

BHM Construction and Maintenance Decision-making Frameworks

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Abstract

Bridge health monitoring (BHM) is thriving in infrastructure engineering, and enormous maintenance needs follow with the rapid development of highway construction. The synergistic combination of BHM data with predictive maintenance strategies proves particularly crucial for enhancing infrastructure resilience and achieving cost-effective asset management. This presentation focuses on the cutting-edge research and development of BHM systems and intelligent maintenance decision-making models, which play a pivotal role in ensuring structural safety and extending service lifespan through advanced technological integration. Our comprehensive study establishes innovative frameworks that seamlessly incorporate design, construction, and integration with real-time pre-warning algorithms and intelligent maintenance decision-making models to form a comprehensive framework for bridge safety and lifecycle management - from real-time data acquisition and critical feature extraction to accurate condition assessment, reliable performance prediction, and optimized maintenance planning. The developed models demonstrate superior capabilities in continuous structural monitoring, precise safety evaluation, and data-driven maintenance strategy formulation, as validated through multiple practical bridge applications that confirm both technical robustness and operational feasibility. These advancements provide engineering practitioners and maintenance authorities with scientifically grounded, actionable solutions that significantly enhance structural reliability while optimizing resource allocation and management efficiency throughout infrastructure service periods.

Keywords

Bridge Health Monitoring, Structural Condition Assessment, Maintenance Decision-Making, Data-driven Models