Gonzaga, Adilson, Franca, Celso A., Slaets, Annie F.F.

Wood texture classification by fuzzy neural networks

Sch of Engineering at Sao Carlos, Sao Carlos, Brazil

Abstract
The majority of scientific papers focusing on wood classification for pencil manufacturing take into account defects and visual appearance. Traditional methodologies are based on texture analysis by co-occurrence matrix, by image modeling, or by tonal measures over the plate surface. In this work, we propose to classify plates of wood without biological defects like insect holes, nodes, and cracks, by analyzing their texture. By this methodology we divide the plate image in several rectangular windows or local areas and reduce the number of gray levels. From each local area, we compute the histogram of differences and extract texture features, given them as input to a Local Neuro-Fuzzy Network (LNN). Those features are gotten from the histogram of differences instead of the image pixels due to their better performance and illumination independence. Among several features like media, contrast, second moment, entropy, and IDN, the last three ones have showed better results for network training. Each LNN output is taken as input to a Partial Neuro-Fuzzy Network (PNFN) classifying a pencil region on the plate. At last, the outputs from the PNFN are taken as input to a Global Fuzzy Logic (GFL) doing the plate classification. Each pencil classification within the plate is done taking into account each quality index.

Index Keywords
Backpropagation, Computer vision, Feature extraction, Fuzzy sets, Image analysis, Learning systems; Fuzzy neural networks, Supervised learning, Texture classification; Neural networks

Correspondence Address
Gonzaga Adilson; Sch of Engineering at Sao Carlos, Sao Carlos, Brazil

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