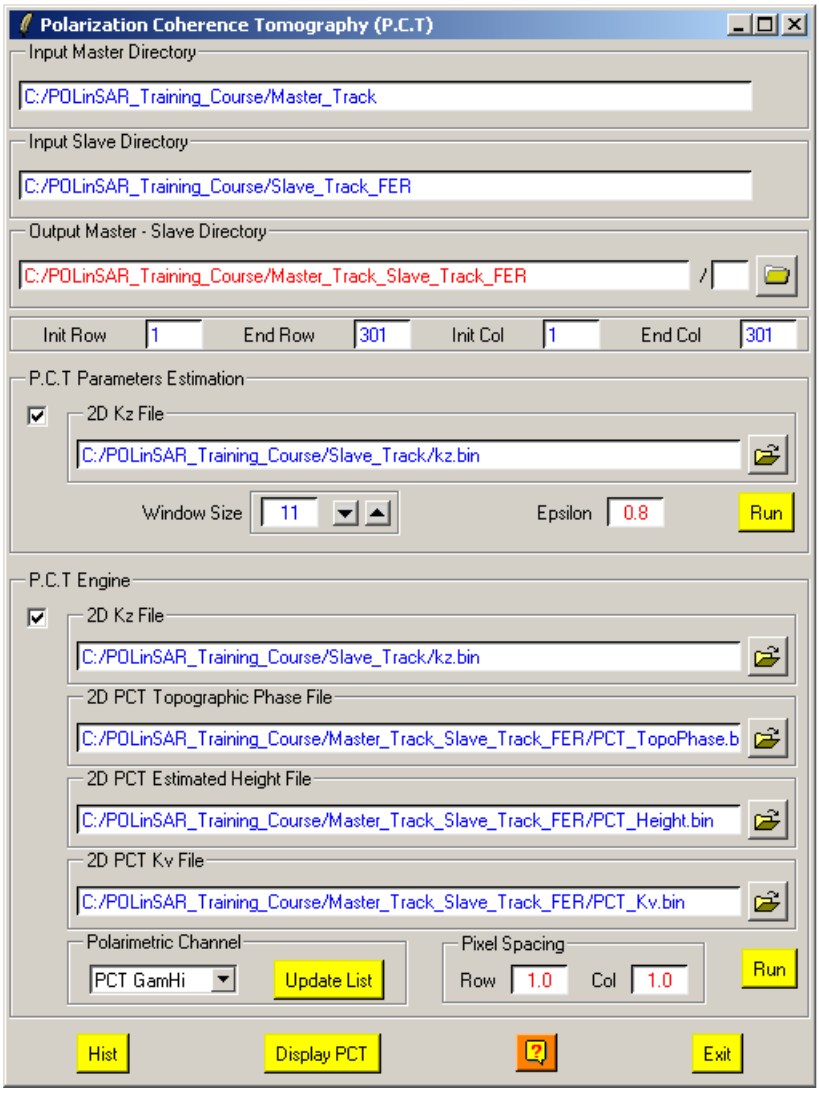
Polarization Coherence Tomography (P.C.T)



Description:

This function is used to apply the Polarization Coherence Tomography procedure on Pol-InSAR raw binary data elements

This procedure is based on the use of the scale factor or vertical wavenumber kz.

Comments:

Parameters written in Red can be modified directly by the user from the keyboard.

Input/Output Arguments:

Input Master Directory	Indicates the location of the considered **Master Main Directory (M-MD)** containing the polarimetric data sets to be processed.
Input Slave Directory	Indicates the location of the considered **Slave Main Directory (S-MD)** containing the polarimetric data sets to be processed.
Output Master-Slave Directory	Indicates the location of the processed data output directory. The default value is set automatically to : **Master-MD_Slave-MD (M-MD_S-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.

PCT Parameters Estimation:

The PCT Parameters Estimation functionality proposes the following processing steps:

1) Create two optimal reference polarization channels:

The procedure isolates candidates for the two volume and surface dominated polarization channels $\underline{w}_1$ and $\underline{w}_2$ (using physical models or phase/coherence optimisation) and calculate the corresponding optimal interferometric complex coherences γ_{Hi} and γ_{Lo} (see equation 52 of the PCT Training Course lecture note).

The output binary files are *cmplx_coh_PCTgamHi.bin* and *cmplx_coh_PCTgamLo.bin*.

The corresponding BMP output files are *cmplx_coh_PCTgamHi_mod.bmp*, *cmplx_coh_PCTgamHi_pha.bmp*, *cmplx_coh_PCTgamLo_mod.bmp* and *cmplx_coh_PCTgamLo_pha.bmp*.

2) Topographic phase estimation:

This procedure uses the two optimal reference interferometric complex coherences γ_{Hi} and γ_{Lo} in the appropriate order to estimate the topographic phase ϕ_0 (see equations 50 and 64 of the PCT Training Course lecture note).

The output binary file is *PCT_TopoPhase.bin* and the corresponding BMP output file is *PCT_TopoPhase.bmp*.

3) Height estimation:

This procedure identifies a volume polarization channel (from appropriate selection of optimum states $\underline{w}_{Hi}$ and $\underline{w}_{Lo}$) and calculates k_v. Then it estimates height from k_z and k_v. (see equations 55, 56, 57 and 65 and 66 of the PCT

Training Course lecture note).
The output binary files are *PCT_Kv.bin* and *PCT_Height.bin*, and the corresponding BMP output files are *PCT_Kv.bmp* and *PCT_Height.bmp*.

2D Kz File Enter the complete full path of the input Vertical Wavenumber Kz file name.

Window Size Data may be processed through an additional box car filtering. Users have then to set the size of the (N*N) sliding window used to compute the local estimate of the average matrix.
The default value of N is set to **11**.

Epsilon Users have to set the value of the **Epsilon (ε)** used in the PCT procedure (see the PCT Training Course lecture note).
Default value is set to **ε = 0.8**

PCT Engine:

The PCT Engine functionality proposes the following processing steps:

1) Calculate Legendre Spectrum :

The procedure calculates the Legendre function (*f0*, *f1* and *f2*) then derives the two Legendre coefficients (*a10* and *a20*) for the selected polarization channel w (see equations 22, 44, 62 and 68 of the PCT Training Course lecture note).
The output binary files are *PCT_f0.bin*, *PCT_f1.bin*, *PCT_f2.bin*, *PCT_a10.bin* and *PCT_a20.bin*. The corresponding BMP output files are *PCT_a10.bmp* and *PCT_a20.bmp*.

2) Construction of the vertical structure :

From the determination of the Legendre parameters a_{10} and a_{20}, the procedure reconstructs the normalized vertical scattering structure function for each pixel in the image, in order to obtain a 3-D image, PCT providing the z variation for each xy pixel of the SAR image (see equation 69 of the PCT Training Course lecture note).
The 3D output files are *~/Tmp/PCT_Tomo.asc* and *~/Tmp/PCT_Tomo.bin*.

2D Kz File Enter the complete full path of the input Vertical Wavenumber Kz file name.

2D PCT Topographic Phase File Enter the complete full path of the input Topographic Phase file name.
If exists, default value is set to : PCT_TopoPhase.bin

2D PCT Estimated Height File Enter the complete full path of the input Estimated Height file name.
If exists, default value is set to : PCT_Height.bin

2D Kv File Enter the complete full path of the input Vertical Wavenumber Kv file name.
If exists, default value is set to : PCT_Kv.bin

Polarimetric Channel Users can select different polarimetric channels in the combo box among a proposed list. The elements of these different lists

	correspond to the generated complex coherence files. If some polarisation channels are missing, they have to be generated using the **Complex Coherence Estimation** functionality. In this case, it is important to click on the button **Update List** in order to update the different polarisation channel lists.
Pixel Spacing	Value in meters of the pixel spacing along the row and col directions

Hist:

Clicking on the **Hist** button launches the Data Analysis – Histogram functionality

Display PCT:

Clicking on the **Display PCT** button launches the PCT Display functionality

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