

Chapter 9

Multisensor Data Fusion and Its Application

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ABSTRACT

Smart industrial processes are impossible without the use of machinery. Majority of these machines comprise rotating machines. As supporting tools for developing maintenance strategies, a Data-driven approach for multifault diagnosis of Rotating Machines is currently used in smart industry. This Chapter presents Multisensor Data Fusion and its application in Predictive maintenance methodology for multifault diagnosis of Industrial Rotating Machines. The main objective of Multisensor Data Fusion, rather than the different sensors being applied independently, are optimally fused to take advantage of their respective strengths, by combining data from multiple sensors and related information to achieve specific inferences than could be achieved by a single sensor. This chapter presents a methodology using data extraction features domain parameters for multifault diagnosis of Rotating Machines. The analysis shows that Root Mean Square Amplitude increases as fault develops, Crest Factor is more for healthy bearing and less for faulty bearing, these can provide early warning of faults

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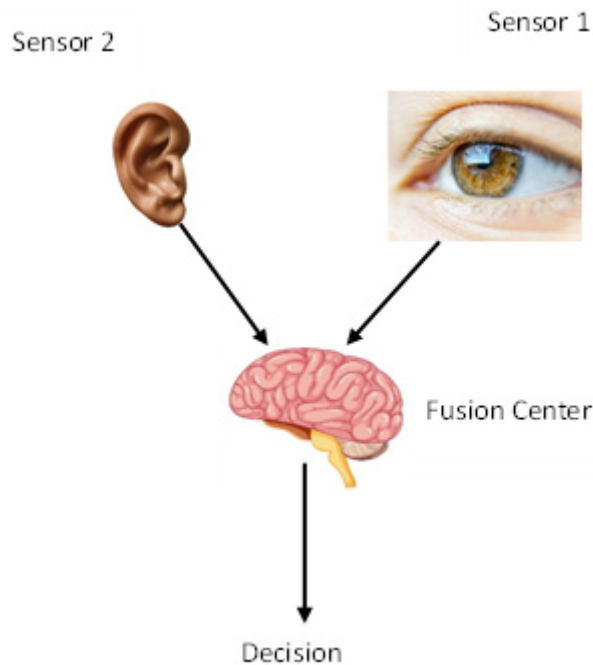
1. INTRODUCTION

Smart industrial processes are impossible without the use of machinery. Majority of these machines comprise rotating machines. As supporting tools for developing maintenance strategies, a Data-driven approach for multifault diagnosis of Rotating Machines is currently used in smart industry. The concept of multisensor data fusion is hardly new. As humans and animals have evolved, they have developed the ability to use multiple senses to help them survive. Data fusion is carried out by the human brain when, for example, associating images and sound while watching television. Some interesting examples of human and other animal data fusion processes are discussed by Luo and Kay (1989). The fusion of multiple information by humans occurs every time the senses are stimulated by appropriate signals. Our sensors, for example eyes, ears, nose, tongue and skin, are fusing sight, hearing, smell, taste and tactile information in our brain. The sound of a voice combined with visual information helps in identifying a person; Figure 1 illustrates this example.

Multisensory data fusion is naturally performed by animals and humans to assess more accurately the surrounding environment and to identify threats, thereby improving their chances of survival. While the concept of data fusion is not new, the emergence of new sensors, advanced processing techniques, and improved processing hardware have made real-time fusion of data increasingly viable.

In recent years, significant attention has focused on multisensor data fusion for both military and nonmilitary applications. Data fusion techniques combine data from multiple sensors and related information to achieve more specific inferences than could be achieved by using a single, independent sensor.

Figure 1. Illustration of the human data fusion system



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