

Exploring the Integration of Artificial Intelligence in H-BIM for Modern Heritage Documentation: The Case Study of Toyota Tower in Dubai.

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Abstract

Dubai is a city that has rapidly transformed from a small trading post to a global metropolis in the span of a few decades, especially after the discovery of oil. The rapid urbanization and technological development of Dubai have made it increasingly difficult to identify, document, recognize and preserve the modern heritage of the 1970s and 1980s. This research sheds light on the digital documentation and preservation of modern heritage in the Emirate of Dubai, a city that is heading towards globalization. The case study of Toyota Tower, one of the oldest residential high-rise buildings built in the early 1970s, was selected for documentation using drone scanning, photogrammetry, and point cloud. These methods allow for comprehensive and accurate data capture. From the workflow, a framework has been distilled, aiming to enhance the accuracy, efficiency, and comprehensiveness of capturing and documenting the heritage attributes of modern heritage buildings.

In recent years, numerous researchers [1-2] used different digital technologies to document heritage in general and modern heritage buildings in particular. Using machine learning and AI is a rapidly growing field in the realm of construction and building information management (BIM). Scan-to-H-BIM with AI integration has been shown to significantly improve the accuracy and efficiency of documentation. Data from laser scans and point clouds can be analyzed by AI algorithms to create high-quality H-BIM models that can then be used for building maintenance, renovation, and heritage preservation. [3]. In another study, AI-based object detection and segmentation techniques in order to automatically generate semantic H-BIM models. [4]. In this research, digital survey scans will be progressed to heritage building information modeling (H-BIM) to better assess Dubai City's modern architecture's heritage attributes, i.e. the tangible characteristics of the building that make up its heritage value. An H-BIM model is generated using artificial intelligence (specifically, machine learning) to identify patterns of architectural repetition. An extensive literature review is performed to identify relevant plugins that are capable of identifying and extracting potential heritage attributes from the H-BIM model. Two plugins are selected for further investigation, and their suitability and efficiency in recognizing heritage attributes are compared. Since patterns provide the base for the machine learning algorithm, the Dubai modern heritage typology would thus provide an excellent case study, as these high-rise buildings are characterized by repeating elements.

Research findings can assist government authorities in Dubai and the wider UAE in better understanding modern heritage, enhance its appreciation and start implementing preservation measures. Moreover, the research emphasizes the relevance and potential of integrating digital technologies and artificial intelligence into the documentation of modern heritage, providing insights that can be applied to other global cities experiencing rapid urbanization and transformation.

References

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