Non-destructive Mango Quality Assessment using Image Processing: Inexpensive Innovation for the Fruit Handling Industry

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Abstract

Thailand is one of the most important mango producers in Southeast Asia, but fruit sorting is still done by hand which is tedious and inaccurate. Thus, the need exists for improvement of efficiency and accuracy of fruit quality assessment that can meet the demands of international markets. Low-cost and non-destructive sensing technologies capable of sorting fruits according to their properties would help promote the mango export industry in Thailand. Image processing techniques have been applied increasingly for sorting applications in recent years. This work has assessed the application of image processing for detecting value parameters in Thai mango varieties, namely 'Nam Dokmai' and 'Maha Chanok'. An automatic image acquisition system was developed and laboratory experiments were conducted to obtain optical data and reference analyses. Fruit qualities including colour and the presence of defects such as anthracnose, bruises and latex stains were monitored during the ripening process. To evaluate origins of mechanical damage, field research using mock fruits included in transport shipments was conducted to record conditions during the post-harvest handling chain. Image processing and quantitative analyses were used to assess the data. The Pearson correlation coefficients and p-values have provided a confidence that the machine vision system is able to collect accurate colour data from the mango fruits. For the defects detection, the images acquired by the automatic picture acquisition system were segmented and analysed by using discriminant analysis to evaluate the threshold of detection. The results will be incorporated for development of a robust classification system for quality prediction and establishment of a machine vision system for automatic grading and sorting of mangos. The work has also helped to recommend better post-harvest practices. Proper post-harvest handling and quality assurance will improve product value. As a result, farmers and exporters can have better access to high-value international markets, enabling them to increase their income and provide consumers with a premium product.

Keywords: Image processing, mango, post-harvest handling, quality assessment, Thailand

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