A Combined Approach Based on Artificial Intelligence and Computer Vision for Qualitative Grading of Rice Grains

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Abstract : The quality inspection of rice (Oryza sativa L.) during its various processing stages is very important. In this research, an artificial intelligence-based model coupled with computer vision techniques was developed as a decision support system for qualitative grading of rice grains. For conducting the experiments, first, 25 samples of rice grains with different levels of percentage of broken kernels (PBK) and degree of milling (DOM) were prepared and their qualitative grade was assessed by experienced experts. Then, the quality parameters of the same samples examined by experts were determined using a machine vision system. A grading model was developed based on fuzzy logic theory in MATLAB software for making a relationship between the qualitative characteristics of the product and its quality. Totally, 25 rules were used for qualitative grading based on AND operator and Mamdani inference system. The fuzzy inference system was consisted of two input linguistic variables namely, DOM and PBK, which were obtained by the machine vision system, and one output variable (quality of the product). The model output was finally defuzzified using Center of Maximum (COM) method. In order to evaluate the developed model, the output of the fuzzy system was compared with experts' assessments. It was revealed that the developed model can estimate the qualitative grade of the product with an accuracy of 95.74%.

Keywords : machine vision, fuzzy logic, rice, quality