

Nelder Mead Optimization

Minimizing of a user defined function by using Nelder Mead Method. Dimensionality of function that is to be minimized only limited by calculator memory.

Variables:

- i1, i2, i3, j1, j2: Loop variables
- imax,imin: Indices for minimum resp.. maximum in simplex
- fux(): Function to minimize; takes list lxw as x-values and delivers zfn as value of function
- lfw: List of function values (dimension: zd0+1)
- lrc: List of coordinates of reflection point (dimension: zd0)
- lxw: List of x-values (dimension: zd0), at beginning starting value, at end result
- msi: Matrix of simplex values (dimension zd0 X zd0+1)
- zak: Termination criterion
- zd0: Number of dimensions
- zs0: Step width at beginning
- zeps: termination criterion for step width

Example:

Minimize the following function:

$$f(x_1, x_2, x_3, x_4, x_5) = (x_1 - 2)^2 + (x_2 - 1)^2 + (x_3 - 1.5)^2 + x_4^2 + (x_5 + 1)^2 + 2 * ((x_1 - 2) * (x_2 - 1))^2 + 0.5 * ((x_2 - 1) * (x_5 + 1))^2$$

→ Generate function fux()

fux()

Func

Return (lxw[1]-2.)^2+(lxw[2]-1.)^2+(lxw[3]-1.5)^2+lxw[4]^2+(lxw[5]+1)^2+2.*((lxw[1]-2.)*(lxw[2]-1.))^2+0.5*((lxw[2]-1)*(lxw[5]+1))^2 -> zy0

EndFunc

Put in starting value of x parameters:

{0.,0.,0.,0.,0.} -> lxw;

Start optimization with parameter for initial step width (0.5) and termination criterion for step width (0.0001):

→ nmo(0.5,0.0001)

During the optimization the following screen is shown:

0.270704	0.660873	0.524304	0.210295	0.563637	0.461540
--- fmin, fmax, zak					
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With:

fmin: Minimum function value of current simplex

fmax: Maximum function value of current simplex

zak: Step width of current simplex

After about 8 minutes the iterative process ends showing the following screen:

F1	F2	F3	F4	F5	F6	
Tools	RTS4bPrd	Calc	Other	PF9MID	CT&G	

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8.013468E-9
.000101
--- fmin, fmax, zak
8.017958E-9
2.833662E-8
.000097
--- Done -----
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The value of zak is smaller than 0.0001 which was given as termination criterion.

The function value at minimum is given by fmin (8.01×10^{-9})

To get the x-values at minimum get lxw:

F1	F2	F3	F4	F5	F6	
Tools	RTS4bPrd	Calc	Other	PF9MID	CT&G	

```

■ lxw
  {2.0000  1.0000  1.5000 }
lxw
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Result is:

{2.0000,1.0000,1.5000,-8.7125E-6,-.9999}

which is near to the exact minimum {2.,1.,1.5,0.,-1.}