AHDB Horticulture

Project title:	Application of novel machine learning techniques and high speed 3D vision algorithms for real time detection of fruit
Project number:	CTP_FCR_2017_8
Project leader:	Grzegorz Cielniak, University of Lincoln
Report:	Annual report, 12/2019
Previous report:	09/2018
Key staff:	Grzegorz Cielniak (University of Lincoln) Pål From (NMBU) Micheal Mangan (University of Sheffield) Charles Whitfield (NIAB EMR)
Location of project:	University of Lincoln
Industry Representative:	Richard Harnden
Date project commenced:	14/09/2017

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[The results and conclusions in this report are based on an investigation conducted over a one-year period. The conditions under which the experiments were carried out and the results have been reported in detail and with accuracy. However, because of the biological nature of the work it must be borne in mind that different circumstances and conditions could produce different results. Therefore, care must be taken with interpretation of the results, especially if they are used as the basis for commercial product recommendations.]

AUTHENTICATION

We declare that this work was done under our supervision according to the procedures described herein and that the report represents a true and accurate record of the results obtained.

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Signature ..... Date .....12/12/2019.....

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GROWER SUMMARY

Headline

Working towards autonomous fruit harvesting and accurate long-term yield forecasting.

Background

Novel digital technologies including vision systems, robotics and autonomous systems are seen as potential game changers for the horticulture sector. Visions systems can be used to assess and sense the crop to enable better decision support; robotics and autonomous systems offer new means to drive productivity. These issues apply to all soft and tree fruit crops, but also more widely across the whole fresh produce sector. However, all picking and vision systems are dependent on the development of complex algorithms developed to identify, measure and locate fruit in real time. The development of these systems is not trivial, especially in outdoor environments where the background light level and quality can change within an instant.

Summary

This project aims to progressively implement crucial components required for robust autonomous fruit harvesting. The problem is comprised of five major milestones for fruit: segmentation, detection/classification, maturity evaluation, quality grading and finally 3D localisation and pose estimation. The challenge in this project is to achieve this whilst minimising computational requirements to identify fruit and maximising processing speed and recognition fidelity. This project will initially focus on strawberry and be anticipated eventually to include other soft fruit crops. Recent work has focused on long- and short-term tracking of individual fruits spatially and temporally to build a map useful for yield forecasting and online harvesting applications.

Financial Benefits

At this stage, the research is focussed on delivering systems that can operate 24/7 in agri-food environments over multiple disciplines such as harvesting, dense automated agronomy and yield forecasting. With expected financial savings from lower yield forecasting error, increased daily harvesting count, reduced labour demands and better resource (chemical) use from automated agronomy applications.

Action Points

Action points for growers will be developed in the penultimate project stages as it's too early to provide recommendations based on the current results for growers.

