Remote Sensing at Fera

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Platforms and Sensors - Example Projects
RS of Trees - Inspection targeting example

Tree Species Classification - Host Species Target Mapping

UAV Image | Species Classification | Tree Health | Target Map
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Class:
- Ash
- Beech
- Horse chestnut
- Oak
- Elm
- Beech lace
- Silver beech
- Black cherry
- Love apple
- Common maple

NDVI 0.8

NDVI -0.7

Larch

Scale: 1:11,647

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 36
Unit: Meter
Individual tree species identification also provides a tree count.
Mobile GIS - Ground Truth Data
Mobile GIS - Ground Truth Data
Mobile GIS - Host Species Inspections
Mobile GIS - Host Species Inspections
UAV Case Study - Automatic Crop Counts
Data Dissemination - web mapping

- An online map that allow users to view, interrogate, and analyse geographic data
- Shared over the internet and can be accessed via a web browser on a PC, a smartphone and/or a tablet

Benefits:-

- User can interact with the data
- Present the most up-to-date information
- Can reach a wide audience at a very low cost
- Do not require the production of paper maps
- Users do not need GIS software
CLASP Project Introduction

• Funded by STFC Challenge Led Applied Systems Programme (CLASP)

• The Challenge
  • Understanding tree species distribution/health of woodlands: fundamental to disease and pest control
  • Species maps for local scale management.

• Project Aim
  • Develop an approach to tree species mapping over large areas - to be tested on single local authority area
  • Fusion of technology and knowledge
Technologies Involved

Technology Readiness Levels (TRL)

- TRL9 Operations
- TRL8 Active Commissioning
- TRL7 Inactive Commissioning
- TRL6 Large Scale
- TRL5 Pilot Scale
- TRL4 Bench Scale Research
- TRL3 Proof of Concept
- TRL2 Invention and Research
- TRL1 Basic principles
Sensors and Platforms

• EO Satellite (TRL=9)
  - Large spatial coverage
  - Low resolution
  - Sensors fixed but high quality

• UAV (TRL=9)
  - Small spatial coverage
  - High resolution
  - New sensors easily integrated
  - Flight restrictions
  - Privacy and data protection concerns

• Multispectral Sensors (TRL=9)
Multispectral Imagery
Hyperspectral Sensors (TRL = 2-5)
DJI MATRICE 600 PRO

- 5.5 kg Max Payload
- 65 kph Max Speed
- 16-18 minute Flight Time
Future......Data Fusion

UAVs training Sentinel-2

![Image of UAV and satellite]

Proportion from UAV Data

Random Forest Prediction
Using RS information in modelling outbreaks
Model Scenario - Dothectroma Like Pathogen
Modelling Time to Detection
Model Scenario - EAB Outbreak

• 10km square centred on Drax power station
• Woodland: 116 ash trees per ha
• Wider landscape: Randomly distributed 10-18 ash trees per sq. km
• Outbreak starts with 1 female Emerald Ash Borer
• Outbreak simulated over 25 years
• 3 Trap Operator classes
  • Inspector
  • Expert
  • Citizen Scientist

• Parameters
  • Trapping probability
  • Treatment efficacy
  • Treatment radius
  • Number of operators
  • Operator expertise
  • Time between checks
EAB - Agent Based Model
Cost-Benefit Modelling