Agri-Food and Horticultural Robotic and Data Analytic Developments

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Introduction

Harper Adams Engineering activities

Teaching:
- Agricultural engineering
- Off highway vehicles
- Mechanical engineering
- Mechatronics engineering
- Precision agriculture
- Future farming

Research:
- Robot Vehicles
- Robot Harvesters
- Automated weed control
- Crop Scouting
- UAVs/Drone Spraying
- Precision agriculture
- Big Data/IoT

Agricultural Engineering Innovation Centre
Robot Vehicles

1. RTK GPS
2. WiFi antenna
3. Infrared safety barrier
4. Remote dead man’s handle
5. Navigation LIDAR
6. Emergency stop switches
7. Collapsible bumper
8. Canopy LIDAR
9. Distributed CPUs with SAFAR3
10. Physical wheel guards

USER-PA Project
Partners: Israel, Germany, Turkey, Greece, Italy, UK, Denmark
UK funding: DEFRA (2012-2016)
Strawberry Harvesting Robot: AUTOPIC

• AUTOPIC is a multi disciplinary project that is developing a soft fruit harvesting system using autonomous vehicles and robotics.
• Partners include Harper Adams University, the Shadow Robot Company, and the National Physical Laboratory.
Weed Identification & Removal

In arable agriculture image processing is used to identify weeds. Weeds removed by:

- Inter-row – Robotically steered hoe
- Intra-row – Laser weeding
Weed Removal: Laser Weeding

Direction of travel

Tractor or "robot"

Sensor triggers areas to treat

Plants illuminated from LEDs with specific hyperspectral wavelengths

Reflected frequencies define plant type

Nozzle or laser is directed to targets weeds

Sensor
Effector
Platform
Crop Scouting

- Crop scouting robot for vineyards
- Built by Harper Adams MEng students for the University of Athens
- Software Architecture for Agricultural Robots
- Thermal camera for irrigation status
- Multispectral camera for nutrient status
- LIDAR for canopy extent and density
Sub-canopy scouting robot

- Omnidirectional camera
- 3D stereo camera
- Hyperspectral camera
- Hyperspectral camera
- Articulated chassis
- 4 Wheel drive
- 4 Wheel steer
- Intelligent Wheel hubs
Agricultural Drone Centre

- Part of the NCPF
- Working with
  - Civil Aviation Authority, RAF, DfT
  - Chemical Regulation Directorate
  - Drone manufacturers
  - Many drone operators
- Spray testing laboratory to accredit drones to spray agrochemicals in the UK
Hands Free Hectare – future is here

Project outline

Automated machines growing the first arable crop remotely, without operators in the driving seats or agronomists on the ground.

Commercial compact Ag machinery “Open source” automation

1 year project…. One chance!!
Agriculture 4.0

IoT

Data

Farm / Environment

Treatment

New Machinery, Processes & Treatments

Better Informed Decision

Analysis

Information
- Advice / Guidance
- Predictive Responses
- New Management Tools & Systems

Global Data Set

Other Interested Parties
- Agronomy Companies
- Supermarkets
- Agrochemical Companies
- Government, etc.

Business Information

New Research Phenotyping etc.
Three Centres: Harper Adams, SRUC, Cranfield
Connected Farm: 32+ Satellite Farms

The New EPI Centre will be Developing Commercial Agricultural Robots for the UK!