Introduction

Imaging Spectroscopy is the study of light as a function of spatial distribution and wavelength that has been transmitted, emitted, reflected or scattered from an object. This allows us to derive information about the spatial relation of the chemistry of the object.

Imaging spectroscopy is suited for the following tasks:

- Quality control: detection of latent defects in agri-products, e.g. vegetables and fruit.
- Quantification of compounds: carotenes, proteins, sugars, moisture etc.

Application 1: Measuring of compounds in tomatoes

Independent Component Analysis is one of the most widely used methods for blind source separation. We used this technique to estimate the most important compounds which play a role in the ripening of tomatoes.

Two main components were found. These resemble the actual absorption spectra of lycopene and chlorophyll. The method can be implemented in an unsupervised real time sorting machine, using the total compound concentrations and the spatial distribution of the concentrations as criteria.

Application 2: Detection and classification of latent defects in French Fries

New developments in French Fries production are Fries that are still (partially) covered with peel. Traditional French Fries inspection systems equipped with 3CCD cameras cannot differentiate between good product, peel and various defects successfully because these systems lack spectral resolution. It shows that imaging spectroscopy outperforms RGB images in terms of classification accuracy, yield and purity. More importantly, multispectral images show defects which are invisible in color images.

References

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- G. Polder, Spectral imaging for measuring biochemicals in plant material, PhD project, TU Delft