Leaf reflectance spectra from RGB camera and AS7343

Reconstruction and validation on medicinal plants

TECHNISCHE UNIVERSITÄT DARMSTADT

Thesis project

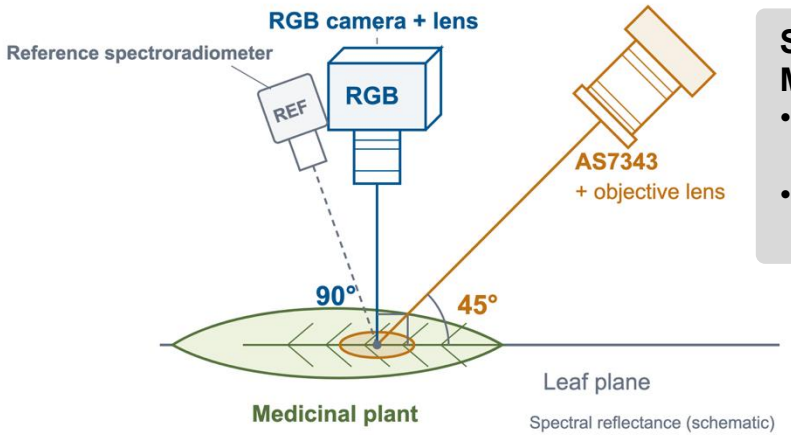
Area: Plant Centric Lighting, sensing
Skills: Python, image processing, sensor fusion
Contact: Felix Wirth
wirth@lichttechnik.tu-darmstadt.de

Project description:

How accurately can leaf reflectance spectra be reconstructed from 3 RGB channels of an industy camera and 11 AS7343 spectral channels?

- Measure medicinal plants, develop the algorithm in Python and validate the system against a reference spectroradiometer.
- Use white/dark references and fixed illumination.
- Pick optimal rgb camera
- Compare RGB, AS7343 and sensor fusion.
- Evaluate spectral RMSE and spectral angle on independent plants.
- For master thesis extension to in production horticulture light environment

Shared leaf measurement area

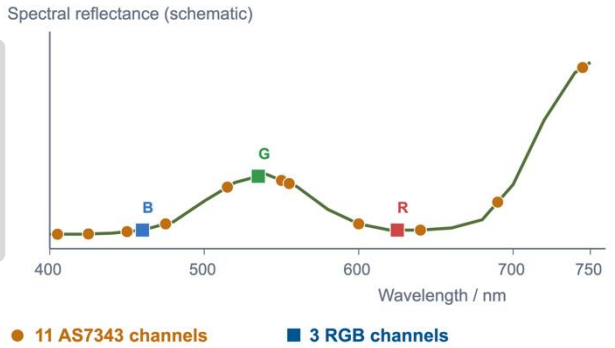


Schematic Measurement System

- Student needs to select RGB camera
- AS Sensor needs to be integrated

Supporting Points

- Ground truth spectral reflectance
- vs. Support points of sensor and rgb camera



Measurement dataset
Measure medicinal plants
Acquire RGB and AS7343 data
Record reference spectra

→

Algorithms and sensor fusion
Test different reconstruction algorithms
Fuse RGB and AS7343 data
Compare RGB alone / AS7343 alone / fusion

→

Reference comparison
Compare reconstructed spectra
with spectroradiometer measurements
Spectral RMSE and
spectral angle (SAM)

→

Validation and evaluation
Test on independent plants
Systematically compare algorithms
Assess the added value of sensor fusion