Seed purity selection using NIR hyperspectral imaging

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Business development SeQso

Contents

- Background
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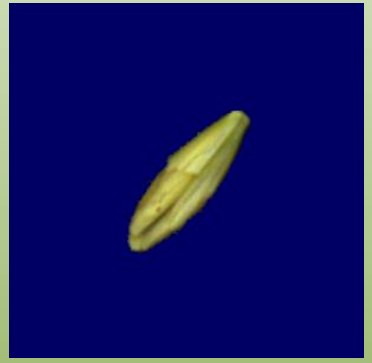
Background SeQso

- Company in development and manufacturing of advanced machines and instruments for seed industry involving:
  - Analysis
  - Sorting
  - Precision sowing
- Multi modal imaging
  - RGB
  - Fluorescence
  - X-Ray
  - Hyperspectral (VIS – NIR – SWIR)

Purity sorting (phenotype)

- Select all seeds belonging to a certain crop
- The remainder is the “debris”
- Case:
  - Oats purity (ingredient in food for gluten free diet)
  - Toughest problem is detection of barley seeds
  - Typical “bad” residual = 10 .. 100ppm
  - Get a debris fraction less 1% of total seed lot with 98% of all bad residual

Sample images

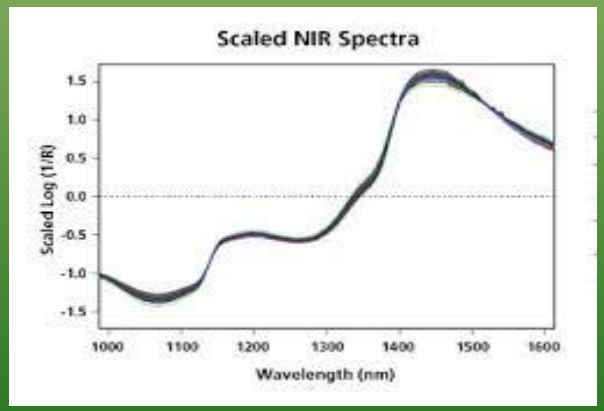


Barley

Oats

Rye

Wheat



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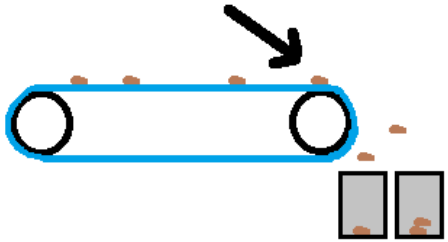
SeQso, Fred Hugen
EPIC Online Technology Meeting on Hyperspectral Imaging

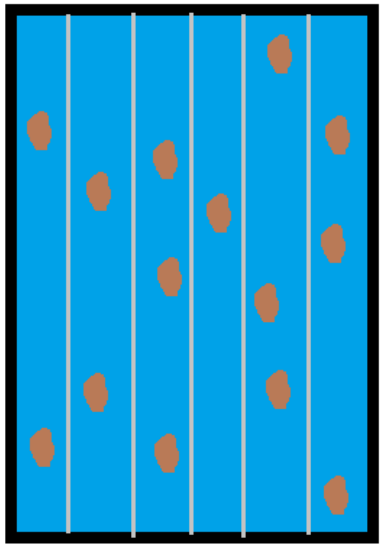
Solution

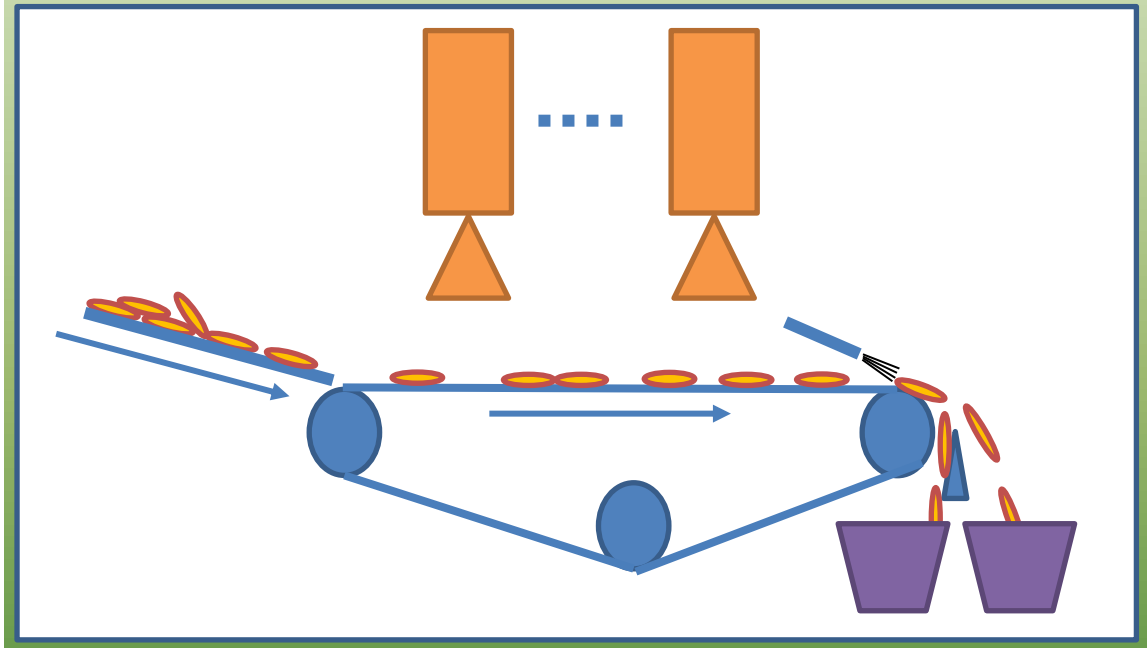
- Sorting machine with a belt with 22 parallel lanes
- Positive selection (blow off everything recognized as an oat)
- Using 12MP high-res RGB color imaging for shape, texture and color analysis
- Using a NIR spectrum for additional measurement data especially for detection of barley

System overview

Principe II







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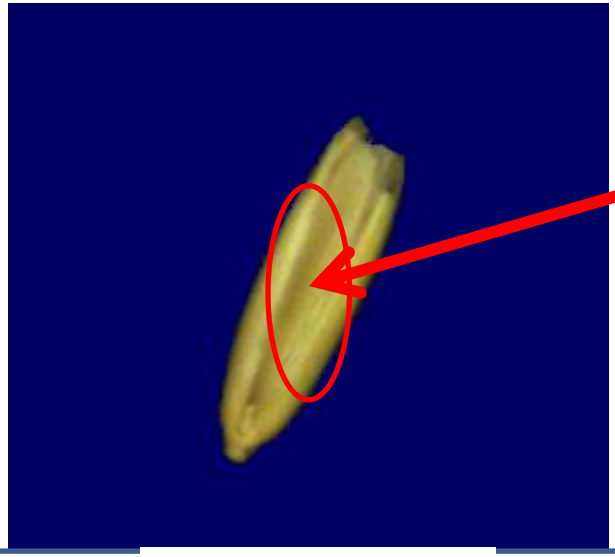
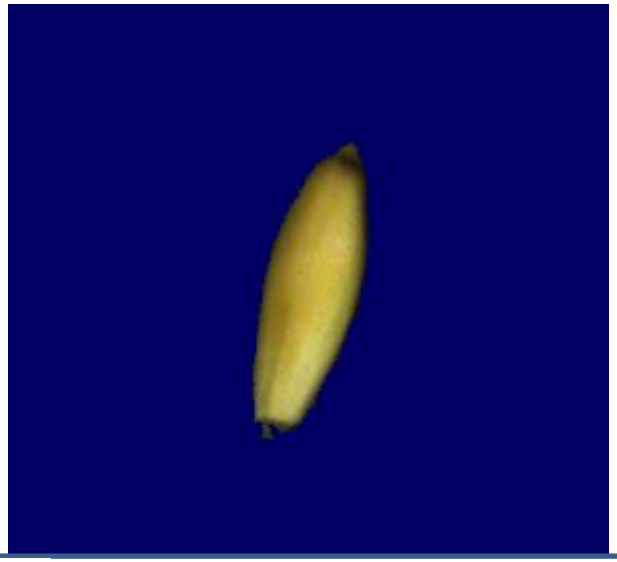
Why hyperspectral imaging?

- There are 22 lanes -> 22 channels for a spectrometer
- Problem for a spectrometer probe is the difference in position/orientation and height of seeds
- Mixing of belt / seed at border of the seed
- Internal part of the oat seed

Hyperspectral imager

- Specim FX17
  - 640 spatial pixels (0.3mm / pixel)
  - 224 bands (used 194)
  - Range 950nm .. 1700nm
- Halogen illumination
  - 10 bulbs of 50W, 12VDC stabilized

Classification

- 




Oat upper side

Barley

Oat down side

Lessons learned

- NIR Hyperspectral imaging requires expensive equipment but is very versatile for biological objects
- Preprocessing of signals is required (normalization / calibration / bad pixels)
- Problems with temperature stability (halogen illumination 500W, camera cooling stability)

Take your next step with Hyperspectral imaging!

“Thanks for your attention”