Corrosion and Bolt-loosening Monitoring using Image-based Deep Learning and Hough Transform

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ABSTRACT

In this study, a method for bolt-loosening detection of rusted bolts using a regional convolutional neural network (RCNN)-based Deep Learning and Hough Line transform (HLT) algorithm is presented. The major objective of the paper is to detect as well as evaluate rotational angle damage of rusted bolts. To obtain the goal, the approaching process of the paper consists of three steps. Firstly, an RCNN-based rusted bolt identification method is outlined. The RCNN-based approach probably classifies rusted and stainless bolts in an image, and then these plausible bolts are cropped out. Secondly, for bolt-loosening estimation, an HLT-based image processing algorithm is designed for estimating the rotational angle of cropped bolt types. Finally, the feasibility of the proposed bolt-loosening detection framework is verified through lab-scale tests. The lab monitoring results indicate that the suggested framework probably acquired well accuracy for rusted bolts at the light intensity condition greater than roughly 63 (Lux) for the trained images in approximately 154-350 (Lux). From that, with practical applications, the given methodology may give out timely warnings in detecting rusted bolts and bolt-loosening in large coastal and offshore structures under allowed light, contributing to reducing inspection cost implemented by traditional inspection manners.

REFERENCES

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