NAG Library Function Document

nag_opt_handle_set_nlnobj (e04rgc)

1 Purpose

nag_opt_handle_set_nlnobj (e04rgc) is a part of the NAG optimization modelling suite and declares the objective function of the problem as a nonlinear function with a particular gradient sparsity structure.

2 Specification

```
#include <nag.h>
#include <nage04.h>
void nag_opt_handle_set_nlnobj (void *handle, Integer nnzfd,
     const Integer idxfd[], NagError *fail)
```

3 Description

After the initialization function nag_opt_handle_init (e04rac) has been called (and unless the objective function has been defined previously by nag_opt_handle_set_linobj (e04rec), nag_opt_handle_set_quadobj (e04rfc) or by nag_opt_handle_set_nlnobj (e04rgc)), nag_opt_handle_set_nlnobj (e04rgc) may be used to declare the objective function of the problem as a nonlinear function and define the sparsity pattern (list of nonzero elements) of its gradient. This objective function will typically be used for nonlinear programming problems (NLP) of the kind:

$$\begin{array}{lll} \underset{x\in\mathbb{R}^n}{\text{minimize}} & f(x) & \text{(a)} \\ \text{subject to} & l_g \leq g(x) \leq u_g & \text{(b)} \\ & l_B \leq Bx \leq u_B & \text{(c)} \\ & l_x \leq x \leq u_x & \text{(d)} \end{array} \tag{1}$$

The values of the nonlinear objective function $f(x)$ and the nonzero values of its gradient $\dfrac{\partial f}{\partial x_i}$ (matching the sparsity pattern) evaluated at particular points in the decision variable space will be communicated to the NLP solver by user-supplied functions (e.g., **objfun** and **objgrd**). See nag_opt_handle_init (e04rac) for more details.

4 References

None.

5 Arguments

1: **handle** – void * *Input*

On entry: the handle to the problem. It needs to be initialized by nag_opt_handle_init (e04rac) and **must not** be changed.

2: **nnzfd** – Integer *Input*

On entry: the number of nonzero elements in the sparse gradient vector of the objective function.

Constraint: **nnzfd** ≥ 0.

3: **idxfd**[**nnzfd**] – const Integer *Input*

On entry: the one-based indices of the nonzero elements of the sparse gradient vector. The indices must be stored in ascending order. Note that n, the number of decision variables in the problem, was set in **nvar** during the initialization of the handle by nag_opt_handle_init (e04rac).

If **nnzfd** $= 0$, the objective is assumed to be zero and the array **idxfd** will not be referenced and may be **NULL**.

Constraints:

$1 \leq$ **idxfd**$[i-1] \leq n$, for $i = 1, 2, \ldots,$ **nnzfd**;
idxfd$[i-1] <$ **idxfd**$[i]$, for $i = 1, 2, \ldots,$ **nnzfd** $- 1$.

4: **fail** – NagError * *Input/Output*

The NAG error argument (see Section 2.7 in How to Use the NAG Library and its Documentation).

6 Error Indicators and Warnings

NE_ALLOC_FAIL

Dynamic memory allocation failed.
See Section 2.3.1.2 in How to Use the NAG Library and its Documentation for further information.

NE_ALREADY_DEFINED

The objective function has already been defined.

NE_BAD_PARAM

On entry, argument ⟨*value*⟩ had an illegal value.

NE_HANDLE

The supplied **handle** does not define a valid handle to the data structure for the NAG optimization modelling suite. It has not been initialized by nag_opt_handle_init (e04rac) or it has been corrupted.

NE_INT

On entry, **nnzfd** $=$ ⟨*value*⟩.
Constraint: **nnzfd** ≥ 0.

NE_INTARR

On entry, $i =$ ⟨*value*⟩, **idxfd**$[i-1] =$ ⟨*value*⟩ and $n =$ ⟨*value*⟩.
Constraint: $1 \leq$ **idxfd**$[i-1] \leq n$.

NE_INTERNAL_ERROR

An internal error has occurred in this function. Check the function call and any array sizes. If the call is correct then please contact NAG for assistance.

An unexpected error has been triggered by this function. Please contact NAG.
See Section 2.7.6 in How to Use the NAG Library and its Documentation for further information.

NE_NO_LICENCE

Your licence key may have expired or may not have been installed correctly.
See Section 2.7.5 in How to Use the NAG Library and its Documentation for further information.

NE_NOT_INCREASING

On entry, $i = \langle value \rangle$, **idxfd**$[i-1] = \langle value \rangle$ and **idxfd**$[i] = \langle value \rangle$.
Constraint: **idxfd**$[i-1] <$ **idxfd**$[i]$ (ascending order).

NE_PHASE

The Hessians of nonlinear functions have already been defined, a nonlinear objective cannot be added.

The problem cannot be modified in this phase any more, the solver has already been called.

7 Accuracy

Not applicable.

8 Parallelism and Performance

nag_opt_handle_set_nlnobj (e04rgc) is not threaded in any implementation.

9 Further Comments

9.1 Additional Licensor

Parts of the code for nag_opt_handle_solve_ipopt (e04stc) are distributed according to terms imposed by another licensor. Please refer to the list of Library licensors available on the NAG Website for further details.

10 Example

See Section 10 in nag_opt_handle_solve_ipopt (e04stc).