Deep learning-based signal processing for evaluating energy dispersal in bridge structures

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Structural Health Monitoring (SHM)



Idea and method: Deep learning-based energy dispersal evaluation



Innovation



Main results: LF of some bridges



LF of point ¹/₂ -span 17 in Phu My Bridge



LF of point 1/2 -span 3 in Sai Gon Bridge



LF of point 1/2 -span 3 in Giong Ong To 2 Bridge



LF of point 1/2 -span 3A in Cong Dap Rach Chiec Bridge

Main results: Training and application



Training and validation performance of the proposed CNN



The confusion matrix of the predicted and actual class categories



The confusion matrix of testing process

Conclusions

- In all real structures, energy dispersal always occurs. Based on the change of vibration energy loss evaluated by the Loss Factor function (LF), health monitoring of bridge can be performed.
- Deep learning-based energy dispersal evaluation is appropriate and highly applicable.
- □ The testing of the proposed method with several actual bridges derives acceptable results.