Bearings fault detection and classification with machine learning and signal processing

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1 Introduction

In this article I will describe two families of methods, to detect and identify different bearing fault type. The first method uses statistical learning/method and the second methods uses signal processing. In the statistical learning methods, we compute a statistical characteristics (mean, variance, kurtosis ...) of a reference sample and use this measure to compute the dissimilarity between the reference sample and subsequent samples.

In the second method signal processing methods (Fast Fourier Transform) is used to extract the frequency spectrum of the vibration time signal of a bearing, and search for the bearing fault frequency. Once this fault frequency is identified , the corresponding amplitude is recorded and monitored for subsequent sample.

2 Bearing fault type

When it comes to bearings, there are several fault type: Ball Pass Frequency Outer race defect (BPFO) which happen in the outer ring of the bearing, Ball Pass Frequency Inner race defect (BPFI) which happen in the inner ring.

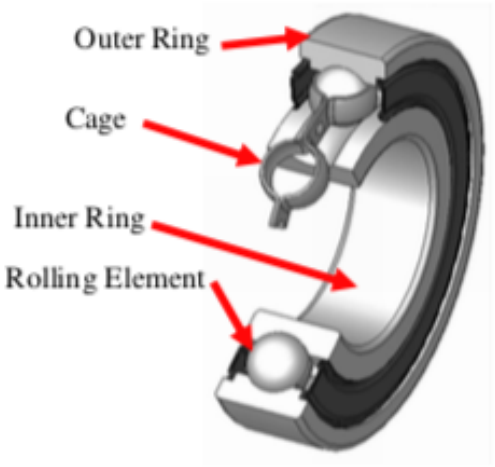

Figure 1: Geometrical representation of a ball bearing (Figure taken form [32])

3 Dissimilarity measure