WAGENINGEN UR
For quality of life

GreenVision

HIQUIP : HIgh speed QUality Inspection of Potatoes

Introduction

Grading and sorting of potatoes ensures that the product meets consumer-preferred quality. Up to now quality sorting is usually performed by trained human inspectors. However, there are some disadvantages to apply human inspectors such as subjectivity, inconsistency and high labour costs. GreenVision has developed a computer vision system to inspect and grade potatoes based on shape, size, cracks, growth cracks and colour defects such as greening, common scab, silver scab and rhizoctonia. The HIgh-speed QUality Inspection of Potatoes (HIQUIP) system incorporates conveyor belts to transport the potatoes to and from the vision unit. The total capacity of the system is about 50 potatoes/sec.

The HIQUIP system

The HIQUIP system consists of a conveyor unit for feeding, a vision unit and a rejection unit (Figure 1). In the feeding unit the potatoes are positioned row-wise in three parallel lines. Conveyor belts transport the potato under the camera for inspection. After inspection, the potato is transported to the rejection unit which drops the potato at the correct rejection station.

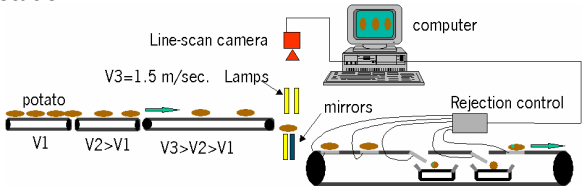

Figure 1. Schematic overview of the HIQUIP system

A digital 3-CCD colour line-scan camera scans the narrow gap between the two conveyors to achieve in-flight inspection of the potato (Figure 2)

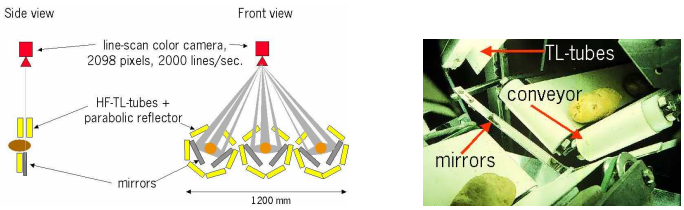

Figure 2. Overview of the camera and lighting set-up (left). Two conveyors with mirrors placed in the gap (right)

Mirrors are placed in the small gap (4 cm) to obtain a 360 degree view of the potato (figure 3). The lack of product holders and the use of mirrors guarantee a 360 degree view of the potato.

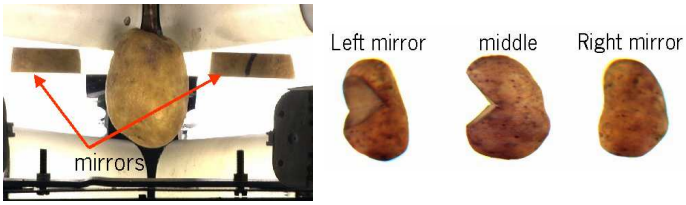

Figure 3. Camera view of the potato as it passes the gap between the conveyors (left). The produced images are sent to the DSP's for processing (right).

The surplus value of the mirrors is immediately shown in the right mirror image, as the crack in the bottom of the potato is still visible in the right mirror image.

Characterisation of potato defects

Factors such as size, shape, greening, coloured spots, cracks, scab, etc. characterise the final grade of a potato. Product experts have examined different potato cultivars for the characterisation of defects and diseases (Figure 4). The results are stored in a database and used for software

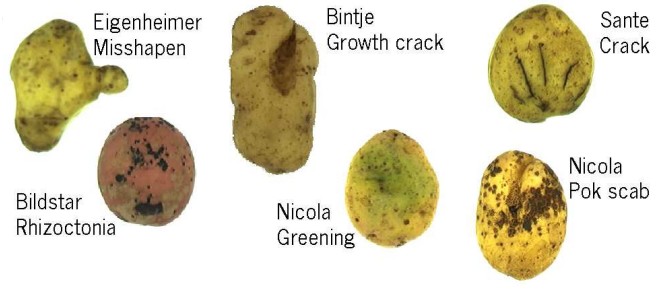

Figure 4. Examples of potato cultivars with different defects

Conclusion

Experiments with yellow and red skin-coloured potatoes have shown that the HIQUIP system is robust and consistent in its classification. The results indicate that the HIQUIP system can fulfil potato industry demands like high efficiency, robustness en accuracy.

Wageningen UR – GreenVision
P.O. Box 17, NL-6700 AA Wageningen, The Netherlands
Telephone: +31 317 478558 Fax: +31 317 475347
E-mail: GreenVision@wur.nl
Internet: greenvision.wur.nl