Applying models from 3rd party software

This page summarizes possibilities on applying chemometric models from 3rd party software onto hyperspectral data for off-line or in-line purposes.

Chemometric modelling is a very essential step when investigating chemical or physical material properties. Typically, experts like to do this in their familiar software environment.
This is supported by the export of data (spectra, cubes) and import of models back into the Perception Studio software program. When configuring the real-time processing core (Perception Core) through the Perception Studio, a data processing system is obtained, allowing multiple predictions per spatial object pixel in industrial real-time.

Introduction

Data Processing Steps

When doing predictions in the industrial environment, a number of data processing steps must be considered:

- Sensor Data Preprocessing
- Hyperspectral Preprocessing
- Feature Extraction
- Feature Operation

The **sensor data preprocessing** aims for a "standardization" of the instrument.
Therefore electrically and optically disorder (like sensor noise, optically distortions, etc.) are corrected by this data processing step. Data from different instruments (same type but different batch) ought to get comparable to each other.

The **hyperspectral preprocessing** aims for a type of spectra best suited for further investigation and analysis.

The **feature extraction** aims for the extraction of a certain value from spectroscopic data. This value can be the prediction value obtained by applying a linear model onto spectral data. Since this step is typically done in parallel, per spatial object pixel multiple predictions can be obtained simultaneously.

Sometimes also **feature operation** is an important step. By feature operation a number of features (output of the feature extraction), like predictions, are mathematically combined with each other.

Prerequisites

Applying models from 3rd party software is possible without any restrictions, when

- the modelling process was done on spectra preprocessed by the Studio program
- the model is linear (**Y**=**B*****X**+B0)
- and the model file (exported from the 3rd party software) is readable by the Perception Studio program.

Preprocessed means: **sensor data preprocessing** as well as **hyperspectral preprocessing** was applied to the spectra using the Perception Studio program (not the 3rd party software).
A linear model is described by the vector **B** and the scalar B0. **X** is a matrix of spectra (input) and **Y** is a vector of predictors (output).

Workflow

The typically workflow on getting and applying a linear model is:

- Set up the instrument and get measurement data from your sample matrix (sensor data preprocessing is applied automatically) - see Setup a Hardware Device.
- Explore the measurement data to check the quality - see Explore Hyperspectral Information.
- Apply hyperspectral preprocessing to the data in the Perception Studio program - see Strategies on the Configuration of Hyperspectral Preprocessing.
- Select spectra from the hyperspectral data measured - see Select Spectra.
- Find the spectral region of interest by using the crop functionality - see Crop Hyperspectral Data.
- Export the data in a format of your choice (e.g. ASCII) - see File Import / Export.
- Import the data into the 3rd party software of your choice - see File Import / Export and e.g. Matlab Scripts.
- Do the modelling work.
- Export the model(s) from the 3rd party software in a format readable by the Perception Studio program - see File Import / Export and e.g. Matlab Scripts.
- Import the model(s) into the Perception Studio program and design a CCI model from it - see CCI Design Method.

- Apply the model(s) to your measurement data and verify the quality of the model(s) - see Applying an existent model on new hyperspectral data.

In case of real-time processing:

- Configure the Real-time processing core in the Setup perspective (Setup a Hardware Device)
- View the instruments predictions of new measurements live in the Perception Studio program (View Feature Streams).