Grower Summary

Soft fruit detection and shape estimation using 3D information and machine learning

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Annual report 2021

Project title:	Soft fruit detection and shape estimation using 3D information and machine learning
Project number:	
Project leader:	Grzegorz Cielniak, University of Lincoln Charles Whitfield, NIAB EMR
Report:	Annual report, 2021
Previous report:	Annual report, 2020
Key staff:	Justin Le Louedec
Location of project:	University of Lincoln
Industry Representative:	Berry Gardens Growers]
Date project commenced:	September 2018

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AUTHENTICATION

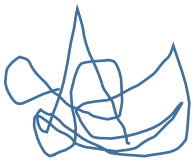
We declare that this work was done under our supervision according to the procedures described herein and that the report represents a true and accurate record of the results obtained.

Justin Le Louedec

PhD student

University of Lincoln

Signature Date 03/11/2021



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Senior Specialist

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Associate Professor in Robotics

University of Lincoln

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GROWER SUMMARY

Headline

The aim of this project is to study 3D information sensing and determine its potential for use with autonomous soft fruit farming. Provided are published results indicating improvements needed in the technology. In addition, we show that 3D information is a crucial component for crop and fruit detection and analysis, and more generally within the topic of autonomous agriculture. Research from this project on achene counting over strawberry surfaces has also been published.

Background

This work is aligned with a larger project around the deployment of robotic platforms in strawberry farms, to help pickers, growers, and the industry members with various tasks. Specifically, we study the vision system of robots and how they can be used for different tasks such as picking or phenotyping. This project could open the door to various applications utilising 3D information. Such applications, relating to automated machine vision systems, are likely to be tasks such as:

- improving fruit differentiation to assist with picking
- providing information to the growers such as size, weight, quality, and number of fruits
- improving phenotyping accuracy
- autonomous phenotyping

Summary

Extensive field have been conducted to evaluate sensing technologies and algorithms. Doing so we have found strong limitations in available current sensing technologies while proving the usefulness of our methods and 3D information. We also have provided some 3D shape descriptors which can be used in phenotyping applications and will be used in later advances in the project. Finally, we proposed a novel method for achene counting over the surface of strawberries, published at BMVC 2021. This method achieves impressive results, performing better than previous method and manual phenotyping work.

Financial Benefits

This project is part of a much larger programme to develop robotics for the horticultural industry. The exact financial outcomes of such investment in robotics and computer science are unclear at this early stage. However, it is expected that a fully working robot picker would

reduce labour cost for picking, transporting, and analysing fruits in the grower facility, with an initial investment in the robot.

Action Points

There are no clear action points at this stage of the project.