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Structural Health Monitoring of Bridges: State of the Art

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ABSTRACT

Infrastructure is a vital component for the development of countries, where bridges in particular are a segment of infrastructure that are vital for the society. As bridges age they could show signs of deterioration that can be caused by continuously being subjected to traffic loads and environmental effects. Structural Health Monitoring (SHM) is a modern technology to monitor the structural performance through the continuous collection of data. The method enables engineers to monitor the health of the structure during its operation, in order to plan for maintenance when any signs of failure are observed from the very beginning. This paper covers a detailed overview of the state of the art of various types of SHM systems implemented on long-span cable-stayed bridges and suspension bridges all around the world. A variety of cases, sensors, and methods of obtaining and studying the data to monitor the structural health of bridges are evaluated, showing the importance of installing SHM systems in long-span bridges.

Keywords: Structural Health Monitoring, Bridges, Maintenance, Sensors, Frequency.

1 INTRODUCTION

In a world where technology is advancing with time, there have been many great developments that have offered a large contribution to the world of bridge engineering. Structural health monitoring in specific has done wonders in civil engineering, as it has allowed engineers to maintain and preserve bridges of different kinds all around the world, and has provided with data that allows for the study of the behaviour of bridges in operation. The method of applying a strategy for identifying damage is denoted as structural health monitoring. In this case, damage is considered as changes that can undesirably impact the performance of the structure (Farrar and Worden, 2007).

Bridges could undergo numerous modes of failure, such as; instability, fatigue, ageing, corrosion, mechanical damage, structural defects, and brittle fracture. There are many environmental effects that can impact the behaviour of long-span bridges in addition to traffic loads, such as; rain, strong winds, natural disasters, and temperature. These effects can result in a long-term impact on long-span bridges, and may eventually result in its deterioration (Chen and Xue, 2018). Hence, the construction of bridges is viewed to be a complex form of construction and therefore it is critical that bridges are carefully monitored (Chen and Xue, 2018).

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