HyDaS

About HyDaS:

HyDaS stands for Hyperspectral Data Simulation tool. This software has been developed as an Open source software for Hyperspectral Remote Sensing data processing with which image visualization of hyperspectral images is done using spectral python library. Moreover, spectral profile is plotted using matplotlib and linear unmixing of data is accomplished where the output file of result can further be used in any other open source /commercial tool.

Hyperspectral Image:

Hyperspectral images are the images which are acquired by imaging spectro-radiometers. Hyperspectral imagery generally provides 100-200 spectral bands with a narrow bandwidth of 5-10 nm. Hyperspectral imaging creates a large number of images from contiguous regions of the electromagnetic spectrum. This increases sampling of the spectrum (versus multispectral data) and greatly increases the amount of information available to a researcher.

Visualization of Hyperspectral Image:

Each band of the image may be displayed one band at a time as a grey scale image, or in combination of three bands at a time as a colour composite image. Colour composite image display combines three primary colours (red, green and blue) in various proportions producing different colours of the visible spectrum.

True colour composite: For true colour composite, the combination used is shown below:

R = (Red band)
G = (Green band)
B = (Blue band)

2. False Colour Composite: The display colour assignment for any band of a hyperspectral image can be done in an entirely arbitrary manner. In this case, the colour of a target in the displayed image does not have any resemblance to its actual colour.

A very common false colour composite scheme for displaying a SPOT multispectral image is shown below:

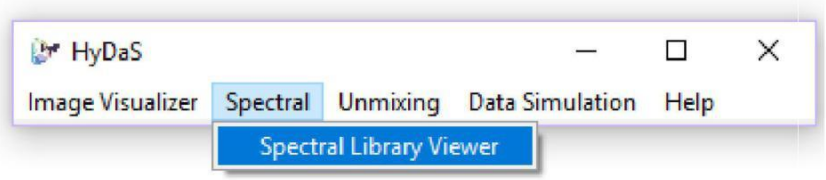
R = XS3 (NIR band)
G = XS2 (red band)
B = XS1 (green band)

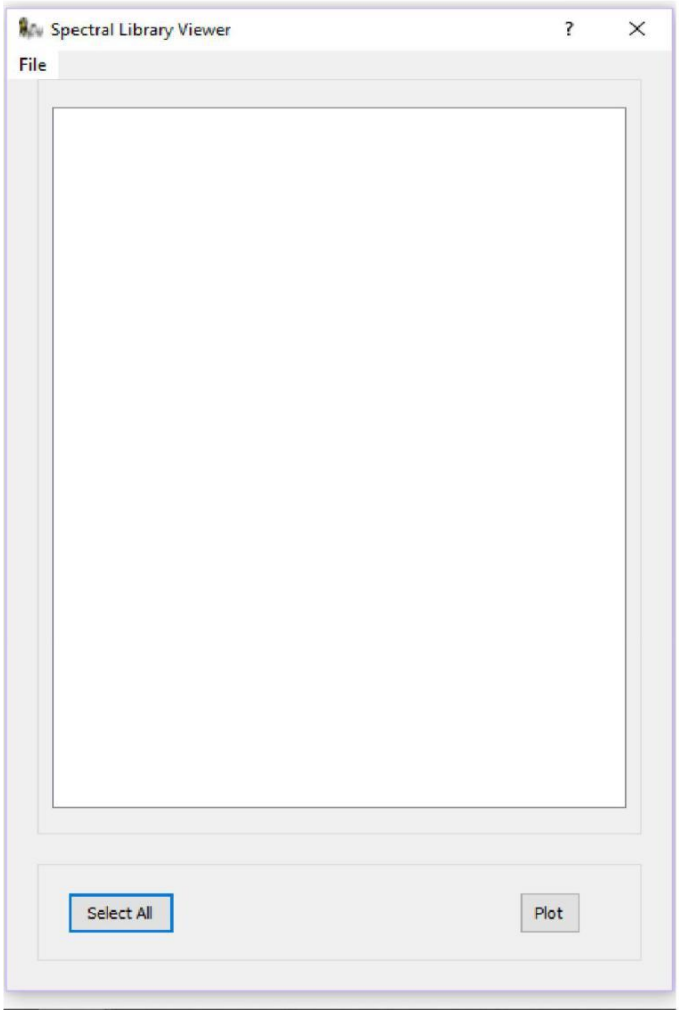
Visualization of Spectral profile:

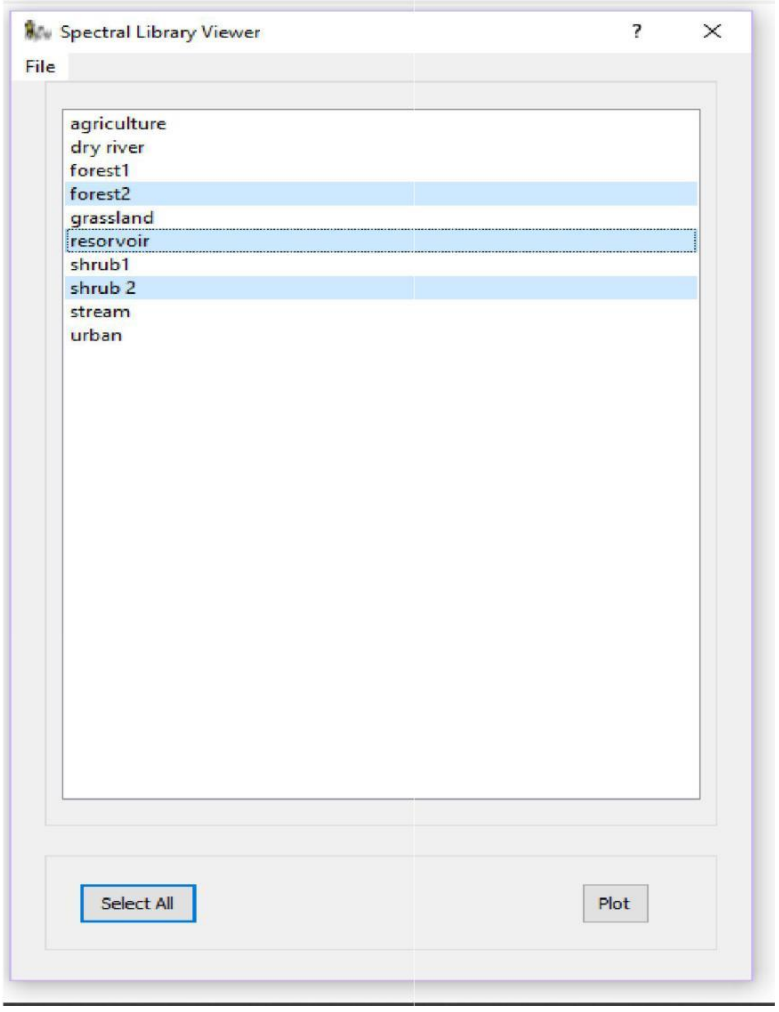
The Spectral Profile plots the sp ectrum of all bands for the selected pixel. You can extract spectra from any multispectral/hyperspectral dataset. This tool uses header info rmation to scale the plot. If multiple layers are di splayed in the Image window view, This tool pl ots a Spectral Profile from each layer. To turn off the plot for an individual layer, disable the check box for that layer in the Layer Manager.

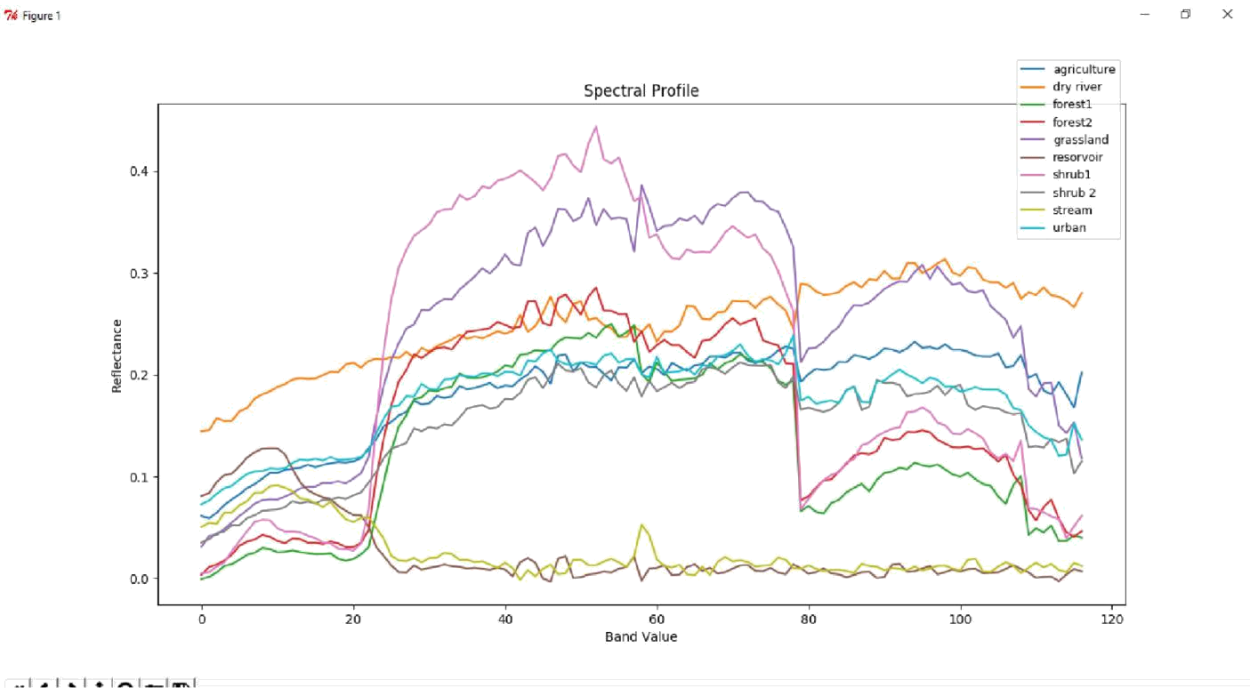
Steps to open a Spectral Profile:

1. Click on Spectral button on toolbar
2. Select a file from the loc ation
3. Select the profiles for which the spectral profile is desired
4. Click on Select All button to select all profiles
5. Click on plot button to p lot the spectral profiles









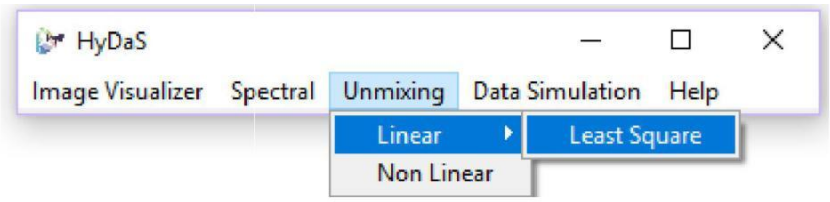
Linear Unmixing:

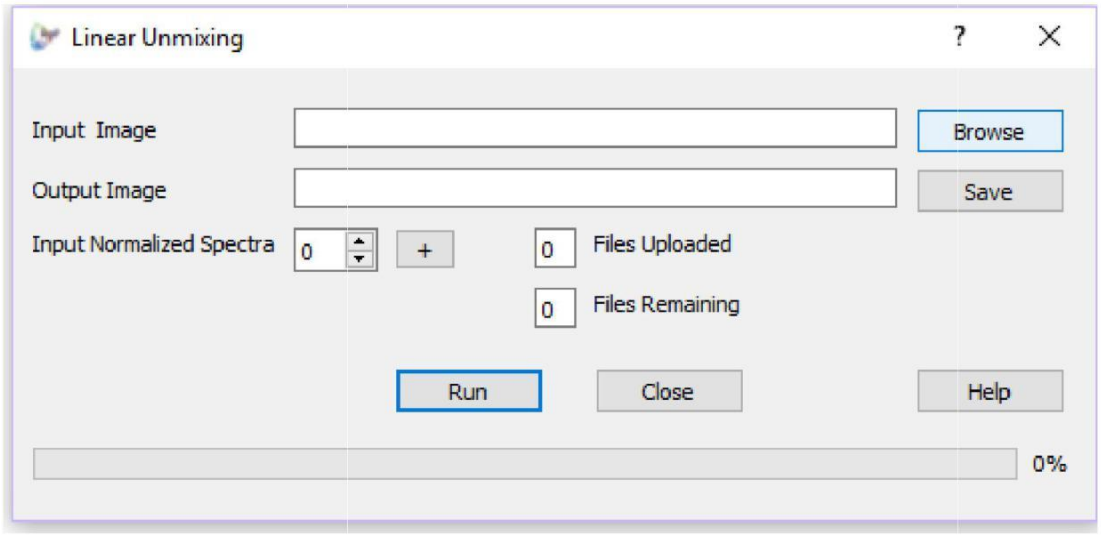
Linear Spectral Unmixing deter mines the relative abundances of materials (urba n, vegetation, water etc.) that are depicted in an image. The reflectance at each pixel of the ima ge is assumed to be a linear combination of the reflectance of each material present within the pix el.

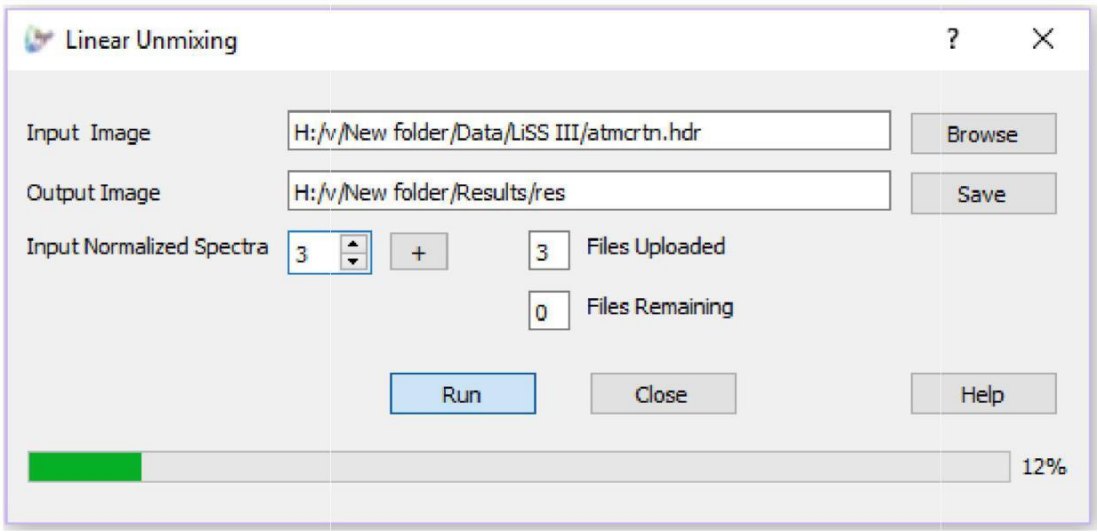
Steps:

1. From the software's main men u bar, select Unmixing> Linear > Least Square. A new dialog box appears.
2. Click on Browse and select a MRS image in .hdr format as an input file.
3. For Spectral unmixing normalized MRS spectra saved in ASCII format are used. For Input Normalized Spectra, first define the number of spectra using SpinBox, followed by clicking on '+' ToolButton to upload the respective ASCII files.
4. At least three normalized spectra (urban, water, vegetation) should be given as input and the maximum shouldn't exceed the number of bands in the input MRS image.
5. To make the job easier for the user, the dialog box displays the number of spectra files uploaded along with the number of files remaining.
6. Click on 'Run' for generating the corresponding Unmixing Coefficients outp ut file in .hdr format.

7. Click on ‘Save’ to select the l ocation to save the output file.







Developers:

1. Akriti
2. Keshav Goswami