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An IoT-based Failure Prediction System Using Machine Learning

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ABSTRACT

Machine condition checking has long been in innovation, designed to advance machine execution and limit unplanned personal time. Since the appearance of the IoT, however, there has been an evolution around monitoring the condition of the machine. An IoT-based model for machine equipment conducts condition testing with AI, computerizes IoT and adds knowledge to machine condition testing. This paper studies different techniques for machine tools condition analysis and classification. In this exam, different techniques are used.

Keywords : Machine tools condition analysis, Machine learning, IoT, Sound data.

INTRODUCTION

Machine condition monitoring is a system for monitoring the condition of a machine for the purpose of monitoring mechanical wear and failure. Vibration, machine noise and temperature measurements are often used as key indicators of machine condition. The data components provide health information about the system and help to quickly identify defects in the machine, preventing unexpected failures and costly and time-consuming repairs. With the development of science, technology and economic environment, the production process of modern industry is becoming more and more continuous and integrated. To meet these characteristics, equipment efficiency is required, but its impact on the entire production chain can also lead to further losses to the economy. For this purpose, companies attach great importance to equipment maintenance and this segment includes a lot of infrastructure, physical resources and capital. Unfortunately, ineffective maintenance leads to wastage of large amount of investment in this area. Many researchers are exploring condition-based monitoring (CBM). CBM is a unique and innovative maintenance strategy based on actual condition maintenance of equipment to avoid unnecessary maintenance, prevent catastrophic defects, increase equipment reliability and improve maintenance efficiency [1].

For any company or industry, the goal of plant maintenance is always to improve uptime and productivity through better preventive or predictable maintenance and diagnostic status tracking, so that targeted objectives can be met with increased revenue. This is a standard approach applied in many industry sectors, but faces Volume 6, Issue 3, May-June 2020. http://ijsrcseit.com Pvt. A. V. Devarankar and others Int J Science CSE and IT, May-June 2020; 6 (3): 664-667 665 Some problems such as extremely limited data storage space and especially scalability when multiple machines are operated in different locations [3].

Industrial Internet of Things or IoT, uses the Internet of Things platform to improve industrial operations and sectors. IIoT is a network of communication-based tools that design a framework that records,

collects, exchanges and analyzes data and offers useful insights that enable industrial companies to make quick business decisions. Intelligent resources, i.e. sensors, automatically relay information over a data transmission network, where, for example, a particular piece of machinery is translated into reliable information about how it operates. This data can then be used for forecast management and design of business process applications. Machine learning is closely related to computer statistics, which also focuses on divination. Nowadays, machine learning is widely used in machine condition monitoring and maintenance. [3] [4] [5]

RELATED WORK

Machine learning has become popular in recent years research area. Some work has been done in the area estimates based on machine position and monitor the most relevant published papers that The analyzes are listed below:

In [1], Yanyu Zhang et al. proposed Online and Remote Machine Condition Monitoring and Fault Diagnosis System Using Wireless Sensor Networks that tracks the status of engines with vibration transmitters, transmits include information by means of WIA-PA arrange, and permits visualizations through the specific master program. Advanced remote control of PC condition and gadget for flaw conclusion utilizing remote sensors.

In [2], D. Ganga et al. proposed an IoT ongoing checking of the condition of electrical machines concentrated on vibration examination by utilizing gateway IoT2040.

In [3], Sana Talmoudi et al. proposed IoT-based failure prediction application for system monitoring using the toorPIA Big Data Engine sensor node used to evaluate the prediction of system failure.

In [4], Yasser Alsouda et al. proposed IoT-based Urban Noise Detection Using Machine Learning: Efficiency of SVM, KNN, Bagging, and Random Forest In which machine learning technique is used for urban noise detection, for audio feature extraction MFCC and supervised learning algorithm is used. To accomplish this authors used low-power and resource-constrained hardware device Raspberry Pi Zero W.

In [6], H. M. Hashemian et al. discussed the State-ofthe-Art Predictive Maintenance Techniques, In which time-based machinery maintenance approaches and predictive monitoring techniques use the latest sensor technology to prevent excessive failure in machine tools, time and expense are also saved.

In [7], M. Pan et al. proposed Remote online computer control system in which TCP / IP internet communication interface is used and BCB programming language is used for application coding. The module is trained using ANN back propagation algorithm.

In [8], W. Wang et al. proposed a Smart Sensing Unit for vibration measurement and machinery condition monitoring, a new signal processing method, wavelet energy spectrum, for bearing fault detection and the max-envelop method and one-scale WT technique is used for feature extraction.

In [9], Z. Zhanf et al. proposed Fault diagnosis and prognosis using wavelet packet decomposition for decomposing the vibration signal, for transforming Volume 6, Issue 3, May-June-2020 | http://ijsrcseit.com Prof. A. V. Deorankar et al Int J Sci Res CSE & IT, May-June-2020; 6 (3) : 664-667 666 that signal in frequency domain using Fourier transformation and From the frequency-domain data, they extracted the features to train an ANN.

In [10], S. S. Goundar et al. Designed a wireless monitoring system for industrial motors using vibration and temperature sensors, vibration data converted into frequency domain using FFT and this real time monitoring is done by using IoT.

In [11], D. Jung et al. proposed the algorithm estimates the Remaining Useful Time (RUL) by considering the threshold of difference and projecting the features of the equipment over space to verify whether the projection reaches this threshold. RANSAC's key principle is to shape various basic predictions from a data set, and classify that assumption with the most helpful measurements.

In [20], Swapnil Dol et al. proposed Smart motor for Industry 4.0, in which researchers has led to the establishment of the SMART Motor Kit, which can be mounted to turn it into a SMART Motor inside any engine. The approach has already been tested on crucial motors all over the industry.

CONCLUSION

This study analyzes the sound data of the machine and reviews the various techniques used to classify the condition of the machine. The more desirable condition is that we can anticipate the breakdown of the machine and start maintenance before the breakdown, so that the machine can still operate in safe condition and perform satisfactory operation. For machine sound classification, various classification techniques are designed and proposed. The machine learning technique for sound classification is the most widely used technique the accuracy of all algorithms varies according to their parameters.

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