

Revolutionizing Healthcare Facility Maintenance: A Groundbreaking AI, BIM, and IoT Integration Framework

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Abstract : The integration of cutting-edge Internet of Things (IoT) technologies with advanced Artificial Intelligence (AI) systems is revolutionizing healthcare facility management. However, the current landscape of hospital building maintenance suffers from slow, repetitive, and disjointed processes, leading to significant financial, resource, and time losses. Additionally, the potential of Building Information Modeling (BIM) in facility maintenance is hindered by a lack of data within digital models of built environments, necessitating a more streamlined data collection process. This paper presents a robust framework that harmonizes AI with BIM-IoT technology to elevate healthcare Facility Maintenance Management (FMM) and address these pressing challenges. The methodology begins with a thorough literature review and requirements analysis, providing insights into existing technological landscapes and associated obstacles. Extensive data collection and analysis efforts follow to deepen understanding of hospital infrastructure and maintenance records. Critical AI algorithms are identified to address predictive maintenance, anomaly detection, and optimization needs alongside integration strategies for BIM and IoT technologies, enabling real-time data collection and analysis. The framework outlines protocols for data processing, analysis, and decision-making. A prototype implementation is executed to showcase the framework's functionality, followed by a rigorous validation process to evaluate its efficacy and gather user feedback. Refinement and optimization steps are then undertaken based on evaluation outcomes. Emphasis is placed on the scalability of the framework in real-world scenarios and its potential applications across diverse healthcare facility contexts. Finally, the findings are meticulously documented and shared within the healthcare and facility management communities. This framework aims to significantly boost maintenance efficiency, cut costs, provide decision support, enable real-time monitoring, offer data-driven insights, and ultimately enhance patient safety and satisfaction. By tackling current challenges in healthcare facility maintenance management it paves the way for the adoption of smarter and more efficient maintenance practices in healthcare facilities.

Keywords : artificial intelligence, building information modeling, healthcare facility maintenance, internet of things integration, maintenance efficiency

Conference Title : ICACE 2025 : International Conference on Architectural and Civil Engineering

Conference Location : Vancouver, Canada

Conference Dates : January 11-12, 2025