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IEEE Recommended Practice for Signal Treatment Applied to Smart Transducers

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Sensor Technology Committee
and the
Signals and Systems in Measurement Committee

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IEEE Std 21451-001™-2017

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Abstract: Signal processing algorithms and data structure are defined in this recommended practice in order to share and to infer signal and state information of an instrumentation or control system. These algorithms are based on the signal and transducers attached to the system. This recommended practice also defines a set of transducer signal treatment services based on signal treatment algorithms as application programming interface (API), which is used for applications to use or call these transducer signal treatment services.

Keywords: IEEE 1451™, IEEE 21451™, oversampling, segmentation, serial, signal shape analysis, smart actuator, smart filtering, smart sensor, smart transducer, time-domain signal analysis

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Introduction

This introduction is not part of IEEE Std 21451-001-2017, IEEE Recommended Practice for Signal Treatment Applied to Smart Transducers.

IEEE Std 21451-001, a recommended practice, defines signal processing algorithms and data structure in order to share and infer signal and state information of instrumentation or control systems. These algorithms are based on acquired signals and the transducers attached to the systems. This recommended practice also defines the commands and responses for requesting information and algorithms for shape analysis, such as exponential, sinusoidal, impulsive noise, noise, and tendency.

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IEEE Recommended Practice for Signal Treatment Applied to Smart Transducers

1. Overview

1.1 Scope

This recommended practice defines signal processing algorithms and data structure in order to share and to infer signal and state information of an instrument or control system. These algorithms are based on their own signal and also on the transducers attached to the system. The recommended practice also defines the commands and replies for requesting information and algorithms for shape analysis such as exponential, sinusoidal, impulsive noise, noise, and tendency.

1.2 Purpose

The purpose is to define a standardized and universal framework that allows smart transducers to extract features of the signal being generated and measured. With the definition of these practices, the raw data can be converted into information and then into knowledge. In this context, knowledge means understanding of the nature of the transducer signal. This understanding can be shared with the system and other transducers in order to form a platform for sensory knowledge fusion.

1.3 Conformance

Conformance to IEEE Std 21451-001™ requires that all non-optional clauses be implemented in the vendor device.

Several keywords are used to differentiate among various levels of requirements and optionally, as follows:

shall: The key word “shall” indicates a mandatory requirement. Designers are required to implement all such mandatory requirements to promote interoperability with other products that conform to the specifications for IEEE Std 21451-001.

recommended: Recommended is a key word indicating flexibility of choice with a strong preference alternative. The word “should” has the same meaning.

should: Should is a key word indicating flexibility of choice with a strong preference alternative. The phrase “it is recommended” has the same meaning.

may: May is a key word that indicates flexibility of choice with no implied preference.