Enhancement in Indian Bridge Management System using analytics within BIM data model.

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Abstract

Indian Bridge Management System and its enhanced version Unified Bridge Management System (UBMS) like all BMS rely on successive visual observations to define status ratings of bridge components which are used for remedial interventions and critical management decisions. These systems are devoid of location details of distress and are reactive in regard to deterioration and risk models as they rely on such changes in ratings for interventions. Incorporating photogrammetric geospatial 3D drawing/model will bring critical hereto missing data to enhance effectiveness and efficiency of IBMS/UBMS. This paper is aimed to present a concept for adding geospatial details to IBMS/UBMS. This incorporation enables the usage of AI and machine learning for improved decision making and reporting. Analysis provides a predictive tool to estimate future distress and the progression of deterioration process and the impact it can have on the future performance. Inclusion of SHM data will also be possible.

Keywords: Unified Bridge Management System, Photogrammetry, Artificial Intelligence, Predictive analysis, Deterioration model.

1. Preamble

The development and evolution of Indian Bridge Management System (IBMS) started in the year 2015, when IDDC Engineers Pvt Ltd (Team IDDC) were awarded the assignment of development and implementation of bridge management system on National Highway networks in India by Ministry of Road, Transport and Highways (MoRTH). [1] IBMS developed in 2015 was a linear path protocol system where all required information in the inventory module culminated with assignment of ratings for structural components of the bridge along with functional rating and socio-economic ratings. All ratings were assigned based on preliminary visual observations. These ratings taken during the inventory module formed the basis of decision-making process. The rating system adopted was 0 to 9 with "0" being associated with critical state and "9" assigned to excellent state. Progressive increment in symptoms of distress results in decreased rating number. Such a system depends heavily on consistent reporting by the field engineers. This is possible only when the engineer is trained in the science of distress identification. Due to lack of any structured training program to bridge inventory and inspection engineers, certain disparities crept into the database and resulted in erroneous decisions being taken. The resulting evolution involved in these component ratings being reviewed and validated by the bridge inspectors during the close, detailed hand touch inspection of each bridge components by a more experienced engineer. Such review and validation procedures are incorporated into IBMS for every data observation that formed part of decision-making process.

During the first development phase inventory module was totally digitized and rest of the