

Soft Fruit Robotics

University of Lincoln

Lincoln Centre for Autonomous Systems (LCAS)

By: Prof. Amir Ghalamzan

Lincoln Institute for Agri-food Technology (LIAT)

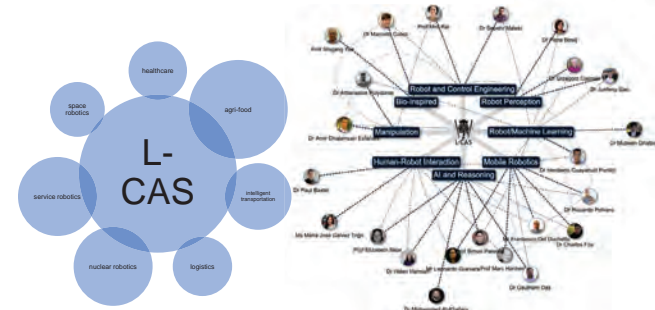
Lincoln Agri-Robotics (LAR)

Date: 01/12/2022



Testing selective harvesting teams at Lincoln Institute for Agri-food Technology (LIAT), University of Lincoln, UK

Agri-Robotics @ University of Lincoln, UK



Perception for Different Tasks/Applications

Breeding

- phenotyping: measure fruit/plant properties for genetic selection

Crop Care

- health monitoring (water/nutrition intake control)
- disease control (identify and treat selectively affected areas)
- husbandry (trim excess/old leaves, remove rotten berries)

Harvesting

- automated picking (pick healthy, ripe berries only)
- quality assurance (during harvest and post-harvest/packing)
- yield prediction (for better management/decision making)

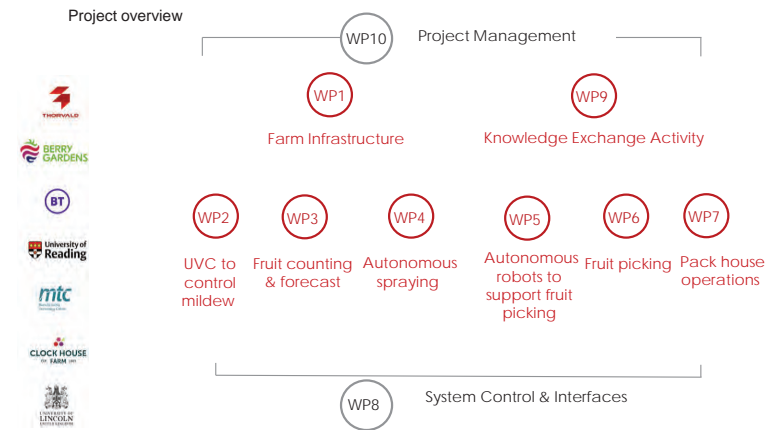




Robot Highways

automating crop care,
monitoring and
harvesting in soft-fruit
production

Robot highway project overview

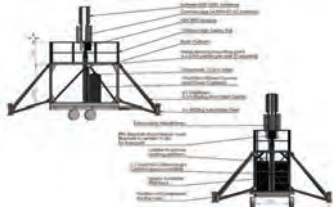


Robot highway project



- The project demonstrates robotics technology to
- Improve forecasting accuracy
- Increase farm productivity
- Reduce packhouse and farm labour
- Reduce fruit waste
- Reduce fungicide use
- Reducing fossil fuel use

WP1: Farm Infrastructure



WP5: Supporting Human Pickers



Trials at Clock House Farm – Integrated Logistics and Crop Monitoring



Robots gathering Data for Yield Forecasting



Some more “low hanging fruits” of Robot Autonomy

- UVC Treatment
 - Removed need for chemical treatment
- Spraying Treatment
 - Concentrated application



Strawberry Picker Robot

Tech effectiveness

Agrobot



TRL

Traptic



Root.ai



Use the same tech for cucumber and strawberry picking

Strawberry Picker Robot

Organifarms



Dogtooth



Tortuga



Octivia-Octinion

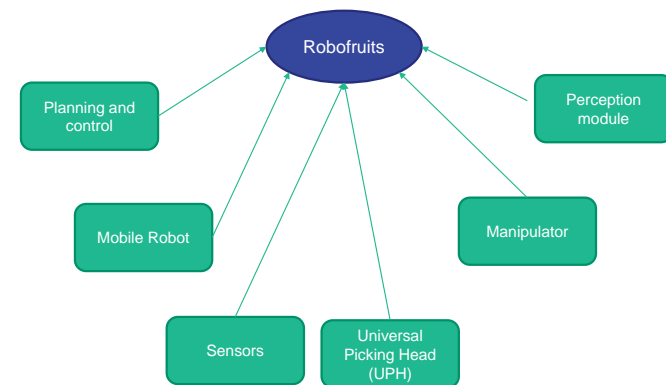


Harvest CROO



Robofruits

- Hygiene (suitable for cleaning on a regular basis)
- Food standard (e.g. safety)
- IP (resistant to water and dust)
- Cluster as a key challenge (Strawberry in clusters are the most common to pick)
- Patent protected
- Modular for being adapted/adopted in future



Unievrsl Picking Head



Integrated system on Thorvald @ Riseholme UoL, UK



Robofruit: Final project demo @ Riseholme, UoL, UK
15 months CERES funded project

The performance of the robofruit in July 2022

Table 3: Results of field experiments.

Trial No.	Total fruit	Pickable fruit	Pickable and detected	Cut success Failures	Grip/Cut failures	Picking Valid failures	Position failures	Successful harvest	Total attempts	Total trial time (s)
1	17	7	1	2	0	0	1	6	10	305
2	15	7	0	1	1	1	3	5	11	335
3	18	8	1	0	0	0	0	7	7	315
4	14	10	0	1	0	0	0	4	15	441
5	25	12	1	2	1	1	1	11	15	455
6	14	9	1	0	0	0	0	8	8	221
7	28	12	2	1	0	2	0	9	15	425
8	8	3	0	0	0	0	0	3	5	78
9	14	8	0	2	0	0	0	5	10	221
10	15	16	0	0	0	1	0	16	17	440
11	31	9	0	1	1	0	1	8	14	311
12	17	10	0	2	0	0	1	8	11	340
13	24	11	0	3	1	0	2	8	12	401
14	21	8	1	0	1	0	2	4	10	270
15	20	8	0	1	1	1	2	7	10	261
16	14	7	1	2	0	0	0	3	8	190
17	23	8	0	1	2	0	0	8	11	331
18	20	11	0	1	1	0	1	8	12	315
Total	377	163	8	36	9	4	17	135	201	5324 (s)

effectively capable of a stable grip and successful cut of the strawberry stem. The picking head is successfully capable of grasping and manipulating the harvested strawberry without contact with the fruit. In contrast, most available technologies handle the fruit by grasping it using grippers or suction cups or directly dropping it into the container after cutting the stem. Our design grasps and handles the fruit from its stem reducing

Conclusion

- Robotics Can help with some of the Soft fruit production challenges
- Reduce production cost and waste

Thank you!



Prof. Marc Hanheide



Dr Soran Parsa



Prof. grzegorz cielniak

Email: aqhalamzanesfahani@lincoln.ac.uk
<https://intmanlab.com/>