

## Image Processing Approach for Detection of Three-Dimensional Tree-Rings from X-Ray Computed Tomography

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**Abstract :** Tree-ring analysis is an important part of the quality assessment and the dating of (archaeological) wood samples. It provides quantitative data about the whole anatomical ring structure, which can be used, for example, to measure the impact of the fluctuating environment on the tree growth, for the dendrochronological analysis of archaeological wooden artefacts and to estimate the wood mechanical properties. Despite advances in computer vision and edge recognition algorithms, detection and counting of annual rings are still limited to 2D datasets and performed in most cases manually, which is a time consuming, tedious task and depends strongly on the operator's experience. This work presents an image processing approach to detect the whole 3D tree-ring structure directly from X-ray computed tomography imaging data. The approach relies on a modified Canny edge detection algorithm, which captures fully connected tree-ring edges throughout the measured image stack and is validated on X-ray computed tomography data taken from six wood species.

**Keywords :** ring recognition, edge detection, X-ray computed tomography, dendrochronology

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