Semantic segmentation model for crack images from concrete bridges for mobile devices

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Abstract

Computer vision algorithms are powerful techniques that can be used for remotely monitoring and inspecting civil structures. Detecting and segmenting cracks in images of concrete bridges can provide useful information related to the health of the structure. There are several states of the art methods based on Deep Learning that have been used for segmentation tasks. However, most of them require a large number of parameters that limits their use in mobile device applications. Here, we propose a DenseNet architecture with only 13 layers with one feature extractor stage and two datapaths. Implementations of state of the art semantic segmentation models are also tested. The proposed model achieves better results than standard algorithms with only a fraction of the parameters making it suitable for developing mobile device applications for bridge structure monitoring. As an additional contribution, two new databases for semantic segmentation of cracks are presented. These databases are used to test all the algorithms in this work and will be available upon request. Additional experiments using a public database are also performed for the sake of comparison. The best results are obtained using the proposed DenseNet-13 architecture with only 350,000 parameters achieving an Intersection Over Union of 94.51% for crack semantic segmentation.

Palabras clave

Palabras clave de autor: Concrete bridge; crack detection; segmentation; deep learning; structural integrity

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