

POPULATION-BASED STRUCTURAL HEALTH MONITORING FOR BRIDGE MANAGEMENT: A THEORETICAL CASE STUDY

ABSTRACT Structural health monitoring (SHM) has the potential to play a crucial role in the management and maintenance of bridges, ensuring their safe operation and longevity. However, the widespread adoption of SHM in bridge management has been hindered by various factors, such as high costs, logistical complexities, and a lack of validation on real-world structures.

This research paper explores the potential of Population-Based Structural Health Monitoring (PBSHM) as a viable solution to address the challenges faced in conventional SHM practices for bridges. PBSHM involves the pooling of data from multiple bridges, enabling the inference of valuable information for the monitoring and maintenance of similar structures. By leveraging data from diverse sources, PBSHM has the potential to overcome some of the limitations associated with individual bridge-specific SHM systems.

The paper discusses the potential benefits and drawbacks of implementing PBSHM in bridge management, examining its capacity to improve cost-effectiveness, reliability, and scalability compared to traditional approaches. Furthermore, it highlights the potential of PBSHM to enhance bridge safety and mitigate risks through the early detection of structural issues.

To illustrate the practical application of PBSHM, a theoretical case study is presented, demonstrating how this novel approach could be utilised in real-world scenarios. The case study showcases how PBSHM can provide valuable insights for making informed decisions and prioritising resources for bridge management.

This work explores the potential significance of adopting PBSHM as an innovative tool in the field of bridge management. By leveraging collective data and knowledge, PBSHM has the potential to change how bridges are monitored, maintained, and managed, thereby ensuring the safety and sustainability of critical infrastructure.