Identifiant de la contribution : **202** Type : **non spécifié**

”DATA1#6 - Ball bearing diagnosis using a homogenous hybrid database in a supervised machine learning”

mercredi 12 juillet 2023 15:40 (20)

Digital twins (DT) are often described as a virtual and dynamic representation of a system. They guarantee interaction between physical and virtual spaces. In the context of maintenance 4.0, the lack of historical data can be caused by an impossible instrumentation for complex systems. To face it, DT offers the possibility to simulate several operating modes which can serve for a diagnostic. This operation can be made by using machine learning algorithm (MLA) through a diagnosis by classification. But the challenge is to identify the best use of both data historical and simulated on a hybridisation database to make the most reliable diagnosis. In this paper, a digital twin combining a discrete element model (DEM) and a finite element model (FEM) is developed to generate data with an outer race default signature. These generated data with five sizes of defaults are also measured on the test bench. According to a percentage, historical data are used to build the homogenous hybrid database. Two MLAs (Support Vector Machines and K-Nearest Neighbours) are used to perform a classification by training the homogenous hybrid database and the test is realised by using the rest of historical data. The results of this approach show a better reliability than existing methods on the tested datasets also it’s allowed to evaluate the contribution of historical data in homogenous hybridisation process.

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Classification par session : Survishino 10 / Data driven condition monitoring 1