Apple fruit sorting using novel thresholding and area calculation algorithms

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Abstract

The speed and capacity (kg/hr) for sorting apples are two important factors that have to be taken care of post-harvest. To increase the speed and capacity of apples being sorted, a new algorithm for segmenting the region of interest from an apple fruit image and to find the percentage of defective area after sorting process has been proposed in this paper. First, the region of interest from the acquired color image of an apple fruit was segmented using the proposed global thresholding algorithm GTA. Features were extracted from the segmented image using the coefficients obtained by applying wavelet transformation using the Haar filter. Further, the Naive Bayesian classifier was applied to sort apples as defective and sound. Second, the defective area of the defective sample was segmented using the K-means algorithm and median filter. The defective area in percentage was calculated using the proposed diseased area calculation algorithm DACA to decide about the acceptance of that defective sample. The performance of the proposed GTA was compared with Otsu's and Kapur's thresholding algorithms. With less segmentation time, it was found that the Naive Bayesian classification using GTA gave a 96.67% accuracy rate than Otsu's with 65% and Kapur's with 93.33% accuracy rate. The execution time of the proposed DACA was less when compared to the bwarea function in MATLAB.