MAINTENANCE IN SHIPS - A DYNAMIC CONCEPT

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ABSTRACT

Maintenance procedures must be implemented to maintain ships' equipment and systems functioning with good performance. Nowadays, it's almost impossible to break maintenance from data analysis. Through an implemented maintenance system, an organization may be able to establish a dynamic maintenance management. Crossing collected data from working systems and integrating it in a risk matrix implementing a Fuzzy methodology will probably support a decision for maintenance intervention. This investigation aims to support the application of a Fuzzy methodology in a maintenance dynamic concept. It presents a methodology for implementing this decision support method.

Keywords: maintenance, fuzzy methodology, decision, equipment.

INTRODUCTION

Giving the advanced technology and the search for optimization and high performance, equipment's are now connected to remote systems and networks that allows sharing information with other members of an organization. This instrumented equipment's, which produces amounts of data – Big Data, can allow the implementation of a dynamic maintenance considering the application of algorithms.

Big data may have three characteristics: volume, velocity, and variety (Zerhari, et al., 2015) suggested various technics of treating and cluster data considering simple machine clustering and multimachine. To limit this data for a final support decision matrix, other various methodologies should be applied to filter it.

Creating a Fuzzy Logic through other methodologies it is a challenge that must be built through accurate methods. Various fuzzificated databases can feed a risk matrix, the risk results may be correspondent to maintenance solutions considering various defined possibilities.

Before applying directly, the Fuzzy Logic, the filter methodologies should be applied, for example:

- Clustering;
- Artifitial Neural Network;
- Modified control charts.

Fahad et al (2014) present an overview of five classes clustering algorithms: partitioning-based, hierarchical-based, density-based, grid-based, model-based, and the respective considered subclasses. In this article we use it to select the significant data that interested in build the fuzzification system.

Artificial neural network (ANN) models are applied in various multi-disciplinary environments, such as product and process design (Mumali, 2022), for support decision-making in processes. It processes various information through various information nodes.

To monitoring vibration values before fuzzification we had chosen the modified EWMA (EWMAM) which is a special chart that have enhanced capacity for "detect small changes and causes" (Lampreia, 2013) (Lampreia, et al., 2018).

RESULTS AND CONCLUSIONS

In this study, considered an equipment and its data. It was considered various sub-databases which data is filtered with methodologies like clusters, ANN and modified control charts.

The sub database´s that will feed the Fuzzy Matrix are: the plan maintenance system, the information of maintenance intervention, the time functioning, and the data from condition control.

It was considered that Fuzzy Logic may be applied in a concept of dynamic maintenance.

By the application of algorithms in an implemented maintenance system, may lead to maintenance optimization and consequently reducing cost in material and personnel.

REFERENCES

[1] Fahad, A., Alshatri, N., Tari, Z., Alamri, A., Khalil, I., Zomaya, A., . . . Bouras, A. (2014). A Survey of Clustering Algorithms for Big Data: Taxonomy and Empirical Analysis. Emerging Topics in Computing Journal, 2(3), 267-279.

[2] Lampreia, S. (2013). Manutenção Baseada no Estado de Condição. Uma Aboradgem Utilizando Cartas de Controlo Modificadas. Monte da Caparica: Faculdade de ciências e Tecnologia da Universidade nova de Lisboa.

[3] Lampreia, S., Requeijo, J., Dias, J., Vairinhos, V., & Barbosa, P. (2018). Journal of Quality in Maintenance Engineering. Condition monitoring based on modified CUSUM and EWMA control charts, 24(1), 119-132.

[4] Mumali, F. (2022). Artificial neural network-based decision support systems in manufacturing processes: A systematic literature review. Computers & Industrial Engineering, 165(107964), 1-20.

[5] Zerhari, B., Lahcen, A., & Mouline, S. (2015). Big Data Clustering: Algorithms and Challenges. Tetuan - Morocco: ResearchGate.