Application of a monitoring system based on the use of a digital twin model for bridge diagnostics and structure assessment after singular events. Malleco viaduct

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Abstract

Decision-making about the operation and maintenance of a bridge is a very important task for the entities managing the road network. Having complete, reliable and updated information on the condition of critical infrastructure is a need of great importance at present that is going to be increasingly relevant [1]. The use of digital systems based on twin models allows a quick evaluation of the bridge integrity and to study by simulation how the structure would behave in singular events [2]. These systems use sensors to obtain the structural characteristics of the bridge and with this data a digital mathematical model is generated whose behaviour emulates the real bridge. It is very important to determine the impact of traffic accidents on structures or the effects of natural catastrophes such as earthquakes. These systems optimize bridge structural monitoring tasks and are less costly than visual auscultation [3]. This article focuses on the application, on a real scale, of these systems and the results obtained. Specifically this application was on the Malleco viaduct that allows the crossing of Route 5 South over the Malleco River in Collipulli. The structure, with an approximate height of 70 meters between grade and normal water level of the Malleco River, consists of 9 continuous sections and an additional isostatic section (at the entrance to the bridge, north side), reaching 344.91 meters in length and a width of 20 meters. Two situations that occurred on the Malleco viaduct were evaluated: possible structural damage due to the passage of a convoy of special transport vehicles and possible structural damage due to a major accident with direct impact on the structure. After these bridge evaluation tests, it was verified that the structure had not suffered structural damage due to these events, demonstrating the usefulness of these systems and their performance.

References

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