

Integrated Management of Bridge Infrastructure through Bridge Digital Twins: A Preliminary Case Study

Alireza Adibfar, Ph.D., AM. ASCE¹ and Aaron M. Costin, Ph.D., AM. ASCE²

¹M.E. Rinker Sr. School of Construction Management, University of Florida. ORCID: <https://orcid.org/0000-0002-6952-3091>. Email: adib2016@ufl.edu

² Assistant Professor, M.E. Rinker Sr. School of Construction Management, University of Florida. ORCID: <https://orcid.org/0000-0003-4263-8101>. Email: aaron.costin@ufl.edu

ABSTRACT

Data play a significant role in the lifecycle management of road infrastructure and bridges, and their integration is a crucial element of smart infrastructure systems. However, the current practice of managing infrastructure involves the use of an abundance of data produced by a variety of non-interoperable information systems. Thus, the lack of interoperability creates major challenges in deployment of a fully integrated and smart management system for the infrastructure. This research focuses on the development of a Digital Twin that could be used as an umbrella for integrating the live load traffic data on bridges with other bridge lifecycle data to mirror the bridge behavior and offer a smart and integrated bridge management system. Intelligent Transportation Systems (ITS) are remarkable instances of advanced technology that reduced the human role in the operation and management of transportation infrastructure. Weigh-in-motion (WIM) is a type of ITS system provides a stream of valuable data about weight and other dynamic attributes of the fleeting traffic over road network and bridges. In this research, the real-time WIM data are integrated into a BrIM model by visual scripting to form the digital twin of the bridge. Through this approach, weight sensor data could be streamed in the Digital Twin of bridge, and the level of data utilization by different stakeholders can be improved. The outcomes of this study will help the preservation and sustainability of bridges and helping their resiliency through pro-active planning and enhancing the utilization of the available data.