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NAME

wishart − test for equality in two complex polarimetric radar signals

SYNOPSIS

wishart −n *nlook* [**−M** *maskfile* [*maskvalue*]] [**−a** | **−d**] < inbil > outbil

DESCRIPTION

For each input pixel in two multilook, comlex, polarimetric radar sequences *wishart* finds the logarithm of the likelihood ratio Q to test for significant difference or change from one scene to the other. The input is formed as the outer product of the complex vector $[\mathrm{Shh}\ \sqrt{2}\mathrm{Shv}\ \mathrm{Svv}]^T$. The likelihood ratio Q is independent of whether Shv is multiplied by $\sqrt{2}$ or not. The covariance matrix

$$\begin{bmatrix} \mathrm{ShhShh}^* & \sqrt{2}\,\mathrm{ShhShv}^* & \mathrm{ShhSvv}^* \\ \sqrt{2}\,\mathrm{ShvShh}^* & 2\,\mathrm{ShvShv}^* & \sqrt{2}\,\mathrm{ShvSvv}^* \\ \mathrm{SvvShh}^* & \sqrt{2}\,\mathrm{SvvShv}^* & \mathrm{SvvSvv}^* \end{bmatrix}$$

is Hermitian and Wishart distributed.

The input can be either two times nine float frames (ShhShh*, Re{ShhShv*}, Im{ShhShv*}, Re{ShhSvv*}, Im{ShhSvv*}, ShvShv*, Re{ShvSvv*}, Im{ShvSvv*}, SvvSvv*) or if we assume azimuth symmetric targets two times five float frames (ShhShh*, Re{ShhSvv*}, Im{ShhSvv*}, ShvShv*, SvvSvv*). In the azimuth symmetric target case ShhShv*, ShvSvv* and of course their complex conjugates are set to 0. Also two times three float frames (ShhShh*, ShvShv*, SvvSvv*) can be input in which case all off-diagonal elements are set to 0. Finally two times one float frame (ShhShh* or SvvSvv*) can be input. The input must consist of two concatenated scenes with the same number of frames (two times one, three, five or nine).

The input must be band-interleaved by line (BIL), output is BIL. The output consists of two float frames, one with ln(Q) and another with the significance level ($P\{-2\,\rho\,\ln(Q)\} \le \chi^2$) for an associated test statistic, see Conradsen et al. (2003) mentioned below. A low value of the test statistic Q rejects the hypothesis of equal covariance matrices, i.e., the hypothesis of no difference or no change is rejected for low ln(Q).

OPTIONS

−n *nlook* (**not optional**)

nlook is the number of looks, i.e., the number of degrees of freedom for the covariance data calculated for each pixel

−M *maskfile* [*maskvalue*]

if *maskfile* (a file with format byte) has value *maskvalue* the output for the corresponding pixel is set to 0.0 for frame 0 and 1.0 for frame 1; if no *maskvalue* is specified all values greater than 0 are mask values

−a assume azimuth symmetric target

−d use data on diagonal of covariance matrix only

SEE ALSO

bil(1), cloude(1)

BUG

Pixels containing a mask value rather than a SAR data value may cause *wishart* to be unable to calculate ln(Q) which in turn may cause a strange error message from one of the routines used to calculate the significance for the test. After this *wishart* stops. To remedy use **−M** with an appropriate mask.

REFERENCES

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AUTHOR

Allan Aasbjerg Nielsen, Ph.D., M.Sc.
IMM, Informatics and Mathematical Modelling
Technical University of Denmark, Building 321
E-mail aa@imm.dtu.dk, Internet www.imm.dtu.dk/˜aa