Title Orienting apples for imaging using their inertial properties and random apple loading

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Abstract

The inability to control apple orientation during imaging has hindered the development of automated systems for sorting apples for defects such as bruises and for safety issues such as faecal contamination. Recently, a potential method for orienting apples based on their inertial properties was discovered. To test this method, apples were rolled down a track consisting of two parallel rails. As angular velocity increased, apples generally moved to an orientation where the stem/calyx axis was parallel to the plane of the track and perpendicular to the direction of travel. However, theoretical analyses and experimental results have demonstrated that select initial loading conditions could prevent or impede this orientation process. In this study, the practical importance of initial loading conditions was tested using two different methods to randomly load apples onto a track. Replicate tests indicated that successful orientation at rates of about 80% for Red and Golden Delicious cultivar apples was random, and that only 5% of the apples exhibited undesirable loading condition and orientation. Results suggest that a commercially viable orientation system could be developed by recycling apples that are not oriented during imaging, and that it should be possible to improve single-pass orientation rates by addressing track compliance and loading velocity issues.