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David Lira Nuñez , Milton Borsato

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## An Ontology-based Model for Prognostics and Health Management of Machines

David Lira Nuñez<sup>\*1</sup>, Milton Borsato<sup>2</sup>

<sup>\*1</sup>Department of Mechanical Engineering, Universidade Tecnológica Federal do Paraná, Guarapuava, Paraná, Brazil

[nunez@utfpr.edu.br](mailto:nunez@utfpr.edu.br)<sup>1</sup>

Phone: +55 4298701462

<sup>2</sup>Department of Manufacturing Engineering, Universidade Tecnológica Federal do Paraná, Curitiba, Paraná, Brazil

[borsato@utfpr.edu.br](mailto:borsato@utfpr.edu.br)<sup>2</sup>

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### ABSTRACT

Recent advances in smart manufacturing open up opportunities in industrial support, specifically in maintenance and physical asset management. This trend allows data collected from machines in operation to interact with cyberspace computers through a communication network, thus forming the concept of cyber-physical systems (CPS). Besides, rapid advances in information and communications technologies provide approaches for analysing data, in an increasingly rapid, autonomously, ubiquitous and in real time way, providing information that assists humans in making better decisions. In this sense, Prognostics and Health Management (PHM) of machines, is indicated as a promising application of Smart Manufacturing in the CPS context, demanding the standardization of concepts, terms, and a formal implementation of data collection and treatment. For this purpose, the Design Science Research (DSR) methodology is used in this paper, encompassing international standards, the unified 5-level architecture, ontology, and dependability for failure analysis in mechanical components. In addition, the creation of an ontology using the OWL 2 language was guided by the ‘Ontology Development 101’ approach. A pilot test was carried out using a centrifugal pump to demonstrate the applicability of the ontology. Thus, the ontology is evaluated in Protégé, which allow queries with SPARQL language to provide future decision-making for condition-based maintenance in real processes.

Keywords: cyber-physical systems; prognostics health management; dependability analysis; ontology engineering.

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