

Title Computer vision detection of peel defects in citrus by means of a region oriented segmentation algorithm

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Abstract

Due to the high sorting speed required during fruit inspection and classification in packing lines, most of the current automatic systems, based on machine vision, normally employ supervised techniques oriented towards individual pixels to segment the images of the fruits. These techniques require previous training given by experts in order to classify the colour of each pixel as belonging to any of the regions of interest and frequent training sessions during normal operation throughout the season to adapt the system to the great colour variability present in biological products like fruits. In region-oriented segmentation algorithms, however, the contrast between different areas in the image becomes more important than the individual pixel colour, thus solving the problem related to the variability of the natural colour of fruits. This work proposes a region-oriented segmentation algorithm for detecting the most common peel defects of citrus fruits. Focused on the detection of the regions of interest consisting of the sound peel, the stem and the defects, this method is an original contribution that allows successful segmentation of smaller defects, such as scale. The algorithm was tested on images of different varieties of oranges and mandarins presenting defects, without any further training being given between inspections of different batches, even species, of citrus fruits. Assuming that the most surface of the fruit corresponds to sound peel, the proposed algorithm was able to correctly detect 95% of the defects under study.