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Crack detection in oak flooring lamellae using ultrasound-excited thermography

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Abstract

Today, a large number of people are manually grading and detecting defects in wooden lamellae in the parquet flooring industry. This paper investigates the possibility of using the ensemble methods *random forests* and *boosting* to automatically detect cracks using ultrasound-excited thermography and a variety of predictor variables. When friction occurs in thin cracks, they become warm and thus visible to a thermographic camera. Several image processing techniques have been used to suppress the noise and enhance probable cracks in the images. The most successful predictor variables captured the upper part of the heat distribution, such as the maximum temperature, kurtosis and percentile values 92–100 of the edge pixels. The texture in the images was captured by Completed Local Binary Pattern histograms and cracks were also segmented by background suppression and thresholding.

The classification accuracy was significantly improved from previous research through added image processing, introduction of more predictors, and by using automated machine learning. The best ensemble methods reach an average classification accuracy of 0.8, which is very close to the authors' own manual attempt at separating the images (0.83).

Keywords: Ultrasound-excited thermography, Crack detection, Parquet flooring, Wood, Ensemble classification, Machine learning