Automatic detection of pith location along boards of Norway spruce on the basis of data from optical scanning of longitudinal surfaces

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Different mechanical and physical properties of wood are related to the location of pith. Norway spruce wood from the centre of logs, close to the pith, is characterized by lower longitudinal MOE, larger spiral grain angle, and larger longitudinal shrinkage coefficient than what wood farther away from the pith is [1]. Thus, knowledge of pith location along timber boards may play an important role in both appearance grading and in assessment of mechanical properties such as strength [2]. The current work aims to develop an algorithm which is capable of automatically estimating the pith location of Norway spruce boards, along the boards' length direction, by utilizing optical scanning of longitudinal surfaces. The initial step of the algorithm is to identify defect free sections along the timber board. This is done by utilizing data from tracheid effect scanning of the four sides of the timber board. Thereafter, a continuous wavelet transform (CWT), similar to fast Fourier transform, is applied on grey scale images from scanning, to analyse the variation of light intensity across the four surfaces at selected positions along the board. Obtained local frequencies correspond to the local annular ring pattern on surfaces. Then, assuming that annular growth rings are concentric circles with the pith in the centre, *detected* local annular ring wavelengths (using CWT) and *artificial* annual ring wavelengths corresponding to different hypothetical locations of pith are compared, and an optimization procedure is used to identify the location of pith that *minimizes* the discrepancy between the detected and artificial sets of annular ring wavelengths. Figure 1 shows grey scale images of short segments of longitudinal surfaces, graphs of the detected local annual ring widths, and a photograph of the board cross section where the determined location of pith is marked out. Preliminary results reveal that data from optical scanners and the suggested method allow for accurate detection of annular ring width and location of pith along boards.

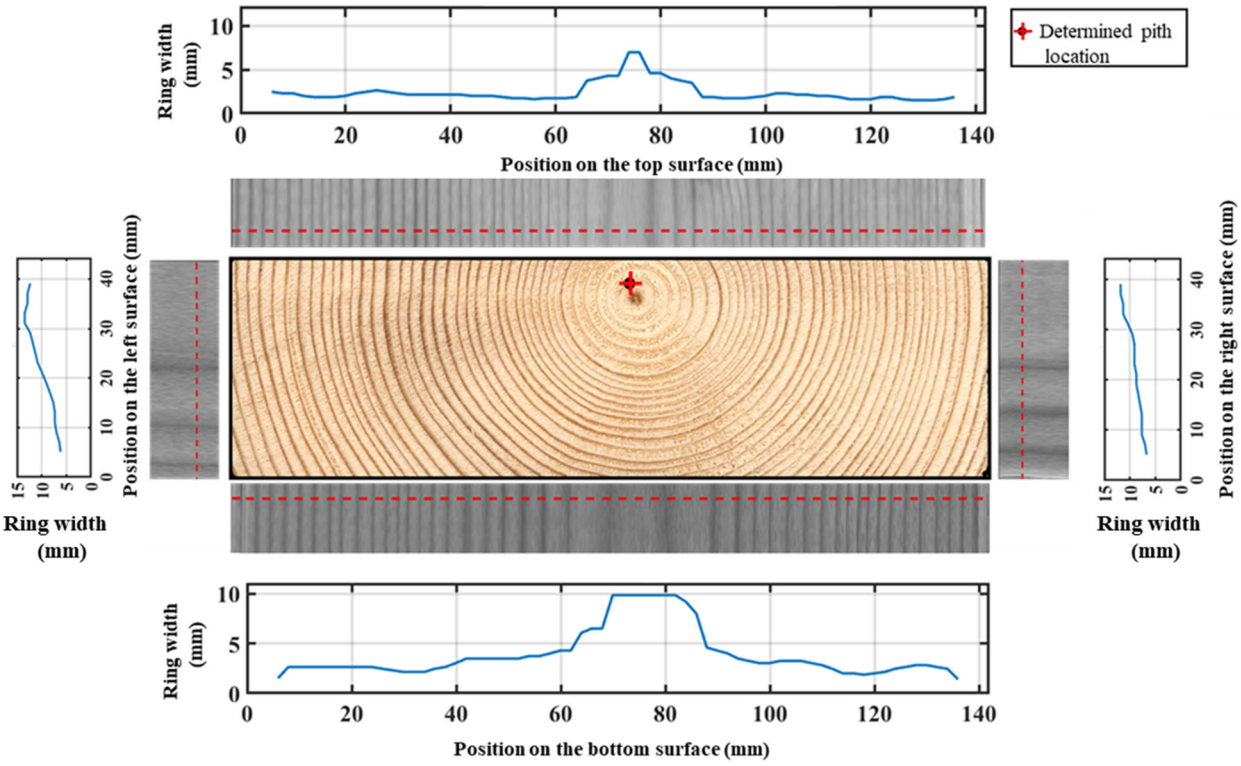

Figure 1: Determined pith location based on detected surface annual ring pattern (wavelength)

References

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