Extracting crack characteristics from RGB-D images

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1. Introduction

The images acquired by RGB-D camera (**Figure 1**) provide a unique opportunity for vision-based structural health monitoring (SHM). The addition of a fourth channel, the depth, that encodes 3D data enables not only defect detection but also extraction of its characteristics, like surface area or volume. In addition, the resulting three-dimensional damage representations can be easily used to enrich BIM models to as-is state. However, there are some limitations as these type of sensors were not built with precision in mind, rather real-time data acquisition. This results in noisy depth data and low-resolution RGB sensors.

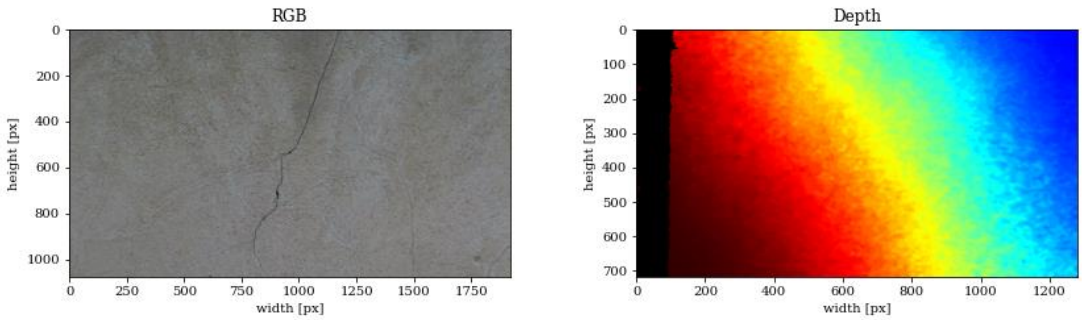

Figure 1. RGB-D image of a cracked concrete surface.

Nevertheless, these sensors found applications in SHM context. Authors of [1] presented a method that combines RGB-D data with deep learning to perform volumetric measurements of spalling, and a method for surface area measurements of defects (rust stains, efflorescence, contamination) was presented in [2]. However, the limitations mentioned above hinder application for crack assessment, as authors of [3] had to pair depth sensor with hi-resolution DSLR camera to enable crack width measurement.

On the other hand, creating high-resolution (HR) images out of low-resolution (LR) ones with deep learning is an active field of research. This type of task is called super-resolution (SR), and could enhance performance of low-cost RGB-D sensors (**Figure 2**).

This workshop proceeding presents results from initial experiment with super-resolution (SR) enchanted crack width measurement using low cost RGB-D sensor, namely Intel RealSense D435i.

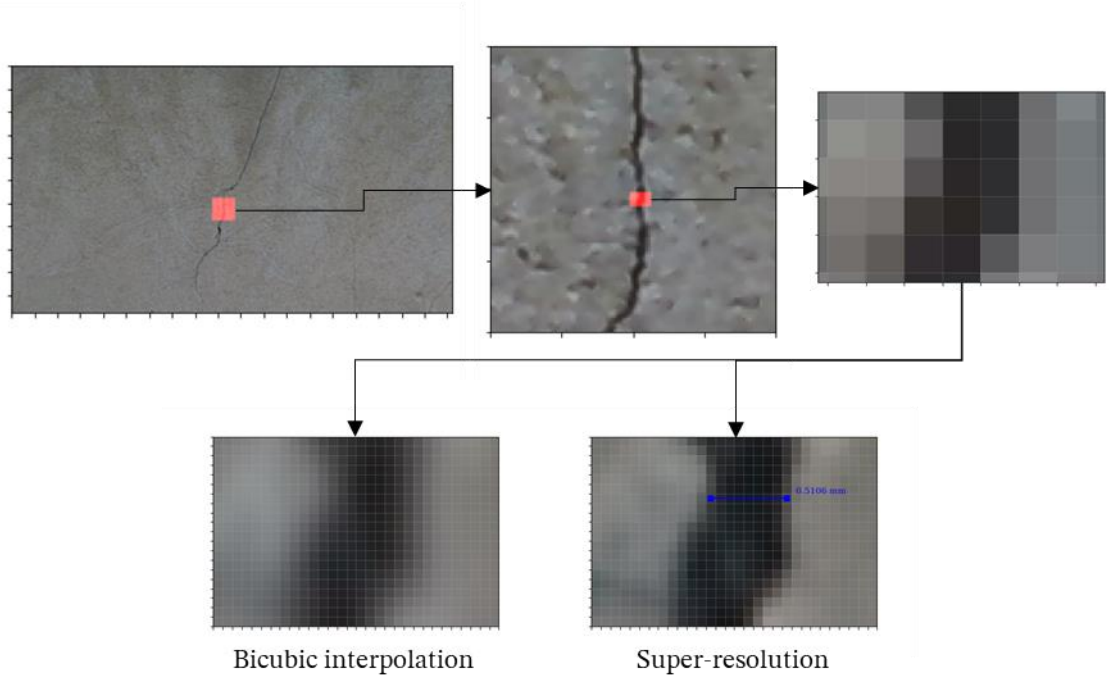

Figure 2. Comparison of two images upscaled with different methods, simple bicubic interpolation and super-resolution deep learning model [4].

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