Development of a Digital Grain Analysis Image Processing Tool through Machine Vision

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Abstract

Oryza sativa (rice) is a dietary staple food with consistently increasing demand in growth and production and is one of the world's most crucial crops consumed by over half of the population. Accounting for 42% of the caloric intake of the international human population, the availability of quality rice grain is associated with food security. Rice grain quality assessment, however, is time-consuming and complex—leading to the development of a tool that automates such process by extracting morphological properties of grains, as indicators and classifiers of grain quality, that allows for the grading of rice from just the photograph of a sample of rice grains. Using machine vision and MATLAB, a computational model was developed that extracted quality indicators from grain properties such as color, major/minor axis length, chalkiness, and head rice count; datasets resulting from the image processing tool were compared for accuracy against the manual means of measurement. The developed tool exhibited general success in pulling color, chalkiness, and sample broken grain/head rice count—but faced difficulties in determining grain-specific factors such as major/minor axis length and grain shape from the edge detection algorithm used. Nevertheless, the tool provides an efficient means of gathering color and head rice count, two major indicators of grain quality. Further refinements and adjustments to the tool and its algorithms allow for the collection and processing of more grain properties, allowing for further assessment of the grain and its growth conditions, climate, and environment for both rice consumers and producers from all backgrounds.