Integration of BrIM in Bridge Management - Enhanced Predictive Functionality

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Abstract

Bridge Information Model [BrIM] is being evolved as a possible solution to become the one-stop solution for bridge design to management. Research is ongoing to present a concept of integrating BrIM as the front end or back end and incorporating functionalities of the Bridge Management System [BMS]. Such integration is envisaged to maximize the utilization of the core capabilities of both BrIM and BMS. Integration of BrIM and BMS will yield analytics essential for the prediction of deterioration models, risk analysis and prioritization and optimization of fund allocation. The use of 3D geometric models, Digital photography using photogrammetry software and Structural Health Monitoring to evaluate the performance of the bridge, have all resulted in enhanced capabilities, reliable prediction of deterioration models, and risk analysis based on a scientific approach. Integration of BrIM with BMS has resulted in enhanced sustainability and predictive functions.

Keywords: Unified Bridge Management System; Bridge Information Modelling (BrIM); Photogrammetry; Artificial Intelligence; Deterioration model.

1 Introduction

Ageing of bridges globally requires the maintenance of existing bridges to be prioritized over the construction of new bridges. New bridge construction is more costly than maintaining old bridge. Most of the current BMS's are based on 2D information systems and do not utilize data related to shape, orientation, and geospatial information. To overcome these problems, research on integration of Bridge Management System [BMS] with bridge information modelling [BrIM] has significantly gained importance. The service life of a bridge, which is governed by safety and serviceability criteria, can be extended by regular maintenance and timely rehabilitation interventions [1]. To this end, bridge management systems evaluate deterioration models that allow condition forecasting [Predictive analysis], maintenance cost and risk modelling to estimate optimal maintenance interventions or maintenance scenarios. These models necessitate high-quality data [2]. Inventory data, inspection data, and data on maintenance interventions are all stored in databases. BrIM are the best tool to monitor project from conceptualization to end of construction process. It is essential to provide more accurate and useful inventory representation beyond the alphanumeric representation in current bridge databases. The solution to this shortcoming is to enhance BrIM. Enhanced BrIM will need to function as One Stop Solution for Bridges from Conceptualization to Demolition. BrIM enhancement will need data that is needed for bridge management systems. It should be noted here that, in addition to data on inspections and maintenance interventions, the digital representation of bridge elements constructed during maintenance or improvement interventions is critical for bridge management. This means that BrIM must track the evolution of bridge conditions over time, temporal BrIM is required. The development of temporal BrIM should gain financially from existing real-time and dynamic databases. Currently, researchers focus on the

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