

NAME

krig – 2-D simple, ordinary and universal kriging of irregularly spaced data

SYNOPSIS

krig [*options*] < inseq > outseq

options are:

-p *filename*

[-b *xblocklength* *xblocklength*]

[-d **0** | **1** | **3** | **6**]

[-v [*filename*]]

[[-gx *minx maxx*] **[-gy** *miny maxy*] **[-gstep** *xstep [ystep]]] | **[-gsize** *nc nr*]] |*

[-G *filename*] |

[-t]

[-sr [*max-distance* [*max-supp*]]] |

[-so [*max-order* [*max-distance* [*max-supp*]]] **[-n** *filename*]

[-u] **[-4]** | **[-8]**

DESCRIPTION

krig performs kriging on the irregularly sampled variables. The covariance function used is a 2-order spherical function. The parameters to the function must be supplied in an ASCII file using **-p** (the filename defaults to *cov.par*).

krig reads from *stdin*. The input is irregularly sampled variables in the IMSM defined irregular HIPS format, see *a2h* or *asc2hips*. Using the 2-order spherical covariance-function it calculates the Best Linear Unbiased Estimate (BLUE) to the desired points or area. The kriging method is based on minimizing the estimation variance under the condition that the estimate is unbiased.

The results are piped to the *stdout* in float or double HIPS format. Both block-kriging and point-kriging are available. It is possible to specify a drift in the data (linear or quadratic) – using the **-d** option.

The number of points used in the kriging estimation can be limited by *max-supp* number. The selection of the points to be used in the estimate can be done in two ways: Default is **-sr** select by range which takes the nearest points (Euclidean distance). Or they might be selected by a neighbourhood relation using the **-so** select by order option. The relationship file is supplied by the **-n** option. Specify the maximum order of the neighbours which are used. The relationship file might be created using the program *del aunay*.

Optionally the variance of the estimate is calculated and printed to the file specified by the **-v** option.

Input must be float or double in the IMM defined Irregular HIPS format, see *a2h*.

The system of kriging equations is solved by means of LINPACK routines.

OPTIONS

-p *covariance-filename*

defaults to *cov.par*. The file contains the parameters to the 2-order spherical covariance-function and must be specified. The format of the file is: {*%d %a1 %a2 %c0 %c1 %c2*}* repeated as many times as the number of variables. *d* is a dummy integer (to number the lines/variables), *a1,a2,c0,c1,c2* are floating-point numbers. The covariance function is defined as:

$cov(h)=$

if ($h==0$) $c0+c1+c2$

if ($0<h<=a1$) $c1*(1 - 1.5*h/a1 + (h/a1)^3/2) + c2*(1 - 1.5*h/a2 + (h/a2)^3/2)$

if ($a1<h<=a2$) $c2*(1 - 1.5*h/a2 + (h/a2)^3/2)$

if ($a2<h$) 0

To use a 1-order spherical function set $a1=0$ and $c1=0$. To use nearest neighbour interpolation set $a1=-1$. To use local mean interpolation set $a1=-2$. To use inverse distance interpolation set $a1=-4$. To use inverse squared distance interpolation set $a1=-5$.

- b** *xblocklength yblocklength*
The size of the blocks to be estimated are specified by their side lengths. If the options **-gx** and **-gy** are used the blocklengths are set to the steplengths.
- d** *number*
specifies the universal kriging number. The number 0 gives simple kriging, 1 gives ordinary kriging, 3 gives universal kriging using a linear drift and 6 gives universal kriging using a quadratic drift.
- v** *variancefilename*
specifies the filename of the variance calculated by the kriging program. The format of this file is the same as the format of the estimate sent to *stdout*.
- gx** *xmin xmax*
- gy** *ymin ymax*
specifies grid to which kriging is desired. If this option is not used the values are set to the values from the *inseq*. Do not use with the **-G** and **-t** options.
- gstep** *xstep [ystep]*
sets the distance between the points or blocks. If *ystep* is not specified it is set equal *xstep*. Do not use with **-gsize**.
- gsize** *nrows ncols*
specifies the number of columns and rows in the *outseq*. Do not use with **-gstep**.
- G** *pointfilename*
specifies the coordinates of the points to which kriging is desired, must be of IMM defined Irregular HIPS format. Do not use with **-gx**, **-gy** and **-t**. It may contain only the x- and y-coordinates of the points.
- sr** [*max-distance* [*max-supp*]]
support by range – specifies the method of witch neighbours used in the estimation are found. The neighbours are supplied by Euclidean distance. Only the *max-supp* points closer than the *max-distance* are used. If the *max-distance* is not supplied the range of influence *a2* from the covariance function is used. Do not use with **-so**.
- so** [*max-order* [*max-distance* [*max-supp*]]]
support by orderrelation – specifies the method of witch neighbours used in the estimation are found. *max-order* specifies the maximum order of neighbours to use. It is possible to specify an additional restriction to the used points by specifying *max-distance* which is the largest distance to search support. *max-supp* is the maximum number of points to use. **-n** must used when **-so** is used. The file contains the neighbourhood relationship of the measurepoints (*inseq*). The file might be created by program *delaunay*. Do not use with **-sr**.
- n** *neighbourhood-relation-filename*
specifies the name of the file containing the neighbourhood relationship. This file might be created using the program *delaunay*. Must be specified with **-so**.
- u** *undef-value*
specifies output value for (grid)points with no kriging estimates, default is -9999.0.
- 4** output float data
- 8** output double data
- t** test kriging by the leave-one-out method.

DEFAULT ACTION

Default action is ordinary point kriging to a grid determined by the input coordinates ($ystep = xstep = \sqrt{(x_{max}-x_{min}) \cdot (y_{max}-y_{min}) / n_{points}}$), where *npoints* is the number of observations in the *inseq*, search radius is *a2* with *max-supp* 5.

EXAMPLES

krig < los.hips > result.hips

krig -p cov.par -gsize 128 128 < los.hips > result.hips

krig -p cov.par -G locations.hips < los.hips > result.hips

krig -p cov.par -gx 10 75 -gsize 128 128 -sr 4.2 -v variance.hips < los.hips > result.hips

SEE ALSO

delautay, asc2hips, crossv, a2h, crossv2d, cokrig, location

REFERENCES

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A.G. Journel and Ch.J. Huijbregts: *Mining Geostatistics*. Academic Press, 1978.

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