The Automated Visual Inspection and Grading of Timber

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submitted by

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SUMMARY

A method has been developed to visually detect and discriminate the features on the surface of sawn planks of radiata pine for the purpose of grading the timber. The features include small and large knots, cone holes, pitch, bark, wane, resin and holes. The grade of the plank is determined by the number, distribution and type of features present. The automation of the visual inspection of timber for grading to a national standard has not previously been attempted which makes the present study unique.

It is postulated that the grey level histogram of the image of the wood is sufficient to discriminate the features from the background of prominent growth rings. The image of the wood is digitised from a charge coupled device (CCD) camera and segmented into smaller sub-images, called local areas. Statistics of the distribution of pixel intensities within each local area place it in a feature-measure space. A decision boundary is derived from a labelled set of samples that divides the feature-measure space into two half-spaces: one containing local areas that enclose a part of a feature, and the other containing local areas that contain only growth rings. This method allows over 95% of the local areas to be correctly classified.

Local areas that contain parts of the same feature are identified and merged together to form feature areas. The grey level histogram of the feature area is postulated as being sufficient to separate and size the features within a feature area. It is further postulated that an identification of the type of feature can be made with shape measures. This is supported by the analysis of a series of images containing a range of features which reveals the strengths and weaknesses of the methods used to discriminate them.

A comprehensive study of the use of texture measures in the detection and discrimination of features concludes that these measures are required to improve the performance of the algorithms based on histogram methods to a level that will allow commercialisation of an automated inspection system. The design of a production system is described and found to be a realisable project.
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