

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

Authors : Mina Sadat Orooje, Mohammad Mehdi Latifi, Behnam Fereydooni Eftekhari

Abstract : Cutting-edge advancements in Internet of Things (IoT) technologies, coupled with innovative paradigms in Artificial Intelligence (AI) systems, are fostering the development of intelligent computing infrastructures tailored for healthcare facility management. However, the current state of hospital building maintenance management is marked by sluggish, repetitive, and disjointed processes, resulting in significant losses in finances, resources, and time. Moreover, the potential of Building Information Modelling (BIM) in facility maintenance management is hindered by the scarcity of data and information within digital models of built environments. Consequently, there is a pressing need to streamline the data collection process and its management. This paper introduces a framework that integrates Artificial Intelligence (AI) with BIM-IoT technology for enhancing the process of healthcare Facility Maintenance Management (FMM) to address these pressing challenges. The methodology proposed for developing this framework begins with an exhaustive review of existing literature and an analysis of requirements to gain insights into the current technological landscape and associated challenges. Subsequently, data collection and analysis efforts are undertaken to gain deeper insights into hospital infrastructure and maintenance records. The article identifies critical AI algorithms to tackle predictive maintenance, anomaly detection, and optimization requirements, while also formulating integration strategies for BIM and IoT technologies to facilitate real-time data collection and analysis. The framework delineates protocols for data processing, analysis, and decision-making. A prototype implementation is then carried out to demonstrate the functionality of the framework, followed by an evaluation and validation process to gauge its effectiveness and solicit user feedback. Refinement and optimization steps are subsequently executed based on evaluation outcomes. Finally, the findings are documented and disseminated within the healthcare and facility management communities. This framework aims to enhance maintenance efficiency, reduce costs, offer decision support, enable real-time monitoring, provide data-driven insights, and ultimately, improve patient safety and satisfaction. By addressing the current challenges in healthcare facility maintenance management, it lays the groundwork for the adoption of smarter and more efficient maintenance practices in healthcare facilities.

Keywords : Artificial Intelligence (AI), building Information modeling (BIM), healthcare facility maintenance, internet of things (IoT) integration, maintenance efficiency

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