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An investigation into apple inspection in colour space

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Abstract

To maximize the storage life of packed apples, no damaged apple can be included because the ethylene produced by the damaged, rotting fruit can lead to damage in the surrounding fruit. The variability in size, shape and colour of apples has meant that the commercial inspection process has had to remain largely manual. In manual inspection, all surfaces of the apple are sequentially presented to human inspectors who remove deformed or blemished apples from the processing line.

Most automated commercial inspection systems use infrared images to inspect the apples. These systems struggle to identify defects near the stem or calyx because of the reduced information in the monochrome images. In this work, the full visible light spectrum, via a full colour camera, was used to inspect apples in an attempt to isolate and identify stems, calyxes and defects.

A Sobel filter and an islanding routine were used to find areas of interest in undamaged apple skin. This led to the identification of 92.7% of stems, 97.9% calyxes and 83.0% of defects. Image processing for defect identification took as little as 16ms per image; fast enough for implementation in a commercial application where speed is critical.

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