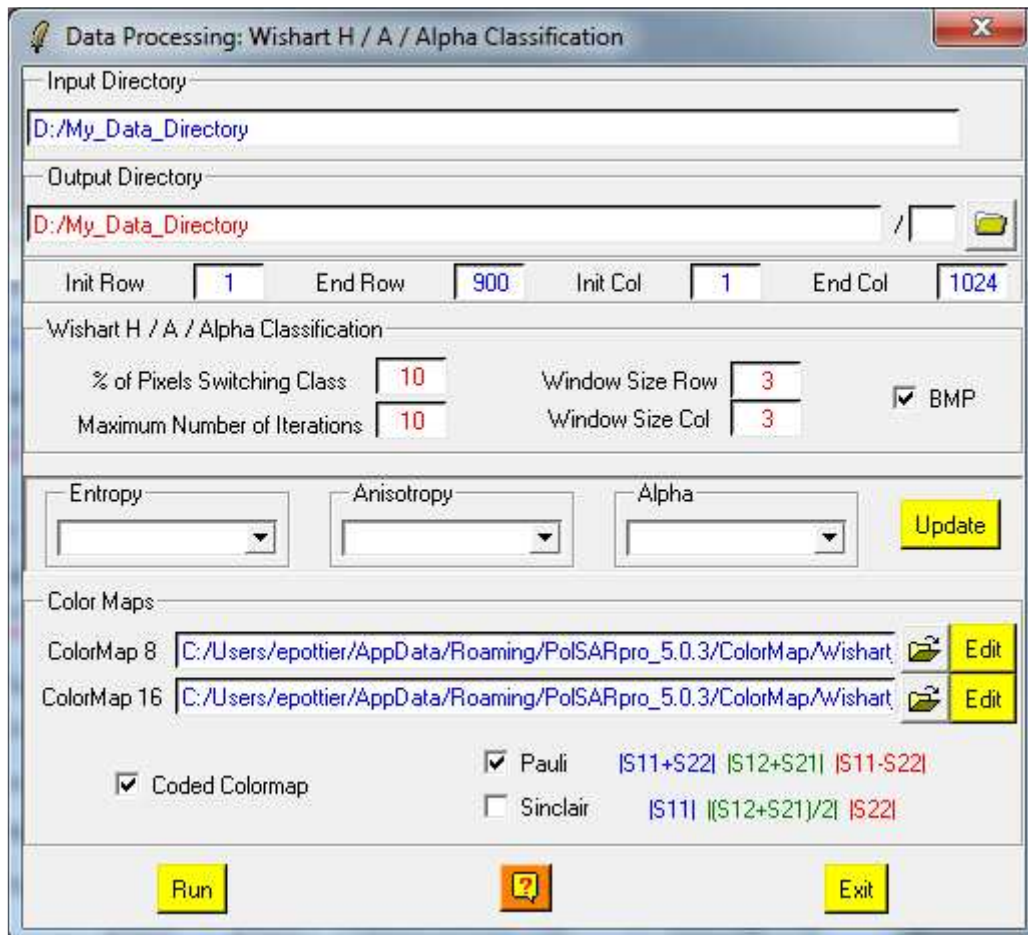# Wishart H/A/Alpha Classification

Description:

This program creates binary and bitmap image files resulting from the segmentation of polarimetric data using the Wishart H-Alpha and Wishart H-A-Alpha schemes. The Wishart polarimetric classification scheme performs a Maximum Likelihood (ML) statistical segmentation of a polarimetric data sets based on the multivariate complex Wishart probability density function of second order matrix representations.

An optimal segmentation necessitates maximizing a global ML function over the entire polarimetric data set and requires an unreasonable amount of time. A sub-optimal solution consists in iteratively optimising this function using a k-mean clustering algorithm. It is well known that such an algorithm may get stuck in local minima and is then highly sensitive to the initialisation conditions. It was found that an initialisation of the different clusters using the results of the H-Alpha classification procedures led to satisfying and stable results (J.S. Lee et al.).

A similar ML segmentation scheme explicitly including Anisotropy related information may be built from the Wishart statistics and led to improved

segmentation results (E. Pottier et al.).

Comments:
can be modified directly by the user from the keyboard.

Input/Output Arguments:

Input Directory	Indicates the complete location of the considered **Main Directory (MD)** containing the matrix data to be classified.
Output Directory	Indicates the location of the processed data output directory. The default value is set automatically to **Main Directory (MD)**.

Output Image Number of Rows/Columns:

The output image numbers of rows and columns are initialised to the input data set dimensions.

Users wishing to process a sub-part of the initial image can modify the **Init** and **End** values of the converted images rows and columns.

Note: init and end values have to remain within the range defined by the input image dimensions.

Classification Configuration:

Window Size	Data to be decomposed may be processed through an additional filtering procedure consisting of a boxcar filter. Users have then to set the size of the (NxN) sliding window used to compute the local estimate of the average matrix. Users wishing to avoid additional filtering may set N to 1.

The segmentation termination criterion consists of a logical combination of the two following conditions. The iterative k-mean clustering procedure is stopped if :

% of Pixels Switching Class	A sufficiently low percentage of pixels switch class from one iteration to the other. (The default value is set automatically to 10%)
Maximum Number of Iterations	The number of iterations reaches a maximum value. (The default value is set automatically to 10)

ColorMaps:

The colour coding of the bitmap output files is realized by the way of a 8 or 16 element colormap initialised with arbitrary values. Users have the possibility to modify the elements of the colormap in an interactive way.

There exists also the possibility to create an automatic **Coded Colormap** obtained from an RGB colour coding of each Class Feature Vectors.

Output Files:

Each classification procedures creates ouput binary files and the corresponding optional bitmap image files.

Classification binary output files :

- MD / wishart_H_alpha_class_X.bin
- MD / wishart_H_A_alpha_class_X.bin

Classification bitmap output files :

- MD / wishart_H_alpha_class_X.bmp
- MD / wishart_H_A_alpha_class_X.bmp

The variable **X** indicates the window size of the eventual additional filtering performed prior to data classification.