostics and Health Management of Electronic Systems.

Prognostics and health management is an approach to protect the integrity of equipment and avoid unanticipated operational problems leading to mission performance deficiencies, degradation, and adverse effects on mission safety. Researchers and application developers have developed a variety of approaches, methods, and tools that are useful for these purposes, but applications to real-world situations may be hindered by the lack of visibility into these tools, the lack of uniformity in the application of these tools, and the lack of consistency in their demonstrated results. There is a need for documented and favorable guidance that will encourage practitioners to invest the resources necessary to put these techniques into practice. While specific application domains often require customized treatment for PHM application development, some core principles apply to all. This document describes those core principles and exemplifies their application within the electronics domain.

While this standard presents the normative requirements for a PHM system, Annex A will act as a guide for those who wish to implement prognostics and health management for complex electronic components and systems. However, it is possible to extend the core principles described in this document to other application domains, such as systems comprising electro-mechanical, mechanical, and structural elements.

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IEEE Standard Framework for Prognostics and Health Management of Electronic Systems

1. Overview

1.1 Background

The goal of this standard is to provide information for the implementation of prognostics and health management (PHM) for electronic systems. Within the system health management community, there are several different interpretations of the term *prognostics*, such as predictive analysis, reliability prediction, damage accumulation prediction, or condition-based prediction. This standard can be used by manufacturers and end users for planning the appropriate prognostics and health management methodology to implement and the associated life cycle operations for the system of interest. This standard aims to provide practitioners with information that will help them make business cases for PHM implementation and select proper strategies and performance metrics to evaluate PHM results. The overall aim is to provide a broad overview of PHM while at the same time provide significant details to assist the practitioner in making appropriate decisions.

1.2 Scope

This standard covers all aspects of PHM of electronic systems, including definitions, approaches, algorithms, sensors and sensor selection, data collection, storage and analysis, anomaly detection, diagnosis, decision and response effectiveness, metrics, life cycle cost of implementation, return on investment, and documentation. This standard describes a normative framework for classifying PHM capability and for planning the development of PHM for an electronic system or product. The use of this standard is not required throughout the industry[1]. This standard provides information to aid practitioners in the selection of PHM strategies and approaches to meet their needs.

1.3 Purpose

The purpose of this standard is to classify and define the concepts involved in PHM of electronic systems and to provide a standard framework that assists practitioners in the development of business cases and the selection of approaches, methodologies, algorithms, condition monitoring equipment, procedures, and strategies for implementing PHM of electronic systems.

[1]At the time of adoption of this standard, there is no known external requirement to use a PHM standard. There is no external agency or regulatory body that is promoting the application of this standard. It is expected that after the approval of this standard, the industry will start using this standard to generate the requirements of PHM systems that will be included in their particular system or products/applications.